Australian Government

ICT10 Integrated Telecommunications Training Package

Release: 3.0

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ICTSUS8237A Lead applied research in ICT sustainability 1890
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ICTTCR2189A Use operational safety in a telecommunications rigging environment 1927
ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures 1941
ICTTCR3062A Build a telecommunications radio structure 1954
ICTTCR3191A Install radio plant and equipment on telecommunications structures 1966
ICTTCR3192A Protect against electromagnetic radiation and system hazards when working on telecommunications radio sites 1977
ICTTEN2008A Use electrical skills in telecommunications work 1987
ICTTEN2140B Use hand and power tools 1995
ICTTEN2207A Install and configure a home or small office network 2004
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ICTTEN2209A Build and maintain a secure network 2020
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ICTTEN4215A Install and configure internet protocol TV in a service provider network 2347
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ICTTEN4241A Design network projects 2365

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ICTTEN8196A Evaluate and apply digital signal processing to communications system 2809
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ICTWOR3041A Schedule resources 2874
ICTWOR3093A Manage spare parts 2882
ICTWOR3127A Supervise worksite activities 2891
ICTWOR3231A Resolve technical enquiries using multiple information systems 2899
ICTWOR3232A Collect and analyse technical information 2907
ICTWOR4032A Undertake a civil site survey 2915
ICTWOR4079A Schedule equipment maintenance 2924
BSBCUS201B Deliver a service to customers 2931
BSBFIM501A Manage budgets and financial plans 2937
BSBINM302A Utilise a knowledge management system 2945
BSBMGT401A Show leadership in the workplace 2951
BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business 2956
BSBSMB306A Plan a home based business 2962
BSBSMB401A Establish legal and risk management requirements of small business 2968
BSBSMB407A Manage a small team 2976
BSBSUS201A Participate in environmentally sustainable work practices 2984
BSBSUS301A Implement and monitor environmentally sustainable work practices 2991
BSBSUS501A Develop workplace policy and procedures for sustainability 3001
BSBWOR401A Establish effective workplace relationships 3010
CPCSUS4001A Implement and monitor environmentally sustainable work practices 3018
CPCCLDG3001A Licence to perform dogging 3031
CPCCLRG3001A Licence to perform rigging basic level 3041
CPCCLRG3002A Licence to perform rigging intermediate level 3054
CPCCLRG4001A Licence to perform rigging advanced level 3066
CPCCOHS1001A Work safely in the construction industry 3078
CPPSEC3034A Operate information gathering equipment 3089
FNSORG506A Prepare financial forecasts and projections 3097
ICASAS301A Run standard diagnostic tests 3104
ICAICT302A Install and optimise operating system software 3111
ICAICT303A Connect internal hardware components 3119
ICASAS305A Provide IT advice to clients 3128
ICANWK305A Install and manage network protocols 3134
ICANWK406A Install, configure and test network security 3139
ICANWK417A Build an enterprise wireless network 3148
TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more) 3156

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Modification History

Version Modification History

The version details of this endorsed Training Package are in the table below. The latest information is at the top of the table.

Version	Release Date	Comments

3.0	February 2014	**NSSC endorsement:**
		Qualifications
		• **One new qualification:**
		  • ICT40713 Certificate IV in Telecommunications Network Design
		• **Twelve revised qualifications:**
		  • ICT20110 Certificate II in Telecommunications Technology revised, new code ICT20113
		  • ICT20210 Certificate II in Telecommunications revised, new code ICT20213
		  • ICT20310 Certificate II in Telecommunications Cabling revised, new code ICT20313
		  • ICT20410 Certificate II in Telecommunications Digital Reception Technology revised, new code ICT20413
		  • ICT30110 Certificate III in Broadband and Wireless Networks Technology revised, new code ICT30113
		  • ICT30210 Certificate III in Telecommunications revised, new code ICT30213
		  • ICT30310 Certificate III in Telecommunications Cabling revised, new code ICT30313
		  • ICT30410 Certificate III in Telecommunications Digital Reception Technology revised, new code ICT30413
		  • ICT30610 Certificate III in Broadband and Wireless Networks revised, new code ICT30613
		  • ICT40310 Certificate IV in Telecommunications Radio Communications revised, new code ICT40313
		  • ICT40610 Certificate IV in Telecommunications Networks Technology revised, new code ICT40613
		  • ICT50510 Diploma of Telecommunications Planning and Design revised, new code ICT50513

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Version	Release Date	Comments

		Units of competency
		• **Nine new units:**
		  • ICTDRE3248A Design communications wiring systems for customer premises
		  • ICTDRE3249A Develop integrated digital reception systems
		  • ICTNPL4247A Apply compliance requirements to telecommunications work
		  • ICTTEN4241A Design network projects
		  • ICTTEN4242A Conduct site surveys to identify carrier installation requirements
		  • ICTTEN4243A Prepare design drawings and specifications for telecommunications installations
		  • ICTTEN4244A Estimate and quote for carrier telecommunications equipment installations
		  • ICTTEN4245A Design infrastructure for telecommunications network installations
		  • ICTTEN4246A Design dense wavelength division multiplexing installations
		• **Three revised units:**
		  • ICTCBL2162A Install a cable lead-in revised, new code ICTCBL2163A
		  • ICTTEN2007A Use electrical skills in telecommunications work revised, new code ICTTEN2008A
		  • ICTTEN2105A Install and test an internet protocol device in convergence networks revised, new code and title ICTTEN2219A Install and test internet protocol devices in convergence networks
		ISC Upgrade:
		• Minor revisions to 17 qualifications while maintaining equivalence:
		  • ICT20513 Certificate II in Telecommunications Fixed Wireless and Rigging Installation
		  • ICT20613 Certificate II in National Broadband Network Construction
		  • ICT30513 Certificate III in Telecommunications Rigging Installation
		  • ICT30713 Certificate III in National Broadband Network Construction
		  • ICT30813 Certificate III in Telecommunications Fixed Wireless

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Version	Release Date	Comments
		Installation • ICT40110 Certificate IV in Optical Networks • ICT40210 Certificate IV in Telecommunications Network Engineering • ICT40410 Certificate IV in Radio Frequency Networks • ICT40510 Certificate IV in Telecommunications Network Planning • ICT50110 Diploma of Optical Networks • ICT50210 Diploma of Telecommunications Network Engineering • ICT50310 Diploma of Telecommunications Management • ICT50410 Diploma of Radio Frequency Networks • ICT60110 Advanced Diploma of Optical Networks • ICT60210 Advanced Diploma of Telecommunications Network Engineering • ICT70110 Vocational Graduate Certificate in Telecommunications Network Engineering • ICT80110 Vocational Graduate Diploma of Telecommunications Network Engineering • Minor revisions to 52 units while maintaining equivalence: • ICTBWN3082B Perform tests on optical communication system and components • ICTBWN3088B Install optical fibre splitters in fibre distribution hubs • ICTBWN3090B Install lead-in module and cable for fibre to the premises • ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation • ICTBWN3205B Use optical and radio frequency measuring instruments • ICTCBL2005B Install customer cable support systems • ICTCBL2006B Place and secure customer cable • ICTCBL2008B Terminate metallic conductor customer cable • ICTCBL2012B Install functional and protective telecommunications earthing system • ICTCBL2017B Alter services to existing cable system • ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers • ICTCBL2066B Joint and terminate coaxial cable • ICTCBL2136B Install, maintain and modify customer premises

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Version	Release Date	Comments
		communications cabling: ACMA Restricted Rule • ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule • ICTCBL2138B Install, maintain and modify customer premises communications cabling: ACMA Lift rule • ICTCBL2139B Apply safe technical work practices for cabling registration when configuring an ADSL circuits • ICTCBL3009B Install, terminate and certify structured cabling installation • ICTCBL3010B Install and terminate optical fibre cable on customer premises • ICTCBL3011B Install and terminate coaxial cable • ICTCBL3240B Install ribbon fibre cable in the FTTX distribution network • ICTCBL4002B Prepare design drawings and specification for a cable installation • ICTCBL4004B Schedule and supply cabling installation • ICTCBL4023B Supervise cabling project • ICTCBL4057B Test cable bearers • ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards • ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule • ICTDRE3156B Install digital reception equipment • ICTDRE3157B Locate and rectify digital reception equipment faults • ICTITU7106B Manage automated IT system applications using unix • ICTOHS2153B Work safely near power infrastructure • ICTOPN4115B Install and test a dense wavelength division multiplexing system • ICTPMG4048B Schedule installation of customer premises equipment • ICTPMG7145B Undertake a telecommunications project • ICTPMG8143B Manage a telecommunications project • ICTPMG8149B Evaluate and use telecommunications management networks • ICTRFN2163B Install a satellite antenna • ICTRFN2164B Install a terrestrial antenna • ICTRFN2068B Monitor the capacity of an recommend changes

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Version	Release Date	Comments
		to the cellular mobile network • ICTRFN7182B Produce a radio link budget • ICTRFN8180B Analyse a cellular mobile network system • ICTRFN8181B Analyse a satellite communications system • ICTTEN2140B Use hand and power tools • ICTTEN3054B Provide infrastructure for telecommunications network equipment • ICTTEN3077B Commission an electronic unit • ICTTEN3250B Provide infrastructure for telecommunications customer equipment • ICTTEN4001B Identify requirements for customer telecommunications equipment • ICTTEN4003B Estimate and quote for customer telecommunications equipment installation • ICTTEN4229B Design, install and configure a customer smart technology network • ICTTEN7193B Plan a transmission network • ICTTEN7227B Analyse business specifications to produce technical solutions • ICTTEN8195B Evaluate and apply network security • ICTWHS2170B Follow work health and safety and environmental policies and procedures Revised the following skill sets to reflect the changes to units detailed above: • Advanced Cabler Registration Skill Set • Advanced Telecommunications Rigging Installation Skill Set • Basic Open Cabler Registration Skill Set • Basic Restricted Cabler Registration Skill Set • Civil Works – Installation of Pit and Pipe and FDH Skill Set • Commercial Digital Television Antenna Systems Installation Skill Set • Convergent Technology Installations for Home and SME Skill Set • Designer Skill Set • Domestic Digital Television Antenna Installation Skill Set • Installing NBN Wireless and Infrastructure Skill Set • IP Convergence Installations for Home and SME Skill Set • National Broadband Network Advanced Linesworker/Installer Skill Set

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Version	Release Date	Comments
		• National Broadband Network Splicer Skill Set • Radio Technician Skill Set • Wireless LAN and IP Network Installation Skill Set Updated units to current versions.
2.0	19 July 2013	**NSSC endorsement:** **Qualifications** **New qualifications** • ICT20613 Certificate II in National Broadband Network Construction • ICT30713 Certificate III in National Broadband Network Construction • ICT30813 Certificate III in Telecommunications Fixed Wireless Installation **Revised qualifications** • ICT20510 Certificate II in Telecommunications Rigging Installation revised: new code and title ICT20513 Certificate II in Telecommunications Fixed Wireless and Rigging Installation • ICT30510 Certificate III in Telecommunications Rigging Installation: new code ICT30513 **Units of competency** **New units** • ICTCBL3240A Install ribbon fibre cable in the FTTX distribution network • ICTCMP2239A Perform restricted customer premises broadband cabling work: ACMA Restricted Rule • ICTTEN3250A Provide infrastructure for telecommunications customer equipment • ICTWHS2081A Work safely in a radio frequency electromagnetic radiation environment • ICTWHS2170A Follow work health and safety and environmental policies and procedures **ISC Upgrade:**

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Version	Release Date	Comments
		• Make a range of minor editorial changes • Update existing skill sets to reflect addition of new ICTWHS2170 unit and NBN changes to Training Package and revision of pathway qualification information: **New Skill Sets** • Advanced Cabler Registration Skill Set • Basic Open Cabler Registration Skill Set • Basic Restricted Cabler Registration Skill Set • Civil Works – Installation of Pit and Pipe and FDH Skill Set • Designer Skill Set • ICT Access Senior Designer Skill Set • National Broadband Network Advanced Linesworker/Installer Skill Set • National Broadband Network Splicer Skill Set • Plan FTTP Access Network Skill Set **Updated Skill Sets** • Advanced Telecommunications Rigging Installation Skill Set • Basic ICT Sustainability Skill Set • Basic Telecommunications Rigging Installation Skill Set • Commercial Digital Television Antenna Systems Installation Skill Set • Domestic Digital Television Antenna Installation Skill Set • ICT Sustainability Planning Skill Set • Installing NBN Wireless and Infrastructure Skill Set • Technical Help Desk Support Skill Set • Radio Technician Skill Set • Wireless LAN and IP Network Installation Skill Set **Deleted Skill Sets** • Access Network Skill Set • Broadband Skill Set • Cabler Registration Skill Set • Digital Reception Technology Skill Set • Fibre to the Premises (FTTP) Test and Commission Skill Set (Advanced level installers) • Fibre to the Premises (FTTP) Installation Skill Set (Base level installers) • Satellite Digital Television Antenna Installation Skill Set
1.0	15 June	Primary release

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Version	Release Date	Comments
	2010	

Training Package Details

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ISC Name:	Innovation and Business Skills Australia
ISC Website URL:	www.ibsa.org.au

Training Package Volume Number 1	Training Package Volume Name
1	1 of 3
2	2 of 3
3	3 of 3

Training Package Volume Number 1	Training Package Volume Statement

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Training Package Volume Number 1	Training Package Volume Statement
1	Introduction, Qualifications Framework and Assessment Guidelines
2	ICT10 Units of competency
3	Imported units of competency

Training Package Volume Number 1	Training Package Volume Description
1	This document is Volume 1 of the Integrated Telecommunications Training Package endorsed components. As such it provides the introduction to the Training Package, including the Assessment Guidelines and the Qualification Framework. It should not be used in isolation; users will need to ensure they have the relevant volume or volumes for the particular industry sector containing the endorsed units of competency.
2	This volume contains the ICT10 units of competency. It is not to be used in isolation but must be used in conjunction with Volume 1 which includes the Qualifications Framework and Assessment Guidelines, and with Volume 3 which contains imported units of competency.
3	This volume contains imported units of competency. It is not to be used in isolation but must be used in conjunction with Volume 1 which includes the Qualifications Framework and Assessment Guidelines, and with Volume 2 which contains ICT10 units of competency.

Training Package Volume Number	ISBN Number

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Preliminary Information

Important Note to Users

Training Packages are not static documents; they are amended periodically to reflect the latest industry practices and are version controlled. It is essential that the latest version is always used.

Check the version number before commencing training or assessment

This Training Package is Version - check whether this is the latest version by going to the National Training Information Service (www.ntis.gov.au) and locating information about the Training Package. Alternatively, contact Innovation and Business Industry Skills Council at http://www.ibsa.org.au to confirm the latest version number.

Explanation of version number conventions

The primary release Training Package is Version 1. When changes are made to a Training Package, sometimes the version number is changed and sometimes it is not, depending on the extent of the change. When a Training Package is reviewed it is considered to be a new Training Package for the purposes of version control, and is Version 1. Do not confuse the version number with the Training Packages national code (which remains the same during its period of endorsement).

History

This submission puts forward the case for the endorsement of the ICT10 Integrated Telecommunications Training Package Version 3.0 (ICT10 V3.0); continuous improvement of the Training Package, which includes targeted revision of specific components of the ICT10 Telecommunication Training Package.

With the federal government driving the agenda of a number of initiatives in the telecommunications industry, including the NBN, Digital Education Revolution (DER) and sustainability practices to reduce carbon emissions and greenhouse effects on the environment, there has been major work to refresh this third version of ICT10 Integrated Telecommunications Training Package to meet the needs of the Australian industry and broader community.

Extensive industry consultation and research has identified a need for a new qualification and associated new competency units and a need to revise a number of qualifications and competency units.

The major changes introduced into Version 3 of ICT10 Integrated Telecommunications Training Package are the:

- NSSC endorsement for:
  - a new qualification for network design (ICT40713 Certificate IV in Telecommunications Network Design)
  - nine new and three revised recoded units of competency

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  - revision of 12 recoded qualifications
- ISC upgrade of:
  - 17 qualifications
  - 52 units of competency
  - 15 Skill Sets

These new and revised qualifications and units of competency help to maintain the relevance of the Training Package.

List of AQF Qualifications

Qualification Code	Title
ICT20113	Certificate II in Telecommunications Technology
ICT20213	Certificate II in Telecommunications
ICT20313	Certificate II in Telecommunications Cabling
ICT20413	Certificate II in Telecommunications Digital Reception Technology
ICT20513	Certificate II in Telecommunications Fixed Wireless and Rigging Installation
ICT20613	Certificate II in National Broadband Network Construction
ICT30113	Certificate III in Broadband and Wireless Networks Technology
ICT30213	Certificate III in Telecommunications
ICT30313	Certificate III in Telecommunications Cabling
ICT30413	Certificate III in Telecommunications Digital Reception Technology
ICT30513	Certificate III in Telecommunications Rigging Installation
ICT30613	Certificate III in Broadband and Wireless Networks
ICT30713	Certificate III in National Broadband Network Construction
ICT30813	Certificate III in Telecommunications Fixed Wireless Installation
ICT40110	Certificate IV in Optical Networks
ICT40210	Certificate IV in Telecommunications Network Engineering
ICT40313	Certificate IV in Telecommunications Radio Communications

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Qualification Code	Title
ICT20113	Certificate II in Telecommunications Technology
ICT40410	Certificate IV in Radio Frequency Networks
ICT40510	Certificate IV in Telecommunications Network Planning
ICT40613	Certificate IV in Telecommunications Networks Technology
ICT40713	Certificate IV in Telecommunications Network Design
ICT50110	Diploma of Optical Networks
ICT50210	Diploma of Telecommunications Network Engineering
ICT50310	Diploma of Telecommunications Management
ICT50410	Diploma of Radio Frequency Networks
ICT50513	Diploma of Telecommunications Planning and Design
ICT60110	Advanced Diploma of Optical Networks
ICT60210	Advanced Diploma of Telecommunications Network Engineering
ICT70110	Vocational Graduate Certificate in Telecommunications Network Engineering
ICT80110	Vocational Graduate Diploma of Telecommunications Network Engineering

List of ALL Units within Training Package

Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTBWN3082B	Perform tests on optical communication system and components	
ICTBWN3088B	Install optical fibre splitters in fibre distribution hubs	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTBWN3090B	Install lead-in module and cable for fibre to the premises	
ICTBWN3100B	Work safely with live fibre to test and commission a fibre to the x installation	ICTWHS2170B
ICTBWN3205B	Use optical and radio frequency measuring instruments	
ICTCBL2005B	Install customer cable support systems	
ICTCBL2006B	Place and secure customer cable	
ICTCBL2008B	Terminate metallic conductor customer cable	
ICTCBL2012B	Install functional and protective telecommunications earthing system	
ICTCBL2016A	Joint metallic conductor cable on customer premises	
ICTCBL2017B	Alter services to existing cable system	
ICTCBL2064A	Haul underground cable	
ICTCBL2065B	Splice and terminate optical fibre cable for carriers and service providers	
ICTCBL2066B	Joint and terminate coaxial cable	
ICTCBL2068A	Install a telecommunications service to a building	
ICTCBL2131A	Install an above ground equipment enclosure	
ICTCBL2132A	Erect aerial cable supports	
ICTCBL2133A	Construct underground telecommunications infrastructure	
ICTCBL2134A	Fix aerial cable	
ICTCBL2135A	Joint metallic conductor cable in access	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
	network	
ICTCBL2136B	Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule	
ICTCBL2137B	Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B
ICTCBL2138B	Install, maintain and modify customer premises communications cabling: ACMA Lift Rule	
ICTCBL2139B	Apply safe technical work practices for cabling registration when configuring ADSL circuits	
ICTCBL2163A	Install a cable lead-in	
ICTCBL3009B	Install, terminate and certify structured cabling installation	
ICTCBL3010B	Install and terminate optical fibre cable on customer premises	
ICTCBL3011B	Install and terminate coaxial cable	
ICTCBL3013A	Perform cable and system test on customer premises	
ICTCBL3014A	Hand over systems and equipment	
ICTCBL3015A	Locate and identify cable system faults	
ICTCBL3018A	Install underground enclosures and conduit	
ICTCBL3019A	Install underground cable	
ICTCBL3020A	Construct aerial cable supports	
ICTCBL3021A	Install aerial cable	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTCBL3049A	Install systems and equipment on customer premises	
ICTCBL3052A	Cut over new systems and equipment on customer premises	
ICTCBL3067A	Modify and cut over cable	
ICTCBL3069A	Install network cable equipment	
ICTCBL3103A	Maintain cable network	
ICTCBL3240B	Install ribbon fibre cable in the FTTX distribution network	ICTCBL2065B
ICTCBL4002B	Prepare design drawings and specification for a cable installation	
ICTCBL4004B	Schedule and supply cabling installation	
ICTCBL4023B	Supervise cabling project	
ICTCBL4057B	Test cable bearers	
ICTCBL4099A	Remotely locate and identify cable network faults	
ICTCMP2022B	Organise and monitor cabling to ensure compliance with regulatory and industry standards	
ICTCMP2239B	Perform restricted customer premises broadband cabling work: ACMA Restricted Rule	ICTCBL2136B
ICTCMP5176A	Undertake radio communications site audit	
ICTDRE3156B	Install digital reception equipment	
ICTDRE3157A	Locate and rectify digital reception equipment faults	
ICTDRE3165A	Install a complex digital reception system	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTDRE3248A	Design communications wiring systems for customer premises	ICTCBL2137B (ICTCBL2136B)
ICTDRE3249A	Develop integrated digital reception systems	
ICTDRE4166A	Integrate customer digital reception equipment	
ICTDRE4167A	Integrate data delivery modes	
ICTEDU3053A	Train customers in new technology	
ICTEDU5025A	Develop and deliver training associated with new and modified products	
ICTITU5144A	Test telecommunications network using virtual instruments	
ICTITU7106B	Manage automated ICT system applications using unix	
ICTNPL4107A	Apply business acumen to network planning	
ICTNPL4108A	Plan the deployment of access network architectures	
ICTNPL4109A	Evaluate the capability of access networks	
ICTNPL4110A	Evaluate the planning requirements for provisioning a telecommunications building facility	
ICTNPL4111A	Develop provisioning of telecommunications building works project	
ICTNPL4112A	Evaluate core network architectures	
ICTNPL4113A	Plan the deployment of core network	
ICTNPL4114A	Produce planning specifications for end to end service delivery	
ICTNPL4150A	Apply knowledge of regulation and legislation	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
	for the telecommunications industry	
ICTNPL4151A	Plan the telecommunications access network for an estate	
ICTNPL4247A	Apply compliance requirements to telecommunications work	
ICTNPL5071A	Develop planning strategies for core network design	
ICTNPL5096A	Develop planning strategies for access network design	
ICTNPL5101A	Apply service measures and demand forecasting to products and services planning	
ICTNPL5154A	Develop planning strategies for building environment design	
ICTNPL6029A	Plan the development and growth of the telecommunications network	
ICTNPL6030A	Forecast service demand	
ICTNPL6046A	Undertake network performance analysis	
ICTOHS2080A	Provide telecommunications services safely on roofs	
ICTOHS2153B	Work safely near power infrastructure	
ICTOPN4115B	Install and test a dense wavelength division multiplexing system	
ICTOPN4116A	Use advanced optical test equipment	
ICTOPN4117A	Prepare activity plans and specifications for a fibre to the x installation	
ICTOPN5118A	Plan and configure dense wavelength division multiplexing systems	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTOPN5119A	Perform acceptance and commissioning tests on optical network	
ICTOPN5120A	Plan for an optical system upgrade and cut over	
ICTOPN5121A	Test and commission a dense wavelength division multiplexing transmission system	
ICTOPN5122A	Test the performance of specialised optical devices	
ICTOPN5123A	Analyse and integrate specialised optical devices in the network	
ICTOPN6124A	Manage optical ethernet transmission	
ICTOPN6125A	Manage dense wavelength division multiplexing transmission system	
ICTOPN6128A	Design a dense wavelength division multiplexing system	
ICTOPN6129A	Analyse optical transmission systems	
ICTPMG2130A	Prepare site for support installation	
ICTPMG2173A	Plan, organise and undertake work activities	
ICTPMG4048B	Schedule installation of customer premises equipment	
ICTPMG4152A	Manage the delivery of network infrastructure	
ICTPMG5027A	Develop customer premises equipment installation project plans	
ICTPMG5031A	Prepare a project brief	
ICTPMG5039A	Prepare project specifications	
ICTPMG6033A	Develop a project management plan	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTPMG6034A	Prepare a detailed design brief	
ICTPMG7145B	Undertake a telecommunications project	
ICTPMG8142A	Manage a telecommunications workplace	
ICTPMG8143B	Manage a telecommunications project	
ICTPMG8149B	Evaluate and use telecommunications management networks	
ICTPRO5026A	Develop training, marketing and sales resources for telecommunications products	
ICTRFN2163B	Install a satellite antenna	
ICTRFN2164B	Install a terrestrial antenna	
ICTRFN3055A	Install a radio communications antenna and feedline	
ICTRFN3070A	Install mobile telecommunications in motor vehicles	
ICTRFN3146A	Install WiMAX customer premises equipment broadband wireless access equipment	
ICTRFN3155A	Construct and test a radio communications device	
ICTRFN3175A	Operate and maintain radio communications technical instruments and field equipment	
ICTRFN4095A	Conduct radio frequency measurements	
ICTRFN4158A	Select an antenna system for radio communications	
ICTRFN4159A	Test and repair cellular network equipment	
ICTRFN4174A	Undertake radio communications signals monitoring	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTRFN4177A	Install radio communications base station equipment	
ICTRFN4178A	Maintain hybrid fibre coaxial broadband cable network	
ICTRFN5097A	Test cellular handset enhancements and international roaming agreements	
ICTRFN5148A	Test and measure cellular phone and network equipment performance	
ICTRFN5179A	Evaluate and analyse radio frequency signal coverage plots	
ICTRFN6098B	Monitor the capacity of and recommend changes to the cellular mobile network	
ICTRFN6171A	Produce and evaluate architecture designs for WiMAX networks	
ICTRFN7182B	Produce a radio link budget	
ICTRFN8180B	Analyse a cellular mobile network system	
ICTRFN8181B	Analyse a satellite communications system	
ICTSMB4160A	Set up and operate a contractor business	
ICTSMB4161A	Operate a contractor business with employees	
ICTSUS4183A	Install and test renewable energy system for ICT networks	
ICTSUS4184A	Install and test power saving hardware	
ICTSUS4185A	Install and test power management software	
ICTSUS4186A	Install thin client applications for power over ethernet	
ICTSUS5187A	Implement server virtualisation for a sustainable ICT system	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTSUS6233A	Integrate sustainability in ICT planning and design projects	
ICTSUS6234A	Establish a business case for sustainability and competitive advantage in ICT projects	
ICTSUS7235A	Use ICT to improve sustainability outcomes	
ICTSUS7236A	Manage improvements in ICT sustainability	
ICTSUS8237A	Lead applied research in ICT sustainability	
ICTSUS8238A	Conduct and manage a life cycle assessment for sustainability	
ICTTCR2188A	Use rigging practices and systems on telecommunications network structures	
ICTTCR2189A	Use operational safety in a telecommunications rigging environment	
ICTTCR2190A	Use safe rigging practices to climb and perform rescues on telecommunications network structures	
ICTTCR3062A	Build a telecommunications radio structure	ICTTCR2188A ICTTCR2189A ICTTCR2190A
ICTTCR3191A	Install radio plant and equipment on telecommunications structures	ICTTCR2188A ICTTCR2189A ICTTCR2190A
ICTTCR3192A	Protect against electromagnetic radiation and system hazards when working on	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
	telecommunications radio sites	
ICTTEN2008B	Use electrical skills in telecommunications work	
ICTTEN2140B	Use hand and power tools	
ICTTEN2207A	Install and configure a home or small office network	
ICTTEN2208A	Install and configure a small to medium business network	
ICTTEN2209A	Build and maintain a secure network	
ICTTEN2218A	Operate new media software packages	
ICTTEN2219A	Install and test internet protocol devices in convergence networks	
ICTTEN3054B	Provide infrastructure for telecommunications network equipment	
ICTTEN3056A	Install telecommunications network equipment	
ICTTEN3063A	Locate, identify and rectify recurrent network faults	
ICTTEN3074A	Recover customer premises equipment	
ICTTEN3075A	Refurbish customer premises equipment	
ICTTEN3077B	Commission an electronic unit	
ICTTEN3089A	Repair and replace telecommunications network hardware	
ICTTEN3104A	Maintain an electronic system	
ICTTEN3250B	Provide infrastructure for telecommunications customer equipment	
ICTTEN4001B	Identify requirements for customer	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
	telecommunications equipment	
ICTTEN4003B	Estimate and quote for customer telecommunications equipment installation	
ICTTEN4040A	Assign a transmission path	
ICTTEN4050A	Install and configure a wireless mesh network	
ICTTEN4051A	Install configuration programs on PC based customer equipment	
ICTTEN4072A	Effect changes to existing customer premises equipment systems and equipment	
ICTTEN4073A	Cut over customer premises equipment major upgrades	
ICTTEN4076A	Complete equipment and software upgrades	
ICTTEN4078A	Commission an electronic system	
ICTTEN4081A	Locate, diagnose and rectify faults	
ICTTEN4085A	Monitor, analyse and action telecommunications network alarms	
ICTTEN4086A	Undertake routine maintenance of the telecommunications network	
ICTTEN4087A	Undertake remote diagnosis and repair of network faults	
ICTTEN4102A	Repair telecommunication system faults	
ICTTEN4126A	Install and configure internet protocol TV in a home network	
ICTTEN4198A	Install, configure and test an internet protocol network	
ICTTEN4199A	Install, configure and test a router	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTTEN4202A	Install and test a radio frequency identification system	
ICTTEN4210A	Implement and troubleshoot enterprise routers and switches	
ICTTEN4211A	Design, install and configure an internetwork	
ICTTEN4212A	Apply advanced routing protocols to network design	
ICTTEN4213A	Configure and troubleshoot advanced network switching	
ICTTEN4214A	Install and maintain a wide area network	
ICTTEN4215A	Install and configure internet protocol TV in a service provider network	
ICTTEN4229B	Design, install and configure a customer smart technology network	
ICTTEN4241A	Design network projects	
ICTTEN4242A	Conduct site surveys to identify carrier installation requirements	
ICTTEN4243A	Prepare design drawings and specifications for telecommunications installations	
ICTTEN4244A	Estimate and quote for carrier telecommunications equipment installations	
ICTTEN4245A	Design infrastructure for telecommunications network installations	
ICTTEN4246A	Design dense wavelength division multiplexing installations	
ICTNPL4247A	Apply compliance requirements to telecommunications work	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTTEN5024A	Provide consultancy and technical support in the customer premises equipment sector	
ICTTEN5037A	Design a telecommunications project	
ICTTEN5038A	Design an electronic system for a telecommunications network	
ICTTEN5058A	Acceptance test new systems and equipment	
ICTTEN5059A	Commission telecommunications network equipment	
ICTTEN5060A	Integrate new systems and equipment into the telecommunications network	
ICTTEN5061A	Cut over new and replacement network equipment	
ICTTEN5083A	Locate, diagnose and rectify complex faults	
ICTTEN5084A	Provide expert advice and support on complex faults	
ICTTEN5092A	Undertake planned outage management	
ICTTEN5147A	Administer a data communications network	
ICTTEN5168A	Design and implement an enterprise voice over internet protocol and a unified communications network	
ICTTEN5200A	Install, configure and test a local area network switch	
ICTTEN5201A	Install, configure and test a server	
ICTTEN5203A	Dimension and design a radio frequency identification system	
ICTTEN5204A	Produce technical solutions from business specifications	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTTEN5217A	Plan a wireless mesh network	
ICTTEN6036A	Undertake qualification testing of new or enhanced equipment and systems	
ICTTEN6042A	Undertake system administration	
ICTTEN6043A	Undertake network traffic management	
ICTTEN6044A	Coordinate fault rectification and restoration of service following network outages	
ICTTEN6045A	Implement planned network changes with minimal impact to the customer	
ICTTEN6047A	Manage a common channel signalling network	
ICTTEN6091A	Analyse and organise repair of highly complex telecommunications network faults	
ICTTEN6094A	Verify new software and hardware releases	
ICTTEN6169A	Produce and evaluate architecture designs for convergent cellular mobile networks	
ICTTEN6172A	Design and configure an IP-MPLS network with virtual private network tunnelling	
ICTTEN6206A	Produce an ICT network architecture design	
ICTTEN6216A	Design and manage internet protocol TV in a service provider network	
ICTTEN7193B	Plan a transmission network	
ICTTEN7219A	Manage alignment of systems with product and technology strategy	
ICTTEN7220A	Translate domain and solution architectures into platform requirements and designs	
ICTTEN7221A	Manage end to end architectural solutions across multiple domains	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTTEN7222A	Manage solution architecture and impacts in line with organisational processes	
ICTTEN7223A	Manage application layer solutions	
ICTTEN7224A	Manage voice, data and internet protocol network solutions	
ICTTEN7225A	Manage network testing strategies	
ICTTEN7226A	Manage development and application of testing artefacts	
ICTTEN7227B	Analyse business specifications to produce technical solutions	
ICTTEN7228A	Manage project requirements and process implementations	
ICTTEN7230A	Scope project requirements and process solutions	
ICTTEN8149A	Analyse business specifications to produce technical solutions	
ICTTEN8194A	Investigate the application of cloud networks in telecommunications switching	
ICTTEN8195B	Evaluate and apply network security	
ICTTEN8196A	Evaluate and apply digital signal processing to communications system	
ICTTEN8197A	Produce engineering solutions using numerical computations and simulation	
ICTWHS2081A	Work safely in a radio frequency electromagnetic radiation environment	
ICTWHS2170B	Follow work health and safety and environmental policies and procedures	

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Units of Competency in ICT10 Integrated Telecommunications Training Package and their Prerequisite Requirements		
Code	**Title**	**Prerequisite units**
ICTWOR2141A	Work effectively in a telecommunications technology team	
ICTWOR3028A	Organise resources	
ICTWOR3035A	Organise material supply	
ICTWOR3041A	Schedule resources	
ICTWOR3093A	Manage spare parts	
ICTWOR3127A	Supervise worksite activities	
ICTWOR3231A	Resolve technical enquiries using multiple information systems	
ICTWOR3232A	Collect and analyse technical information	
ICTWOR4032A	Undertake a civil site survey	
ICTWOR4079A	Schedule equipment maintenance	

List of Imported Units

Unit Code and Title	**Prerequisite**	**Origin**
BSBCUS201B Deliver a service to customers	NA	BSB07 Business Services Training Package
BSBCUS402B Address customer needs	NA	BSB07 Business Services Training Package
BSBFIM501A Manage budgets and financial plans	NA	BSB07 Business Services Training Package

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Unit Code and Title	Prerequisite	Origin
BSBINM302A Utilise a knowledge management system	NA	BSB07 Business Services Training Package
BSBMGT401A Show leadership in the workplace	NA	BSB07 Business Services Training Package
BSBOHS509B Ensure a safe workplace	NA	BSB07 Business Services Training Package
BSBPMG521A Manage project integration	NA	BSB07 Business Services Training Package
BSBPMG522A Undertake project work	NA	BSB07 Business Services Training Package
BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business	NA	BSB07 Business Services Training Package
BSBSMB306A Plan a home based business	NA	BSB07 Business Services Training Package
BSBSMB401A Establish legal and risk management requirements of small business	NA	BSB07 Business Services Training Package
BSBSMB405B Monitor and manage small business operations	NA	BSB07 Business Services Training Package
BSBSMB407A Manage a small team	NA	BSB07 Business Services Training Package

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Unit Code and Title	Prerequisite	Origin
BSBSUS201A Participate in environmentally sustainable work practices	NA	BSB07 Business Services Training Package
BSBSUS301A Implement and monitor environmentally sustainable work practices	NA	BSB07 Business Services Training Package
BSBSUS501A Develop workplace policy and procedures for sustainability	NA	BSB07 Business Services Training Package
BSBWHS504A Manage WHS hazards and risks	NA	BSB07 Business Services Training Package
BSBWHS501A Ensure a safe workplace	NA	BSB07 Business Services Training Package
BSBWOR401A Establish effective workplace relationships	NA	BSB07 Business Services Training Package
CPCCOHS1001A Work safely in the construction industry	NA	CPC08 Construction, Plumbing and Services Training Package
CPCCLDG3001A Licence to perform dogging	NA	CPC08 Construction and Plumbing Services Integrated Framework Training Package
CPCCLRG3001A Licence to perform rigging basic level	NA	CPC08 Construction, Plumbing and Services Training Package
CPCCLRG3002A Licence to perform rigging intermediate level	NA	CPC08 Construction, Plumbing and Services Training Package

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Unit Code and Title	Prerequisite	Origin
CPCCLRG4001A Licence to perform rigging advanced level	NA	CPC08 Construction, Plumbing and Services Training Package
CPCSUS4001A Implement and monitor environmentally sustainable work practices	NA	CPC08 Construction, Plumbing and Services Training Package
CPPSEC3034A Operate information gathering equipment	NA	CPP07 Property Services Training Package
FNSORG506A Prepare financial forecasts and projections	NA	FNS10 Financial Services Training Package
HLTAID001 Provide cardiopulmonary resuscitation	NA	HLT Health Training Package
HLTAID003 Provide first aid	NA	HLT Health Training Package
ICAICT206A Install software applications	NA	ICA11 Information and Communications Technology Training Package
ICAICT304A Implement system software changes	NA	ICA11 Information and Communications Technology Training Package
ICAICT306A Migrate to new technology	NA	ICA11 Information and Communications Technology Training Package
ICAICT401A Determine and confirm client	NA	ICA11 Information and

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Unit Code and Title	Prerequisite	Origin
business requirements		Communications Technology Training Package
ICAICT405A Develop detailed technical design	NA	ICA11 Information and Communications Technology Training Package
ICAICT508A Evaluate vendor products and equipment	NA	ICA11 Information and Communications Technology Training Package
ICANWK305A Install and manage network protocols	NA	ICA11 Information and Communications Technology Training Package
ICANWK406A Install, configure and test network security	NA	ICA11 Information and Communications Technology Training Package
ICANWK416A Build security into virtual private networks	NA	ICA11 Information and Communications Technology Training Package
ICANWK417A Build an enterprise wireless network	NA	ICA11 Information and Communications Technology Training Package
ICANWK410A Install network hardware to a network	NA	ICA11 Information and Communications Technology Training Package
ICANWK411A Install software to networked computers	NA	ICA11 Information and Communications Technology Training Package

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Unit Code and Title	Prerequisite	Origin
ICANWK502A Implement secure encryption technologies	NA	ICA11 Information and Communications Technology Training Package
ICANWK503A Install and maintain valid authentication processes	NA	ICA11 Information and Communications Technology Training Package
ICANWK509A Design and implement a security perimeter for ICT networks	NA	ICA11 Information and Communications Technology Training Package
ICANWK516A Determine best-fit topology for a local network	NA	ICA11 Information and Communications Technology Training Package
ICANWK517A Determine best-fit topology for a wide area network	NA	ICA11 Information and Communications Technology Training Package
ICANWK518A Design an enterprise wireless local area network	NA	ICA11 Information and Communications Technology Training Package
ICANWK520A Design IT system security controls	NA	ICA11 Information and Communications Technology Training Package
ICAS2014B Connect hardware peripherals	NA	ICA11 Information and Communications Technology Training Package
ICAS3234B Care for computer hardware	NA	ICA05 Information and

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Unit Code and Title	Prerequisite	Origin
		Communications Technology Training Package
ICAT3025B Run standard diagnostic tests	NA	ICA05 Information and Communications Technology Training Package
ICAU3019B Migrate to new technology	NA	ICA05 Information and Communications Technology Training Package
ICAICT302A Install and optimise operating system software	NA	ICA11 Information and Communications Technology Training Package
ICAICT303A Connect internal hardware components	NA	ICA11 Information and Communications Technology Training Package
ICASAS203A Connect hardware peripherals	NA	ICA11 Information and Communications Technology Training Package
ICASAS301A Run standard diagnostic tests	NA	ICA11 Information and Communications Technology Training Package
ICASAS303A Care for computer hardware	NA	ICA11 Information and Communications Technology Training Package
ICASAS304A Provide basic system administration	NA	ICA11 Information and Communications Technology Training Package

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Unit Code and Title	Prerequisite	Origin
ICASAS305A Provide IT advice to clients	NA	ICA11 Information and Communications Technology Training Package
ICASAS409A Manage risks involving ICT systems and technology	NA	ICA11 Information and Communications Technology Training Package
ICASAS505A Review and update disaster recovery and contingency plans	NA	ICA11 Information and Communications Technology Training Package

Mapping to Previous Training Package

Summary mapping to previous Training Package – qualifications *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments**	**E/N**
ICT20113 Certificate II in Telecommunications Technology	ICT20110 Certificate II in Telecommunications Technology	Vocational outcomes deemed equivalent. Change in WHS core unit. Other units updated to current versions.	E
ICT20213 Certificate II in Telecommunications	ICT20210 Certificate II in Telecommunications	Vocational outcomes deemed equivalent. Change in WHS core unit. Other units updated to current versions.	E
ICT20313 Certificate II in Telecommunications Cabling	ICT20310 Certificate II in Telecommunications Cabling	Vocational outcomes deemed equivalent. Change in WHS core unit. Other units updated to current versions.	E
ICT20413 Certificate II in Telecommunications	ICT20410 Certificate II in Telecommunications	Vocational outcomes deemed equivalent.	E

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Summary mapping to previous Training Package – qualifications *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
Digital Reception Technology	Digital Reception Technology	Change in WHS core unit. Other units updated to current versions.	
ICT20513 Certificate II in Telecommunications Fixed Wireless and Rigging Installation	ICT20513 Certificate II in Telecommunications Fixed Wireless and Rigging Installation	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT20613 Certificate II in National Broadband Network Construction	ICT20613 Certificate II in National Broadband Network Construction	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT30113 Certificate III in Broadband and Wireless Networks Technology	ICT30110 Certificate III in Broadband and Wireless Networks Technology	Vocational outcomes deemed equivalent. Change in WHS core unit. Other units updated to current versions.	E
ICT30213 Certificate III in Telecommunications	ICT30210 Certificate III in Telecommunications	Vocational outcomes deemed equivalent. Change in WHS core unit. Other units updated to current versions. Additional electives included to provide broader choice.	E
ICT30313 Certificate III in Telecommunications Cabling	ICT30310 Certificate III in Telecommunications Cabling	Vocational outcomes deemed equivalent. Change in WHS core unit. Other units updated to current versions. Additional electives included to provide broader choice.	E
ICT30413 Certificate III in Telecommunications Digital Reception Technology	ICT30410 Certificate III in Telecommunications Digital Reception Technology	Vocational outcomes deemed not equivalent. Change to packaging rules and to composition of core units. Other units updated to current versions. Additional electives included to provide broader choice.	N
ICT30513 Certificate III in Telecommunications Rigging Installation	ICT30513 Certificate III in Telecommunications Rigging Installation	Vocational outcomes deemed equivalent. Units updated to current versions.	E

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Summary mapping to previous Training Package – qualifications *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT30613 Certificate III in Broadband and Wireless Networks	ICT30610 Certificate III in Broadband and Wireless Networks	Vocational outcomes deemed equivalent. Change in WHS core unit. Other units updated to current versions.	E
ICT30713 Certificate III in National Broadband Network Construction	ICT30713 Certificate III in National Broadband Network Construction	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT30813 Certificate III in Telecommunications Fixed Wireless Installation	ICT30813 Certificate III in Telecommunications Fixed Wireless Installation	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT40110 Certificate IV in Optical Networks	ICT40110 Certificate IV in Optical Networks	Vocational outcomes deemed equivalent. Elective units updated to current versions.	E
ICT40210 Certificate IV in Telecommunications Network Engineering	ICT40210 Certificate IV in Telecommunications Network Engineering	Vocational outcomes deemed equivalent. Elective units updated to current versions.	E
ICT40313 Certificate IV in Telecommunications Radio Communications	ICT40310 Certificate IV in Telecommunications Radio Communications	Vocational outcomes deemed equivalent. Packaging rules changed: • core units decreased by one by moving ICTWOR2141A Work effectively in a telecommunications technology team to elective bank • elective unit requirement increased by one. Core and elective units updated to current versions. Additional electives included to provide broader choice.	E
ICT40410 Certificate IV in Radio Frequency	ICT40410 Certificate IV in Radio Frequency	Vocational outcomes deemed	E

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Summary mapping to previous Training Package – qualifications *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
Networks	Networks	equivalent. Elective units updated to current versions.	
ICT40510 Certificate IV in Telecommunications Network Planning	ICT40510 Certificate IV in Telecommunications Network Planning	Vocational outcomes deemed equivalent. Additional elective included to provide broader choice.	E
ICT40613 Certificate IV in Telecommunications Networks Technology	ICT40610 Certificate IV in Telecommunications Networks Technology	Vocational outcomes deemed equivalent. Change in OHS core unit. Other units updated to current versions. Additional electives included to provide broader choice.	E
ICT40713 Certificate IV in Telecommunications Network Design	N/A	New qualification.	
ICT50110 Diploma of Optical Networks	ICT50110 Diploma of Optical Networks	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT50210 Diploma of Telecommunications Network Engineering	ICT50210 Diploma of Telecommunications Network Engineering	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT50310 Diploma of Telecommunications Management	ICT50310 Diploma of Telecommunications Management	Vocational outcomes deemed equivalent. Units updated to current versions, including core unit ICTTEN2219A which was updated to its non-equivalent ICTTEN2219A Install and test internet protocol devices in convergence networks.	E
ICT50410 Diploma of Radio Frequency	ICT50410 Diploma of Radio Frequency	Vocational outcomes deemed equivalent.	E

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Summary mapping to previous Training Package – qualifications *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
Networks	Networks	Units updated to current versions, including core unit BSBPMG510A which was updated to its equivalent BSBPMG522A Undertake project work.	
ICT50513 Diploma of Telecommunications Planning and Design	ICT50510 Diploma of Telecommunications Planning and Design	Vocational outcomes deemed equivalent. Additional electives included to provide broader choice. Units updated to current versions.	E
ICT60110 Advanced Diploma of Optical Networks	ICT60110 Advanced Diploma of Optical Networks	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT60210 Advanced Diploma of Telecommunications Network Engineering	ICT60210 Advanced Diploma of Telecommunications Network Engineering	Vocational outcomes deemed equivalent. Additional elective included to provide broader choice. Units updated to current versions.	E
ICT70110 Vocational Graduate Certificate in Telecommunications Network Engineering	ICT70110 Vocational Graduate Certificate in Telecommunications Network Engineering	Vocational outcomes deemed equivalent. Units updated to current versions.	E
ICT80110 Vocational Graduate Diploma of Telecommunications Network Engineering	ICT80110 Vocational Graduate Diploma of Telecommunications Network Engineering	Vocational outcomes deemed equivalent. Units updated to current versions.	E
No other qualifications were added, deleted or changed in this Version 3 of ICT10.			

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
ICTBWN3082B Perform tests on optical communication system and components	ICTBWN3082A Perform tests on optical communication system and components	Outcomes deemed equivalent. References to other units updated.	E
ICTBWN3088B Install optical fibre splitters in fibre distribution hubs	ICTBWN3088A Install optical fibre splitters in fibre distribution hubs	Outcomes deemed equivalent. Minor editorial change to performance criterion.	E
ICTBWN3090B Install lead-in module and cable fibre to the premises	ICTBWN3090A Install lead-in module and cable fibre to the premises	Outcomes deemed equivalent. References to other units updated.	E
ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation	ICTBWN3100A Work safely with live fibre to test and commission a fibre to the x installation	Outcomes deemed equivalent. References to other units updated.	E
ICTBWN3205B Use optical and radio frequency measuring instruments	ICTBWN3205A Use optical and radio frequency measuring instruments	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL2005B Install customer cable support systems	ICTCBL2005A Install customer cable support systems	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL2006B Place and secure customer cable	ICTCBL2006A Place and secure customer cable	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL2008B Terminate metallic conductor customer cable	ICTCBL2008A Terminate metallic conductor customer cable	Outcomes deemed equivalent. References to other units	E

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
		updated.	
ICTCBL2012B Install functional and protective telecommunications earthing system	ICTCBL2012A Install functional and protective telecommunications earthing system	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL2017B Alter services to existing cable system	ICTCBL2017A Alter services to existing cable system	Outcomes deemed equivalent. Minor changes to range statement to reflect changed terminology.	E
ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers	ICTCBL2065A Splice and terminate optical fibre cable for carriers and service providers	Outcomes deemed equivalent. Addition to application. Minor changes to knowledge requirements and range statement to reflect changed terminology.	E
ICTCBL2066B Joint and terminate coaxial cable	ICTCBL2066A Joint and terminate coaxial cable	Outcomes deemed equivalent. Minor change to element 5.	E
ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule	ICTCBL2136A Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule	Outcomes deemed equivalent. Addition to required knowledge. Minor changes to knowledge requirements and range statement to reflect changed terminology.	E
ICTCBL2137B Install, maintain and modify customer premises	ICTCBL2137A Install, maintain and modify customer premises	Outcomes deemed equivalent. Minor addition to critical	E

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
communications cabling: ACMA Open Rule	communications cabling: ACMA Open Rule	evidence.	
ICTCBL2138B Install, maintain and modify customer premises communications cabling: ACMA Lift Rule	ICTCBL2138A Install, maintain and modify customer premises communications cabling: ACMA Lift Rule	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits	ICTCBL2139A Apply safe technical work practices for cabling registration	Outcomes deemed equivalent. Minor change to title, descriptor and performance criterion.	E
ICTCBL2163A Install a cable lead-in	ICTCBL2162A Install a cable lead-in	Revised unit, outcomes deemed equivalent. Changes to unit descriptor, performance criteria, and required skills and knowledge to reflect current processes.	E
ICTCBL3009B Install, terminate and certify structured cabling installation	ICTCBL3009A Install, terminate and certify structured cabling installation	Outcomes deemed equivalent. Minor changes to an element, a performance criterion and range statement.	E
ICTCBL3010B Install and terminate optical fibre cable on customer premises	ICTCBL3010A Install and terminate optical fibre cable on customer premises	Outcomes deemed equivalent. Minor addition to required knowledge and range statement.	E
ICTCBL3011B Install and terminate coaxial cable	ICTCBL3011A Install and terminate coaxial cable	Outcomes deemed equivalent. Minor changes to an	E

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
		element, performance criteria, required knowledge and range statement.	
ICTCBL3240B Install ribbon fibre cable in the FTTX distribution network	ICTCBL3240A Install ribbon fibre cable in the FTTX distribution network	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL4002B Prepare design drawings and specification for a cable installation	ICTCBL4002A Prepare design drawings and specification for a cable installation	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL4004B Schedule and supply cabling installation	ICTCBL4004A Schedule and supply cabling installation	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL4023B Supervise cabling project	ICTCBL4023A Supervise cabling project	Outcomes deemed equivalent. References to other units updated.	E
ICTCBL4057B Test cable bearers	ICTCBL4057A Test cable bearers	Outcomes deemed equivalent. References to other units updated.	E
ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards	ICTCMP2022A Organise and monitor cabling to ensure compliance with regulatory and industry standards	Outcomes deemed equivalent. References to other units updated.	E
ICTCMP2239B Perform restricted customer premises broadband cabling work:	ICTCMP2239A Perform restricted customer premises broadband cabling work:	Outcomes deemed equivalent. References to other units	E

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
ACMA Restricted Rule	ACMA Restricted Rule	updated.	
ICTDRE3156B Install digital reception equipment	ICTDRE3156A Install digital reception equipment	Outcomes deemed equivalent. Minor change to a performance criterion.	E
ICTDRE3248A Design communications wiring systems for customer premises	N/A	New unit	
ICTDRE3249A Develop integrated digital reception systems	N/A	New unit	
ICTITU7106B Manage automated IT system applications using unix	ICTITU7106A Manage automated IT system applications using unix	Outcomes deemed equivalent. References to other units updated.	E
ICTNPL4247A Apply compliance requirements to telecommunications work	N/A	New unit	
ICTOHS2153B Work safely near power infrastructure	ICTOHS2153A Work safely near power infrastructure	Outcomes deemed equivalent. References to other units updated.	E
ICTOPN4115B Install and test a dense wavelength division multiplexing system	ICTOPN4115A Install and test a dense wavelength division multiplexing system	Outcomes deemed equivalent. References to other units updated.	E
ICTPMG4048B Schedule installation of customer premises equipment	ICTPMG4048A Schedule installation of customer premises equipment	Outcomes deemed equivalent. References to other units updated.	E

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
ICTPMG7145B Undertake a telecommunications project	ICTPMG7145A Undertake a telecommunications project	Outcomes deemed equivalent. Minor changes to several performance criteria.	E
ICTPMG8143B Manage a telecommunications project	ICTPMG8143A Manage a telecommunications project	Outcomes deemed equivalent. Minor changes to several performance criteria.	E
ICTPMG8149B Evaluate and use telecommunications management networks	ICTPMG8149A Evaluate and use telecommunications management networks	Outcomes deemed equivalent. Minor changes to unit descriptor, application and two performance criteria.	E
ICTRFN2163B Install a satellite antenna	ICTRFN2163A Install a satellite antenna	Outcomes deemed equivalent. References to other units updated.	E
ICTRFN2164B Install a terrestrial antenna	ICTRFN2164A Install a terrestrial antenna	Outcomes deemed equivalent. References to other units updated.	E
ICTRFN6098B Monitor the capacity and recommend changes to the cellular mobile network	ICTRFN6098A Monitor the capacity and recommend changes to the cellular mobile network	Outcomes deemed equivalent. References to other units updated.	E
ICTRFN7182B Produce a radio link budget	ICTRFN7182A Produce a radio link budget	Outcomes deemed equivalent. References to other units updated.	E
ICTRFN8180B Analyse a	ICTRFN8180A Analyse a	Outcomes deemed	E

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
cellular mobile network system	cellular mobile network system	equivalent. References to other units updated.	
ICTRFN8181B Analyse a satellite communications system	ICTRFN8181B Analyse a satellite communications system	Outcomes deemed equivalent. References to other units updated.	E
ICTTEN2008A Use electrical skills in telecommunications work	ICTTEN2007A Use electrical skills in telecommunications work	Revised unit, outcomes deemed not equivalent. Changes to elements and performance criteria and required knowledge and range statement to reflect changed processes.	N
ICTTEN2140B Use hand and power tools	ICTTEN2140A Use hand and power tools	Outcomes deemed equivalent. References to other units updated.	E
ICTTEN2219A Install and test internet protocol devices in convergence networks	ICTTEN2105A Install and test an internet protocol device in convergence networks	Revised unit, outcomes deemed not equivalent. Changes to unit title, elements and performance criteria and required knowledge and range statement to reflect changed processes.	N
ICTTEN3054B Provide infrastructure for telecommunications network equipment	ICTTEN3054A Provide infrastructure for telecommunications network equipment	Outcomes deemed equivalent. References to other units updated.	E
ICTTEN3077B Commission an electronic unit	ICTTEN3077A Commission an electronic unit	Outcomes deemed equivalent.	E

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
		References to other units updated.	
ICTTEN3250B Provide infrastructure for telecommunications customer equipment	ICTTEN3250A Provide infrastructure for telecommunications customer equipment	Outcomes deemed equivalent. References to other units updated.	E
ICTTEN4001B Identify requirements for customer telecommunications equipment	ICTTEN4001A Identify requirements for customer telecommunications equipment	Outcomes deemed equivalent. References to other units updated.	E
ICTTEN4003B Estimate and quote for customer telecommunications equipment installation	ICTTEN4003A Estimate and quote for customer telecommunications equipment installation	Outcomes deemed equivalent. References to other units updated.	E
ICTTEN4229B Design, install and configure a customer smart technology network	ICTTEN4229A Design, install and configure a customer smart grid network	Outcomes deemed equivalent. Minor change to unit title and other minor editorial changes.	E
ICTTEN4241A Design network projects	N/A	New unit	
ICTTEN4242A Conduct site surveys to identify carrier installation requirements	N/A	New unit	
ICTTEN4243A Prepare design drawings and specifications for telecommunications installations	N/A	New unit	
ICTTEN4244A Estimate and quote for carrier telecommunications	N/A	New unit	

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Mapping to Previous Training Package Units of Competency *Mapping of units of competency Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Unit Code and Title**	**ICT10 Version 2** **Unit Code and Title**	**Comments in relation to previous Training Package**	**E/N**
equipment installations			
ICTTEN4245A Design infrastructure for telecommunications network installations	N/A	New unit	
ICTTEN4246A Design dense wavelength division multiplexing installations	N/A	New unit	
ICTTEN7193B Plan a transmission network	ICTTEN7193A Plan a transmission network	Outcomes deemed equivalent. References to other units updated.	E
ICTTEN7227B Analyse business specifications to produce technical solutions	ICTTEN7227A Analyse business specifications to produce technical solutions	Outcomes deemed equivalent. Minor changes to performance criteria.	E
ICTTEN8195B Evaluate and apply network security	ICTTEN8195A Evaluate and apply network security	Outcomes deemed equivalent. Minor changes to performance criteria.	E
ICTWHS2170B Follow work health and safety and environmental policies and procedures	ICTWHS2170A Follow work health and safety and environmental policies and procedures	Outcomes deemed equivalent. Minor change to unit descriptor, range statement and other minor editorial changes.	E
No other native units of competency were added, deleted or changed in this Version 3 of ICT10.			

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Summary mapping to previous Training Package – skill sets *Mapping of skill sets Key: E = equivalent, N = not equivalent*			
ICT10 Version 3 **Skill Set title**	**ICT10 Version 2** **Skill Set title**	**Comments**	**E/N**
Advanced Cabler Registration Skill Set	Advanced Cabler Registration Skill Set	Units updated to reflect current versions	E
Advanced Telecommunications Rigging Installation Skill Set	Advanced Telecommunications Rigging Installation Skill Set	Units updated to reflect current versions	E
Basic Open Cabler Registration Skill Set	Basic Open Cabler Registration Skill Set	Units updated to reflect current versions	E
Basic Restricted Cabler Registration Skill Set	Basic Restricted Cabler Registration Skill Set	Units updated to reflect current versions	E
Civil Works – Installation of Pit and Pipe and FDH Skill Set	Civil Works – Installation of Pit and Pipe and FDH Skill Set	Units updated to reflect current versions	E
Commercial Digital Television Antenna Systems Installation Skill Set	Commercial Digital Television Antenna Systems Installation Skill Set	Units updated to reflect current versions	E
Convergent Technology Installations for home and SME Skill Set	Convergent Technology Installations for home and SME Skill Set	Units updated to reflect current versions	E
Designer Skill Set	Designer Skill Set	Units updated to reflect current versions	E
Installing NBN Wireless and Infrastructure Skill Set	Installing NBN Wireless and Infrastructure Skill Set	Units updated to reflect current versions	E
IP Convergence Installations for Home and SME Skill Set	IP Convergence Installations for Home and SME Skill Set	Units updated to reflect current versions	E
National Broadband Network Advanced Linesworker/Installer	National Broadband Network Advanced Linesworker/Installer	Units updated to reflect current	E

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Skill Set	Skill Set	versions	
National Broadband Network Splicer Skill Set	National Broadband Network Splicer Skill Set	Units updated to reflect current versions	E
Domestic Digital Television Antenna Installation Skill Set	Domestic Digital Television Antenna Installation Skill Set	Units updated to reflect current versions	E
Radio Technician Skill Set	Radio Technician Skill Set	Units updated to reflect current versions	E
Wireless LAN and IP Network Installation Skill Set	Wireless LAN and IP Network Installation Skill Set	Units updated to reflect current versions	E

Overview

What is a Training Package?

A Training Package is an integrated set of nationally endorsed competency standards, assessment guidelines and Australian Qualifications Framework (AQF) qualifications for a specific industry, industry sector or enterprise.

Each Training Package:

- provides a consistent and reliable set of components for training, recognising and assessing peoples skills, and may also have optional support materials
- enables nationally recognised qualifications to be awarded through direct assessment of workplace competencies
- encourages the development and delivery of flexible training which suits individual and industry requirements
- encourages learning and assessment in a work-related environment which leads to verifiable workplace outcomes.

How do Training Packages fit within the National Skills Framework?

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The National Skills Framework applies nationally, is endorsed by the Ministerial Council for Vocational and Technical Education, and comprises the Australian Quality Training Framework 2007 (AQTF 2007), and Training Packages endorsed by the National Quality Council (NQC).

How are Training Packages developed?

Training Packages are developed by Industry Skills Councils or enterprises to meet the identified training needs of specific industries or industry sectors. To gain national endorsement of Training Packages, developers must provide evidence of extensive research, consultation and support within the industry area or enterprise.

How do Training Packages encourage flexibility?

Training Packages describe the skills and knowledge needed to perform effectively in the workplace without prescribing how people should be trained.

Training Packages acknowledge that people can achieve vocational competency in many ways by emphasising what the learner can do, not how or where they learned to do it. For example, some experienced workers might be able to demonstrate competency against the units of competency, and even gain a qualification, without completing a formal training program.

With Training Packages, assessment and training may be conducted at the workplace, off-the-job, at a training organisation, during regular work, or through work experience, work placement, work simulation or any combination of these.

Who can deliver and assess using Training Packages?

Training and assessment using Training Packages must be conducted by a Registered Training Organisation (RTO) that has the qualifications or specific units of competency on its scope of registration, or that works in partnership with another RTO, as specified in the AQTF 2007.

Training Package Components

Training Packages are made up of mandatory components endorsed by the NQC, and optional support materials.

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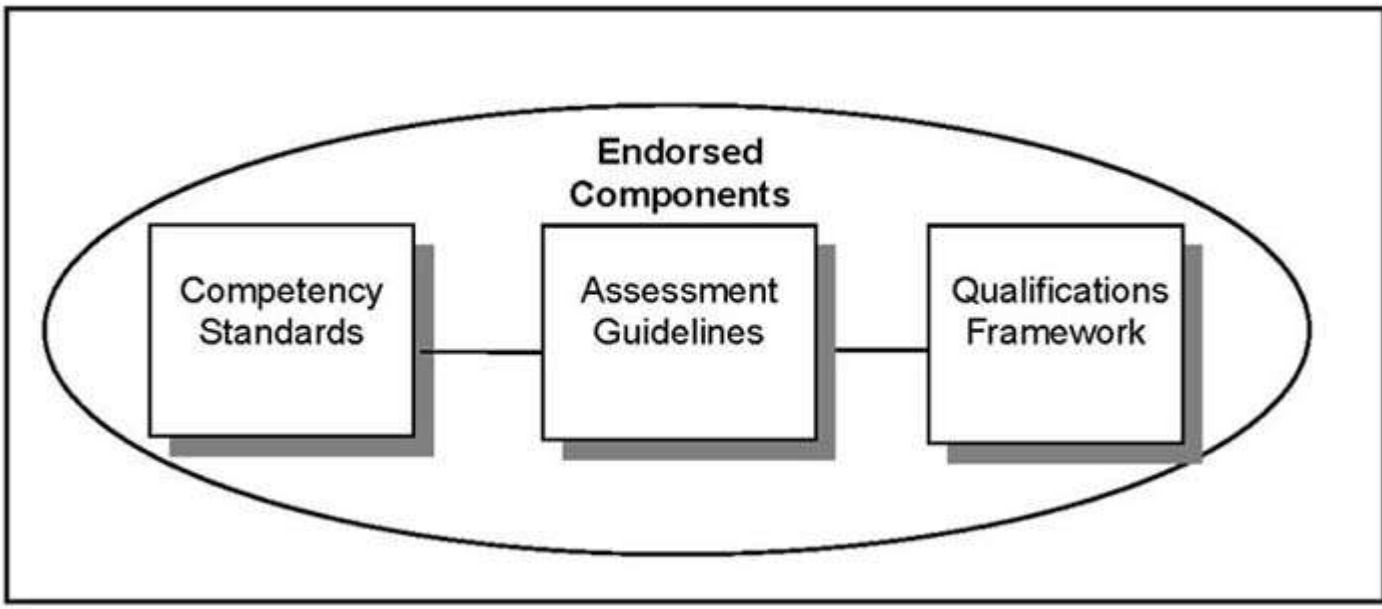
Training Package Endorsed Components

The nationally endorsed components include the Competency Standards, Assessment Guidelines and Qualifications Framework. These form the basis of training and assessment in the Training Package and, as such, they must be used.



Competency Standards

Each unit of competency identifies a discrete workplace requirement and includes the knowledge and skills that underpin competency as well as language, literacy and numeracy; and occupational health and safety requirements. The units of competency must be adhered to in training and assessment to ensure consistency of outcomes.

Assessment Guidelines

The Assessment Guidelines provide an industry framework to ensure all assessments meet industry needs and nationally agreed standards as expressed in the Training Package and the AQTF 2007. The Assessment Guidelines must be followed to ensure the integrity of assessment leading to nationally recognised qualifications.

Qualifications Framework

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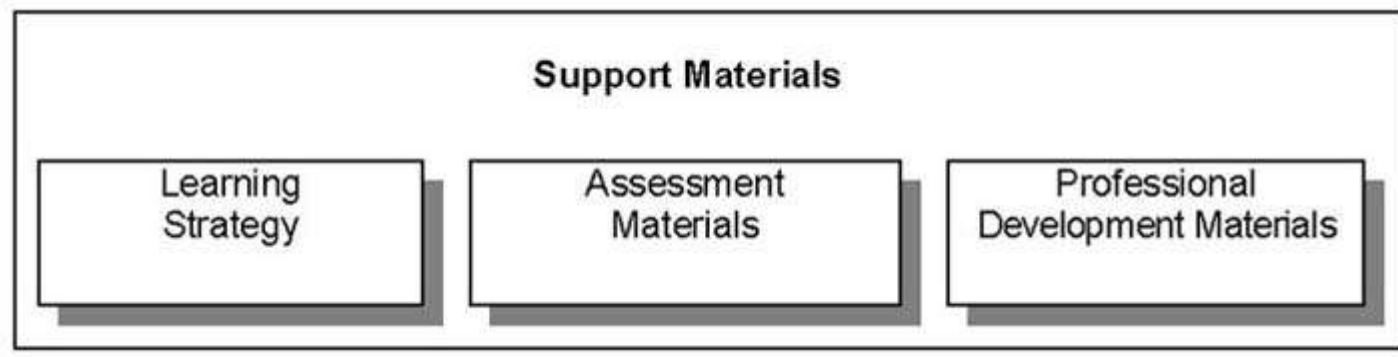
Each Training Package provides details of those units of competency that must be achieved to award AQF qualifications. The rules around which units of competency can be combined to make up a valid AQF qualification in the Training Package are referred to as the "packaging rules". The packaging rules must be followed to ensure the integrity of nationally recognised qualifications issued.

Training Package Support Materials

The endorsed components of Training Packages are complemented and supported by optional support materials that provide for choice in the design of training and assessment to meet the needs of industry and learners.

Training Package support materials can relate to single or multiple units of competency, an industry sector, a qualification or the whole Training Package. They tend to fall into one or more of the categories illustrated below.



Training Package support materials are produced by a range of stakeholders such as RTOs, individual trainers and assessors, private and commercial developers and Government agencies.

Where such materials have been quality assured through a process of "noting" by the NQC, they display the following official logo. Noted support materials are listed on the National Training Information Service (NTIS), together with a detailed description and information on the type of product and its availability < www.ntis.gov.au>

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It is not compulsory to submit support materials for noting; any resources that meet the requirements of the Training Package can be used.

Training Package, Qualification and Unit of Competency Codes

There are agreed conventions for the national codes used for Training Packages and their components. Always use the correct codes, exactly as they appear in the Training Package, **and with the code always before the title**.

Training Package Codes

Each Training Package has a unique five-character national code assigned when the Training Package is endorsed, for example ICT10. The first three characters are letters identifying the Training Package industry coverage and the last two characters are numbers identifying the year of endorsement.

Qualification Codes

Within each Training Package, each qualification has a unique eight-character code, for example ICT20110. Qualification codes are developed as follows:

- the first three letters identify the Training Package;
- the first number identifies the qualification level (noting that, in the qualification titles themselves, arabic numbers are **not** used);
- the next two numbers identify the position in the sequence of the qualification at that level; and
- the last two numbers identify the year in which the qualification was endorsed. (Where qualifications are added after the initial Training Package endorsement, the last two numbers may differ from other Training Package qualifications as they identify the year in which those particular qualifications were endorsed.)

Unit of Competency Codes

Within each Training Package, each unit of competency has a unique code. Unit of competency codes are assigned when the Training Package is endorsed, or when new units of competency are added to an existing endorsed Training Package. Unit codes are developed as follows:

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- a typical code is made up of 12 characters, normally a mixture of uppercase letters and numbers, as in ICTBWN3082A;
- the first three characters signify the Training Package - ICT10 - in the above example and up to eight characters, relating to an industry sector, function or skill area, follow;
- the last character is always a letter and identifies the unit of competency version. An "A" at the end of the code indicates that this is the original unit of competency. "B", or another incremented version identifier means that minor changes have been made. Typically this would mean that wording has changed in the range statement or evidence guide, providing clearer intent; and
- where changes are made that alter the outcome, a new code is assigned and the title is changed.

Training Package, Qualification and Unit of Competency Titles

There are agreed conventions for titling Training Packages and their components. Always use the correct titles, exactly as they appear in the Training Package, and with the code always placed before the title.

Training Package Titles

The title of each endorsed Training Package is unique and relates the Training Packages broad industry coverage.

Qualification Titles

The title of each endorsed Training Package qualification is unique. Qualification titles use the following sequence:

- first, the qualification is identified as either Certificate I, Certificate II, Certificate III, Certificate IV, Diploma, Advanced Diploma, Vocational Graduate Certificate, or Vocational Graduate Diploma;
- this is followed by the words "in" for Certificates I to IV, and "of" for Diploma, Advanced Diploma, Vocational Graduate Certificate and Vocational Graduate Diploma;
- then, the industry descriptor, for example Telecommunications; and
- then, if applicable, the occupational or functional stream in brackets, for example (Computer Systems).

For example:

- ICT20110 Certificate II in Telecommunications Technology.

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Unit of Competency Titles

Each unit of competency title is unique. Unit of competency titles describe the competency outcome concisely, and are written in sentence case.

For example:

- ICTBWN3082A Perform tests on optical communication system and components.

Historical and General Information

Background

It is generally accepted, and inescapably true, that the workforce of the telecommunications industry is ageing. Retirement of a growing number of existing employees will create a shortfall in the workforce and so it is essential to train new entrants to the industry, particularly with the NBN deployment.

Compounding these factors is the changing nature of the industry, increasing convergence of the ‘T’ and ‘IT’ sectors, the integration between optical and radio frequency (RF) networks and the rapid introduction of new IP technologies.

ICT10 Key revisions

Telecommunications regulator

The telecommunications regulator is the Australian Communications and Media Authority (ACMA). The legislation covering ACMA activities involves a broad range of national activities from carrier licensing to use of radio spectrum and the most relevant issue for ICT10 qualifications is the ACMA Cabling Provider Rules Registration.

Australian Communications and Media Authority Building Cabling Regulation CPR Registration – Ex-Licensing

The Cabling Provider Rules (CPR) benchmark units of competency ICTCBL2136B, ICTCBL2137B and ICTCBL2138B meet the ACMA requirements for a cabler ‘registration’ system involving accredited registrars.

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ICTCBL2138B applies only to lift cabling for elevator industry, where other qualifications in 'electrical' are also needed. To be permitted to work with lift cabling, cablers are required to have completed the relevant Electrotechnology qualification such as the Certificate III in Electrotechnology Electrician or equivalent.'

In accordance with the ACMA policy, these are in ICT10 Integrated Telecommunications Training Package qualifications and are not treated as a completely separate requirement, as is often the case in some industries with licensing and registration.

Relationship between units linked to ACMA CPR requirements

Completion of the following six cabling units ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B exceeds the requirements of the benchmark units ICTCBL2136B and ICTCBL2137B. These two benchmark units are used in telecommunications for the purpose of registering with an accredited registrar of the telecommunications regulator ACMA, as a CPR registered cabler. All of these units appear in relevant qualifications in the ICT10 Integrated Telecommunications Training Package in accordance with Training Package guidelines.

An official reference document called 'Pathways to ACMA Cabling Provider Rules Cabler Registration' sets out the competency-based and other alternative ACMA authorised pathways. ACMA and registrars can provide access to this document, which is also available at www.acma.gov.au and www.citt.com.au.

ICTCBL2136B and ICTCBL2137B benchmark standards fulfil the requirements for ACMA Cabling Provider Rules Open Cabling registration and are generally regarded in the industry as a 'fast track' option to gain ACMA CPR registration for participants with some industry experience.

A new unit of competency relating to specialised broadband cabling (ICTCMP2239B) has been developed in response to a need for restricted CPR registered cablers who are required to work on specialised cabling for the broadband network. The new unit of competency applies to restricted CPR holders working on specialist cabling and is for point-to-point work only. It is not an "endorsement", such as those obtained by Open CPR holders for doing underground or aerial work.

ICTCBL2136A Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule is the prerequisite unit for ICTCBL2137A. ICTCBL2136A must be obtained before ICTCBL2137A can be credited. However, in some circumstances, assessment may be concurrent.

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All pathways to CPR registration will now include explicit training for an endorsed Training Package unit of competency for work health and safety.

State/territory arrangements

The six unit of competency set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B that meets the ACMA requirements for CPR registration, is generally used as part of a more specialised customer cabling qualification. This set is usually regarded as more suitable for new entrants where limited industry experience has been obtained and forms the major part of specialised qualifications such as ICT20310 Certificate II in Telecommunications Cabling. When these six units are delivered as a set within state/territory funding approved programs, the two benchmark CPR units are not required.

NOTE ON CPR ENDORSEMENTS: gaining the ACMA CPR registration requirements by either the CPR benchmark units ICTCBL2136B and ICTCBL2137B, or the six unit set (ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B) which were the AUSTEL base cabling licence requirements, does not grant industry competency for specialised cabling activities known as ‘endorsements’, such as coaxial, optical fibre and structured cabling. The separate units for specialised cabling activities are outlined in this Training Package.

Introduction to the Industry

Acting on behalf of the Australian government, and working within the scope of vocational education and training (VET), the Department of Industry works to ensure that Australian industries have access to the people and skills they need, both to maintain existing operations, and to achieve competitive and opportunity-led change.

Innovation and Business Skills Australia, (IBSA) assists industry and governments to identify and coordinate activities directed towards meeting the people and skill needs of six key industry sectors of the Australian economy. These industry sectors include:

- business services
- cultural and creative industries
- education and training
- financial services
- ICT and telecommunications
- printing and graphic arts.

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The telecommunications industry comprises cabling, wireless, switching, transmission, radio frequency (RF) and optical communications, media and IP networks. The construction of the national broadband network (NBN) with fibre technology has required the development of specific qualifications to meet the demands of the NBN construction process, as well as the installation of wireless technology for remote areas.

Advances in digital and IP networking technologies have had a dramatic effect on the demand for better, faster and more bandwidth for ICT communications to serve the Australian economy and community.

Increased demand for ICT communications includes:

- escalating use of social networking applications, such as Facebook, wikis and Twitter
- smart homes and home integration technologies
- increasing use of IP technologies, such as VoIP, IPTV and smart phones
- IP Core and Access Networks replacing traditional ICT networks
- Cloud Computing and Smart Grid technologies becoming the way the ICT industry is adapting globally
- the proliferation of home networks equipped with computer networks, home entertainment and smart home technologies
- small to medium enterprises (SME) and teleworkers using more elaborate teleconference facilities (telepresence) to work from home and reduce transport costs and improve efficiency
- superior and more advanced broadband networks from federal government initiatives to boost Australian economy and improve ways of operating, such as eHealth, eEducation, eTravel and hospitality
- a decline in sales of physical products, such as CDs, countered by a dramatic rise in digital sales through outlets such as iTunes and mobile phone companies
- new approaches to media distribution through the internet
- entry of new participants in the telecommunications mobile phone industry, such as Google and Microsoft.
-

Qualifications Framework

The Australian Qualifications Framework

What is the Australian Qualifications Framework?

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A brief overview of the Australian Qualifications Framework (AQF) follows. For a full explanation of the AQF, see the *AQF Implementation Handbook*. The 2007 version of the *AQF Implementation Handbook* is expected to be available on the Australian Qualifications Framework Advisory Board (AQFAB) website www.aqf.edu.au during September 2007, and in print in October 2007 (obtain the hard copy by contacting AQFAB on phone 03 9639 1606 or email at aqfab@curriculum.edu.au).

The AQF provides a comprehensive, nationally consistent framework for all qualifications in post-compulsory education and training in Australia. In the vocational education and training (VET) sector it assists national consistency for all trainees, learners, employers and providers by enabling national recognition of qualifications and Statements of Attainment.

Training Package qualifications in the VET sector must comply with the titles and guidelines of the AQF. Endorsed Training Packages provide a unique title for each AQF qualification which must always be reproduced accurately.

Qualifications

Training Packages can incorporate the following eight AQF qualifications.

- Certificate I in ...
- Certificate II in ...
- Certificate III in ...
- Certificate IV in ...
- Diploma of ...
- Advanced Diploma of ...
- Vocational Graduate Certificate of ...
- Vocational Graduate Diploma of ...

On completion of the requirements defined in the Training Package, a Registered Training Organisation (RTO) may issue a nationally recognised AQF qualification. Issuance of AQF qualifications must comply with the advice provided in the *AQF Implementation Handbook* and the AQTF 2007 *Essential Standards for Registration*.

Statement of Attainment

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A Statement of Attainment is issued by a Registered Training Organisation when an individual has completed one or more units of competency from nationally recognised qualification(s)/courses(s). Issuance of Statements of Attainment must comply with the advice provided in the current *AQF Implementation Handbook* and the AQTF 2007 *Essential Standards for Registration*.

Under the AQTF 2007, RTOs must recognise the achievement of competencies as recorded on a qualification or Statement of Attainment issued by other RTOs. Given this, recognised competencies can progressively build towards a full AQF qualification.

AQF Guidelines and Learning Outcomes

The *AQF Implementation Handbook* provides a comprehensive guideline for each AQF qualification. A summary of the learning outcome characteristics and their distinguishing features for each VET related AQF qualification is provided below.

Certificate I

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and skills would prepare a person to perform a defined range of activities most of which may be routine and predictable.

Applications may include a variety of employment related skills including preparatory access and participation skills, broad-based induction skills and/or specific workplace skills. They may also include participation in a team or work group.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate knowledge by recall in a narrow range of areas;
- demonstrate basic practical skills, such as the use of relevant tools;
- perform a sequence of routine tasks given clear direction
- receive and pass on messages/information.

Certificate II

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Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and skills would prepare a person to perform in a range of varied activities or knowledge application where there is a clearly defined range of contexts in which the choice of actions required is usually clear and there is limited complexity in the range of operations to be applied.

Performance of a prescribed range of functions involving known routines and procedures and some accountability for the quality of outcomes.

Applications may include some complex or non-routine activities involving individual responsibility or autonomy and/or collaboration with others as part of a group or team.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate basic operational knowledge in a moderate range of areas;
- apply a defined range of skills;
- apply known solutions to a limited range of predictable problems;
- perform a range of tasks where choice between a limited range of options is required;
- assess and record information from varied sources;
- take limited responsibility for own outputs in work and learning.

Certificate III

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and competencies would cover selecting, adapting and transferring skills and knowledge to new environments and providing technical advice and some leadership in resolution of specified problems. This would be applied across a range of roles in a variety of contexts with some complexity in the extent and choice of options available.

Performance of a defined range of skilled operations, usually within a range of broader related activities involving known routines, methods and procedures, where some discretion and judgement is required in the section of equipment, services or contingency measures and within known time constraints.

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Applications may involve some responsibility for others. Participation in teams including group or team co-ordination may be involved.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate some relevant theoretical knowledge
- apply a range of well-developed skills
- apply known solutions to a variety of predictable problems
- perform processes that require a range of well-developed skills where some discretion and judgement is required
- interpret available information, using discretion and judgement
- take responsibility for own outputs in work and learning
- take limited responsibility for the output of others.

Certificate IV

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and competencies would cover a broad range of varied activities or application in a wider variety of contexts most of which are complex and non-routine. Leadership and guidance are involved when organising activities of self and others as well as contributing to technical solutions of a non-routine or contingency nature.

Performance of a broad range of skilled applications including the requirement to evaluate and analyse current practices, develop new criteria and procedures for performing current practices and provision of some leadership and guidance to others in the application and planning of the skills. Applications involve responsibility for, and limited organisation of, others.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate understanding of a broad knowledge base incorporating some theoretical concepts

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- apply solutions to a defined range of unpredictable problems
- identify and apply skill and knowledge areas to a wide variety of contexts, with depth in some areas
- identify, analyse and evaluate information from a variety of sources
- take responsibility for own outputs in relation to specified quality standards
- take limited responsibility for the quantity and quality of the output of others.

Diploma

Characteristics of Learning Outcomes

Breadth, depth and complexity covering planning and initiation of alternative approaches to skills or knowledge applications across a broad range of technical and/or management requirements, evaluation and co-ordination.

The self directed application of knowledge and skills, with substantial depth in some areas where judgment is required in planning and selecting appropriate equipment, services and techniques for self and others.

Applications involve participation in development of strategic initiatives as well as personal responsibility and autonomy in performing complex technical operations or organising others. It may include participation in teams including teams concerned with planning and evaluation functions. Group or team co-ordination may be involved.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

- demonstrate understanding of a broad knowledge base incorporating theoretical concepts, with substantial depth in some areas
- analyse and plan approaches to technical problems or management requirements
- transfer and apply theoretical concepts and/or technical or creative skills to a range of situations
- evaluate information, using it to forecast for planning or research purposes
- take responsibility for own outputs in relation to broad quantity and quality parameters
- take some responsibility for the achievement of group outcomes.

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Advanced Diploma

Characteristics of Learning Outcomes

Breadth, depth and complexity involving analysis, design, planning, execution and evaluation across a range of technical and/or management functions including development of new criteria or applications or knowledge or procedures.

The application of a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts in relation to either varied or highly specific functions. Contribution to the development of a broad plan, budget or strategy is involved and accountability and responsibility for self and others in achieving the outcomes is involved.

Applications involve significant judgement in planning, design, technical or leadership/guidance functions related to products, services, operations or procedures.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

- demonstrate understanding of specialised knowledge with depth in some areas
- analyse, diagnose, design and execute judgements across a broad range of technical or management functions
- generate ideas through the analysis of information and concepts at an abstract level
- demonstrate a command of wide-ranging, highly specialised technical, creative or conceptual skills
- demonstrate accountability for personal outputs within broad parameters
- demonstrate accountability for personal and group outcomes within broad parameters.

Vocational Graduate Certificate

Characteristics of competencies or learning outcomes

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- The self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Substantial breadth and complexity involving the initiation, analysis, design, planning, execution and evaluation of technical and management functions in highly varied and highly specialised contexts.
- Applications involve making significant, high-level, independent judgements in major broad or planning, design, operational, technical and management functions in highly varied and specialised contexts. They may include responsibility and broad-ranging accountability for the structure, management and output of the work or functions of others.
- The degree of emphasis on breadth, as opposed to depth, of knowledge and skills may vary between qualifications granted at this level.

Distinguishing features of learning outcomes

- Demonstrate the self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Initiate, analyse, design, plan, execute and evaluate major broad or technical and management functions in highly varied and highly specialised contexts.
- Generate and evaluate ideas through the analysis of information and concepts at an abstract level.
- Demonstrate a command of wide-ranging, highly specialised technical, creative or conceptual skills in complex contexts.
- Demonstrate responsibility and broad-ranging accountability for the structure, management and output of the work or functions of others.

Vocational Graduate Diploma

Characteristics of competencies or learning outcomes

- The self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Substantial breadth, depth and complexity involving the initiation, analysis, design, planning, execution and evaluation of major functions, both broad and highly specialised, in highly varied and highly specialised contexts.
- Further specialisation within a systematic and coherent body of knowledge.
- Applications involve making high-level, fully independent, complex judgements in broad planning, design, operational, technical and management functions in highly varied and highly specialised contexts. They may include full responsibility and accountability for all aspects of work and functions of others, including planning, budgeting and strategy development.

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- The degree of emphasis on breadth, as opposed to depth, of knowledge and skills may vary between qualifications granted at this level.

Distinguishing features of learning outcomes

- Demonstrate the self-directed development and achievement of broad and highly specialised areas of knowledge and skills, building on prior knowledge and skills.
- Initiate, analyse, design, plan, execute and evaluate major functions, both broad and within highly varied and highly specialised contexts.
- Generate and evaluate complex ideas through the analysis of information and concepts at an abstract level.
- Demonstrate an expert command of wide-ranging, highly specialised, technical, creative or conceptual skills in complex and highly specialised or varied contexts.
- Demonstrate full responsibility and accountability for personal outputs.
- Demonstrate full responsibility and accountability for all aspects of the work or functions of others, including planning, budgeting and strategy.

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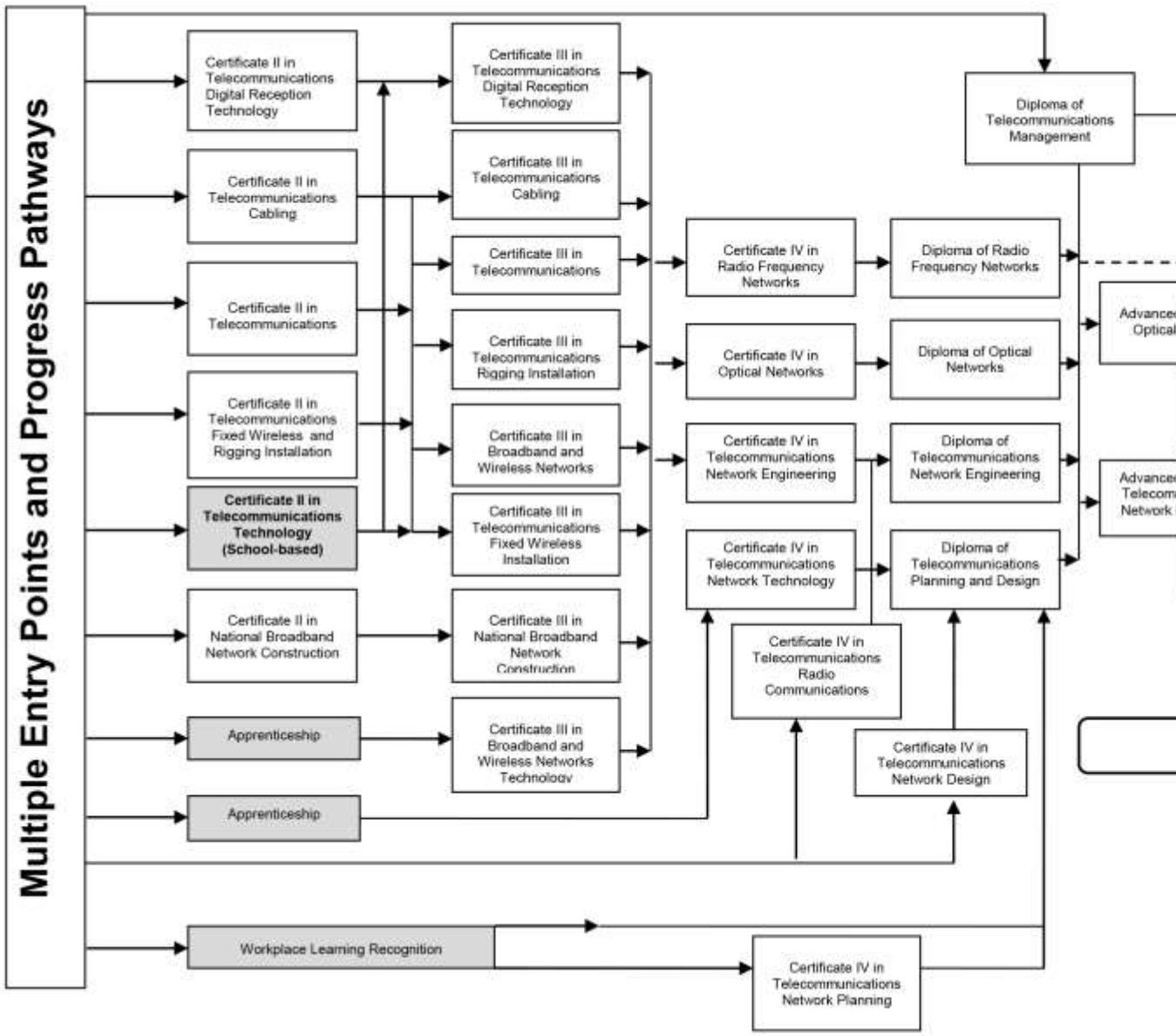
Qualification Pathways

The following pathways charts are provided to show the types of pathways into and from qualifications that are possible with this Training Package. For more information about qualifications and pathways contact Innovation and Business Industry Skills Council (http://www.ibsa.org.au).

Pathways for Telecommunications Qualifications Framework



ICT10 Integrated Telecommunications Skill Sets

Skill Sets

Definition

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Skill sets are defined as single units of competency, or combinations of units of competency from an endorsed Training Package, which link to a licence or regulatory requirement, or defined industry need.

Wording on Statements of Attainment

Skill sets are a way of publicly identifying logical groupings of units of competency which meet an identified need or industry outcome. Skill sets are not qualifications.

Where skill sets are identified in a Training Package, the Statement of Attainment can set out the competencies a person has achieved in a way that is consistent and clear for employers and others. This is done by including the wording "these competencies meet [insert skill set title or identified industry area] need" on the Statement of Attainment. This wording applies only to skill sets that are formally identified as such in the endorsed Training Package. See the 2007 edition of the AQF Implementation Handbook for advice on wording on Statements of Attainmentthe updated version is expected to be available on the AQFAB website www.aqf.edu.au during September 2007 and in print in October 2007.

ICT10 Integrated Telecommunications Skill Sets

Skill sets are designed to be available to industry to train participants in a particular skill set that contains units of competency that will be awarded with a Statement of Attainment and are able to be counted towards a qualification.

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Industry Requirements for Employability Skills

Employability Skills replacing Key Competency information from 2006

In May 2005, the approach to incorporate Employability Skills within Training Package qualifications and units of competency was endorsed. As a result, from 2006 Employability Skills will progressively replace Key Competency information in Training Packages.

Background to Employability Skills

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Employability Skills are also sometimes referred to as generic skills, capabilities or Key Competencies. The Employability Skills discussed here build on the Mayer Committee's Key Competencies, which were developed in 1992 and attempted to describe generic competencies for effective participation in work.

The Business Council of Australia (BCA) and the Australian Chamber of Commerce and Industry (ACCI), produced the Employability Skills for the Future report in 2002 in consultation with other peak employer bodies and with funding provided by the Department of Education, Science and Training (DEST) and the Australian National Training Authority (ANTA). Officially released by Dr Nelson (Minister for Education, Science and Training) on 23 May 2002, copies of the report are available from the DEST website at: http://www.dest.gov.au/archive/ty/publications/employability_skills/index.htm.

The report indicated that business and industry now require a broader range of skills than the Mayer Key Competencies Framework and featured an Employability Skills Framework identifying eight Employability Skills*:

- communication
- teamwork
- problem solving
- initiative and enterprise
- planning and organising
- self-management
- learning
- technology.
-

The report demonstrated how Employability Skills can be further described for particular occupational and industry contexts by sets of facets. The facets listed in the report are the aspects of the Employability Skills that the sample of employers surveyed identified as being important work skills. These facets were seen by employers as being dependent both in their nature and priority on an enterprise's business activity.

** Personal attributes that contribute to employability were also identified in the report but are not part of the Employability Skills Framework.*

Employability Skills Framework

The following table contains the Employability Skills facets identified in the report Employability Skills for the Future.

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Skill	**Facets** *Aspects of the skill that employers identify as important. The nature and application of these facets will vary depending on industry and job type.*
Communication that contributes to productive	• listening and understanding • speaking clearly and directly
and harmonious relations across employees and customers	• writing to the needs of the audience • negotiating responsively • reading independently • empathising • using numeracy effectively • understanding the needs of internal and external customers • persuading effectively • establishing and using networks • being assertive • sharing information • speaking and writing in languages other than English
Teamwork that contributes to productive working relationships and outcomes	• working across different ages irrespective of gender, race, religion or political persuasion • working as an individual and as a member of a team • knowing how to define a role as part of the team • applying teamwork to a range of situations e.g. futures planning and crisis problem solving • identifying the strengths of team members • coaching and mentoring skills, including giving feedback
Problem solving that contributes to productive outcomes	• developing creative, innovative and practical solutions • showing independence and initiative in identifying and solving problems • solving problems in teams • applying a range of strategies to problem solving • using mathematics, including budgeting and financial management to solve problems • applying problem-solving strategies across a range of areas • testing assumptions, taking into account the context of data and circumstances • resolving customer concerns in relation to complex project issues
Initiative and enterprise that contribute to innovative outcomes	• adapting to new situations • developing a strategic, creative and long-term vision • being creative • identifying opportunities not obvious to others

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	• translating ideas into action • generating a range of options • initiating innovative solutions
Planning and organising that contribute to long and short-term strategic planning	• managing time and priorities - setting time lines, coordinating tasks for self and with others • being resourceful • taking initiative and making decisions • adapting resource allocations to cope with contingencies • establishing clear project goals and deliverables • allocating people and other resources to tasks • planning the use of resources, including time management • participating in continuous improvement and planning processes • developing a vision and a proactive plan to accompany it • predicting - weighing up risk, evaluating alternatives and applying evaluation criteria • collecting, analysing and organising information • understanding basic business systems and their relationships
Self-management that contributes to employee satisfaction and growth	• having a personal vision and goals • evaluating and monitoring own performance • having knowledge and confidence in own ideas and visions • articulating own ideas and visions • taking responsibility
Learning that contributes to ongoing improvement and expansion in employee and company operations and outcomes	• managing own learning • contributing to the learning community at the workplace • using a range of mediums to learn - mentoring, peer support and networking, IT and courses • applying learning to technical issues (e.g. learning about products) and people issues (e.g. interpersonal and cultural aspects of work) • having enthusiasm for ongoing learning • being willing to learn in any setting - on and off the job • being open to new ideas and techniques • being prepared to invest time and effort in learning new skills • acknowledging the need to learn in order to accommodate change
Technology that contributes to the effective carrying out of tasks	• having a range of basic IT skills • applying IT as a management tool • using IT to organise data • being willing to learn new IT skills • having the OHS knowledge to apply technology • having the appropriate physical capacity

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Employability Skills Summary

An Employability Skills Summary exists for each qualification. Summaries provide a lens through which to view Employability Skills at the qualification level and capture the key aspects or facets of the Employability Skills that are important to the job roles covered by the qualification. Summaries are designed to assist trainers and assessors to identify and include important industry application of Employability Skills in learning and assessment strategies.

The following is important information for trainers and assessors about Employability Skills Summaries.

Employability Skills Summaries provide examples of how each skill is applicable to the job roles covered by the qualification.

- Employability Skills Summaries contain general information about industry context which is further explained as measurable outcomes of performance in the units of competency in each qualification.
- The detail in each Employability Skills Summary will vary depending on the range of job roles covered by the qualification in question.
- Employability Skills Summaries are not exhaustive lists of qualification requirements or checklists of performance (which are separate assessment tools that should be designed by trainers and assessors after analysis at the unit level).
- Employability Skills Summaries contain information that may also assist in building learners' understanding of industry and workplace expectations.

Industry Requirements for Employability Skills

ICT10 Integrated Telecommunications Training Package seeks to ensure that industry-endorsed employability skills are explicitly embedded in units of competency. The application of each skill and the level of detail included in each part of the unit will vary according to industry requirements and the nature of the unit of competency.

Employability skills are both explicit and embedded within units of competency. This means that employability skills are:

- embedded in units of competency as part of the other performance requirements that make up the competency as a whole
- explicitly described within units of competency to enable Training Package users to identify accurately the performance requirements of each unit with regards to employability skills.

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ICT10 Integrated Telecommunications Training Package also seeks to ensure that employability skills are well-defined and written into units of competency so that they are apparent, clear and can be delivered and assessed as an essential component of unit work outcomes.

Whole of Industry Qualification Information

Packaging of qualifications to meet industry flexibility

The judicious packaging of core and elective units has provided great flexibility for participants to cross over from stream to stream with minimal disruptions. This has been possible by minimising the number of core units and allowing greater choice of elective units.

The mainstream is the Telecommunications/Telecommunications Network Engineering which leads to a Vocational Graduate Diploma.

The following are the Training Packages from which units have been imported to supplement those developed specifically for the telecommunications industry:

- BSB07 Business Services Training Package
- CPC08 Construction, Plumbing and Services Training Package
- CPP07 Property Services Training Package
- FNS04 Financial Services Training Package
- HLT07 Health Training Package
- ICA05 Information and Communications Technology Training Package
- ICA11 Information and Communications Technology Training Package

The importation of units from those Training Packages provides clear support to the telecommunications units in the area of sustainability, project management and IT convergence networks.

The ICT20113 Certificate II in Telecommunications Technology is an exception to the flexible packaging rule. This school-based entry qualification for VET in schools provides an innovative approach to a pathway model for use by schools as a recommended school model pathway. The ICT20113 provides Years 11 and 12 students with skills in Telecommunications Networks, Digital Reception Technology and IP networks in home and SME networks. It contains a core with a choice of three streams; the Cabling Technician stream that enables an ACMA CPR restricted registration, the Digital Reception stream that provides for work on digital reception equipment and the Networking stream that provides for work with IP home and small business networks. Due to the specialisation of the streams, the substitution of elective units is not permitted.

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Work outcome

All VET qualifications must lead to a work outcome. The flexibility of ICT10 Integrated Telecommunications Training Package qualifications allows RTOs to vary programs to meet:

- the specific needs of learners and industry clients
- the needs of a locality or a particular industry application of skills
- greater employability of a group of students or an individual.

Maximising employability

In all cases, when packaging qualifications in ICT10 Integrated Telecommunications Training Package, RTOs must follow the principle of providing groups and individuals with the broadest possible combination of skills and attributes.

When combining units, therefore, choices must be exercised so that duplication of work outcomes does not occur either within the Integrated Telecommunications Training Package or among other Training Packages.

Titles of qualifications

Guidelines on issuing qualifications and the protocol defining the form of qualifications are contained in the *Australian Qualifications Framework (AQF) Implementation Handbook*.

Qualifications in the ICT10 Integrated Telecommunications Training Package have industry descriptors only. There is no provision for nominating an occupational or functional stream in brackets after a title, such as ICT40210 Certificate IV in Telecommunications Network Engineering. In the context of telecommunications performance, an occupational stream could be seen as Telstra or Nokia specific. However, to specify such streams would narrow the focus of what students can achieve and would result in the addition of numerous qualifications to the Training Package without any actual change in their structure.

However, RTOs issuing qualifications may wish to describe the specialisation in which individuals achieve competence in performance or composition. For example, the transcript of units completed could be preceded by a short statement such as:

‘The chosen job functions for this qualification was the 'installation and testing of optical networks'.

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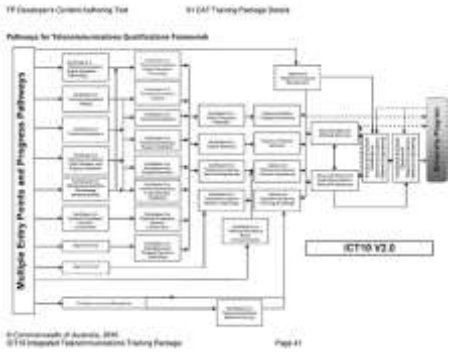
Any descriptive statement may nominate the individual specialisation (e.g. mobile telephony, satellite, microwave, broadcasting, etc.) where competence has been achieved. Note that candidates may achieve competence in one or more areas of specialisation.

Descriptive statements on certificates should always be written with reference to the overall guidelines in the *AQF Implementation Handbook*.



Assessment Guidelines

Introduction

These Assessment Guidelines provide the endorsed framework for assessment of units of competency in this Training Package. They are designed to ensure that assessment is consistent with the AQTF 2007. Assessments against the units of competency in this Training Package must be carried out in accordance with these Assessment Guidelines.

Assessment System Overview

This section provides an overview of the requirements for assessment when using this Training Package, including a summary of the AQTF 2007 requirements; licensing/registration requirements; and assessment pathways.

Benchmarks for Assessment

Assessment within the National Skills Framework is the process of collecting evidence and making judgments about whether competency has been achieved to confirm whether an individual can perform to the standards expected in the workplace, as expressed in the relevant endorsed unit of competency.

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In the areas of work covered by this Training Package, the endorsed units of competency are the benchmarks for assessment. As such, they provide the basis for nationally recognised Australian Qualifications Framework (AQF) qualifications and Statements of Attainment issued by Registered Training Organisations (RTOs).

Australian Quality Training Framework Assessment Requirements

Assessment leading to nationally recognised AQF qualifications and Statements of Attainment in the vocational education and training sector must meet the requirements of the AQTF as expressed in the AQTF 2007 Essential Standards for Registration.

The AQTF 2007 Essential Standards for Registration can be downloaded from < www.training.com.au/aqtf2007>. The following points summarise assessment requirements.

Registration of Training Organisations

Assessment must be conducted by, or on behalf of, an RTO formally registered by a State or Territory Registering/Course Accrediting Body in accordance with the AQTF 2007 Essential Standards for Registration. The RTO must have the specific units of competency and/or AQF qualifications on its scope of registration.

Quality Training and Assessment

Each RTO must provide quality training and assessment across all its operations. See the AQTF 2007 Essential Standards for Registration, Standard 1.

Assessor Competency Requirements

Each person involved in training, assessment or client service must be competent for the functions they perform. See the AQTF 2007 Essential Standards for Registration, Standard 1, for assessor (and trainer) competency requirements.

Assessment Requirements

The RTOs assessments, including RPL, must meet the requirements of the relevant endorsed Training Package. See the AQTF 2007 Essential Standards for Registration, Standard 1.

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Assessment Strategies

Each RTO must have strategies for training and assessment that meet the requirements of the relevant Training Package or accredited course and are developed in consultation with industry stakeholders. See the AQTF 2007 Essential Standards for Registration, Standard 1.

National Recognition

Each RTO must recognise the AQF qualifications and Statements of Attainment issued by any other RTO. See the AQTF 2007 Essential Standards for Registration, Condition of Registration 7: Recognition of qualifications issued by other RTOs.

Access and Equity and Client Outcomes

Each RTO must adhere to the principles of access and equity and maximise outcomes for its clients. See the AQTF 2007 Essential Standards for Registration, Standard 2.

Monitoring Assessments

Training and/or assessment provided on behalf of the RTO must be monitored to ensure that it is in accordance with all aspects of the Essential Standards for Registration. See the AQTF 2007 Essential Standards for Registration, Standard 3.

Recording Assessment Outcomes

Each RTO must manage records to ensure their accuracy and integrity. See the AQTF 2007 Essential Standards for Registration, Standard 3.

Issuing AQF Qualifications and Statements of Attainment

Each RTO must issue AQF qualifications and Statements of Attainment that meet the requirements of the current AQF Implementation Handbook and the endorsed Training Packages within the scope of its registration. An AQF qualification is issued once the full requirements for a qualification, as specified in the nationally endorsed Training Package are met. A Statement of Attainment is issued when an individual has completed one or more units of competency from nationally recognised qualification(s)/courses(s). See the AQTF 2007 and the 2007 edition of the AQF Implementation Handbook-available on the AQFAB website < www.aqf.edu.au>.

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Licensing/Registration Requirements

This section provides information on licensing/registration for this Training Package, with the following important disclaimer.

Licensing and registration requirements that apply to specific industries, and vocational education and training, vary between each State and Territory, and can regularly change. The developers of this Training Package, and DEEWR, consider that the licensing/registration requirements described in this section apply to RTOs, assessors or candidates with respect to this Training Package. While reasonable care has been taken in its preparation, the developers of this Training Package and DEEWR cannot guarantee that the list is definitive or accurate at the time of reading; the information in this section is provided in good faith on that basis.

Contact the relevant State or Territory Department(s) to check if the licensing/registration requirements described below still apply, and to check if there are any others with which you must comply.

The Telecommunications Regulator is the Australian Communications and Media Authority (ACMA). The legislation covering ACMA activities involves a broad range of national activities, from carrier licensing to use of radio spectrum. The most relevant issue for ICT10 qualifications is the ACMA Cabling Provider Rules Registration. Prior to October 2000, Cabling Provider Rules (CPR) Registration was known as ‘licensing’ and included several levels, such as General Premises Cabling, Base Cabling and ‘Endorsements’, Domestic and Restricted Cabling licences.

In 2012 a new unit was introduced to specifically meet the requirements for restricted cablers and compliment the mandated ACMA requirements for work on broadband. Also introduced was the requirement to complete competency unit ICTWHS2170.

Units of competency included in the selections for the relevant ICT10 Integrated Telecommunications qualifications enable candidates to qualify for ACMA CPR registration either by gaining a full qualification, or the required set as a part qualification, skill set, or Statement of Attainment. The units of competency for ACMA CPR registration are:

Restricted Registration Either

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

and

ICTWHS2170B Follow occupational work health and safety (WHS) and environmental policy and procedures

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OR

Restricted Registration

ICTCBL2005B Install customer cable support systems

ICTCBL2006B Place and secure customer cable

ICTCBL2008B Terminate metallic conductor customer cable

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

and

ICTWHS2170B Follow occupational work health and safety (WHS) and environmental policy and procedures

Broadband cabling work Registration

ICTCMP2239 Perform restricted custom premises broadband cabling work; ACMA Restricted Rule

Open Registration

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

and

ICTWHS2170B Follow occupational work health and safety (WHS) and environmental policy and procedures

OR

Open Registration

ICTCBL2005B Install customer cable support systems

ICTCBL2006B Place and secure customer cable

ICTCBL2008B Terminate metallic conductor customer cable

ICTCBL2012B Install functional and protective telecommunications earthing system

ICTCBL2017B Alter services to existing cable system

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

and

ICTWHS2170B Follow occupational work health and safety (WHS) and environmental policy and procedures

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Lift Registration

ICTCBL2138A Install, maintain and modify customer premises communications cabling: ACMA Lift Rule

The following guidance is provided in relation to regulatory requirements that may apply to people working in the Telecommunications industry.

National Standard for Licensing Persons Performing High Risk Work

The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels.

- CPCCLDG3001A Licence to perform dogging
- CPCCLRG3001A Licence to perform rigging basic level
- CPCCLRG3002A Licence to perform rigging intermediate level
- CPCCLRG4001A Licence to perform rigging advanced level

Information on occupational licensing and its intersection with vocational education and training can be found in *Licensing Line News* at www.licensinglinenews.com.

National Code of Practice for Induction for Construction Work

"This Code of Practice provides guidance to persons working in the general and residential construction sectors on the types of induction training that may be needed to provide construction workers with an awareness and understanding of common hazards on construction sites and how they should be managed." (Source: *Licensing Line News* at www.licensinglinenews.com).

Sets and staging for some performances or events may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit ‘CPCCOHS1001A Work safely in the construction industry’ from the CPC08 Construction, Plumbing and Services Integrated Framework Training Package fulfils this requirement.

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Contact state or territory OHS authorities for information on RTOs approved to deliver the general induction training program.

Requirements for Assessors

In order to conduct assessment for statutory licensing or other industry registration requirements, assessors must meet the requirements outlined in the following table, in addition to the AQTF requirements.

LICENCE/ REGISTRATION	JURISDICTION	REQUIREMENTS
Restricted Registration ICTCBL2136B ICTWHS2170B	Australian Communications and Media Authority	Restricted Registered Cabler TITAB registered assessor
Open Registration ICTCBL2136B ICTCBL2137B ICTWHS2170B	Australian Communications and Media Authority	Open Registered Cabler TITAB registered assessor
Restricted Registration ICTCBL2005B ICTCBL2006B ICTCBL2008B ICTCMP2022B ICTWHS2170B	Australian Communications and Media Authority	Restricted Registered Cabler TITAB registered assessor
Open Registration ICTCBL2005B ICTCBL2006B ICTCBL2008B ICTCBL2012B ICTCBL2017B ICTCMP2022B ICTWHS2170B	Australian Communications and Media Authority	Open Registered Cabler TITAB registered assessor
Lift Registration	Australian Communications and Media Authority	Lift Registered Cabler

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ICTCBL2138A		TITAB registered assessor
Endorsement – Structured Cabling ICTCBL3009B	Telecommunications industry preferred (previously mandated by ACMA)	Open Registered Cabler TITAB registered assessor Equivalent competency
Endorsement – Optical Fibre ICTCBL3010B	Telecommunications industry preferred (previously mandated by ACMA)	Open Registered Cabler TITAB registered assessor Equivalent competency
Endorsement – Coaxial Cable ICTCBL3011B	Telecommunications industry preferred (previously mandated by ACMA)	Open Registered Cabler TITAB registered assessor Equivalent competency
Endorsement – Aerial ICTCBL2016A ICTCBL3020A ICTCBL3021A	Telecommunications industry preferred (previously mandated by ACMA)	Open Registered Cabler TITAB registered assessor Equivalent competencies
Endorsement – Underground ICTCBL2016A ICTCBL3018A ICTCBL3019A	Telecommunications industry preferred (previously mandated by ACMA)	Open Registered Cabler TITAB registered assessor Equivalent competencies
Endorsement – Cable and System Testing ICTCBL3013A	Telecommunications industry preferred (previously mandated by ACMA)	Open Registered Cabler TITAB registered assessor Equivalent competency

TITAB and TITAB REGISTERED ASSESSORS

Due to the regulatory aspects of the Telecommunications Training Package, it is vital that compliance is achieved in the areas of vocational education and training as well as sector specific ‘licensing’/registration requirements.

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Prior to October 2000, the 'ACMA Cabling Provider Rules Registration' was known as 'licensing' and included several levels of cabling licences and 'Endorsements'. Since 2000, the Australian Communications and Media Authority (ACMA) - the telecommunications regulator - has mandated that particular competencies apply to registration therefore this Training Package is now a combination of both mandatory and voluntary or industry requirements. Selected competencies within Training Package qualifications allow candidates to qualify for the 'ACMA Cabling Provider Rules (CPR) Registration', either by gaining a full or part qualification or a skill set or Statement of Attainment.

TITAB was funded by the Federal Government, through the ACMA, to provide Registered Assessors to assess telecommunications competency standards, as part of the statutory obligations and mandatory 'licensing'/registration requirements. The management and co-ordination of the Registered Assessors was then delegated to TITAB as the industry moved to co-regulation.

The Registered Assessors are supported by TITAB and must fulfill a number of conditions to maintain current TITAB Assessor registration. This comprehensive network of skilled and knowledgeable TITAB Registered Assessors is used extensively by the telecommunications sector to implement both the 'licensing'/registration and AQTF requirements.

TITAB's contact details are:

PO Box 348 Carlton South Victoria 3053

Phone: 03 9349 4955

Fax: 03 9349 4844

Email: info@titab.com.au

Website: www.titab.com.au

Assessor Competencies

The AQTF 2007 specifies mandatory competency requirements for assessors. For information, Element 1.4 from the AQTF 2007 Essential Standards for Registration follows:

1.4 Training and assessment are conducted by trainers and assessors who:

a) have the necessary training and assessment competencies as determined by the National Quality Council or its successors

b) have the relevant vocational competencies at least to the level being delivered or assessed

c) continue developing their vocational and training and assessment competencies to support continuous improvements in delivery of the RTO's services.

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Requirements for Candidates

English language, literacy and other skill requirements

It is part of an RTO's responsibility to provide appropriate information to candidates to ensure that candidates understand the requirements for language, literacy and other skill requirements prior to learning and assessment. Assessors carrying out this responsibility must ensure candidates or potential candidates are advised effectively of the underlying skill requirements.

Candidates who may have difficulty meeting these requirements must be provided with advice and options, such as appropriate language, literacy and numeracy skills training.

Technology applications are also required as part of the competency specifications of some ICT10 Integrated Telecommunications Training Package competency units. Further, complex cognitive skills in planning, research, interpretation, analysis and synthesis form part of the skills requirements of many units.

In a learning and assessment pathway, some of these skills can be developed through the learning process. However, this will depend on the approach adopted in the learning strategy and learning program content and the level of resourcing available.

In some situations, implementation may be based on an assumption that learners/candidates possess these skills. In these circumstances, and in an assessment-only pathway, candidates must be made aware of the specific skills that underpin the outcomes and performance requirements and ensure they are capable of demonstrating competence. Where essential skills need to be acquired, options for meeting these skill gaps must be provided.

Requirements for RTOs

Training and assessment in remote and regional areas

Training and assessing candidates in remote and regional areas present a range of challenges. These include:

- lack of numbers preventing the establishment of traditional class sizes
- physical remoteness of some communities, where access to training facilities is limited
- scarcity of teachers with the required industry experience
- scarcity of physical training resources (e.g. current and emerging technology).

Some options for overcoming these challenges include:

- partnerships between RTOs to establish classes, i.e. programs delivered on a regional rather than local basis
- delivering certain units by distance mode
- partnerships between industry and RTOs to share resources and personnel
- partnerships between schools and RTOs
- use of technology (e.g. email, CDs and internet) and self-paced resources.

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Assessment in a simulated environment

Units of competency in the ICT10 Integrated Telecommunications Training Package may be assessed in the workplace or in a simulated environment.

The telecommunications industry by its nature involves the use of technologies and processes which have a potentially high impact on customers and a high cost of failure. Normal practice is to protect these technologies and processes from any risk. Therefore assessment of training candidates cannot be undertaken in normal operating environments in most circumstances.

In response to this, industry practice for many years has been to develop models and simulations on which assessments are conducted. These models and simulations are often costly in themselves and soon fall behind the rapidly advancing technology of the industry.

As a result, assessment of candidates for many of the units of competency in the ICT10 Integrated Telecommunications Training Package can only be undertaken using simulations. To maintain the integrity of these assessments RTOs and assessors need to be vigilant in keeping pace with the industry and in checking that assessment simulations accurately reflect workplace activities. RTOs will need regular contact with industry to ensure the currency and validity of assessment simulations.

To assist assessors, the following information provides a framework for conducting assessments in simulated environments.

Simulations must provide opportunities for integrated assessment of competence that includes:

- performing the task (task skills)
- managing a number of tasks (task management skills)
- dealing with workplace irregularities such as unexpected problems, breakdowns and changes in routine (contingency management skills)
- fulfilling the responsibilities and expectations of the job and workplace, including working with others (job/role environment skills)
- transferring competencies to new contexts.

All evidence from simulated activities must result from activities that have taken place in a realistic working environment which replicates the conditions and circumstances in which the candidate will usually be expected to work.

Working conditions should reflect those found in the workplace and include facilities, equipment and materials used in the workplace for the activities being assessed. Most importantly it should also include relationships, constraints and pressures met in the workplace.

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The activity to which the candidate is required to demonstrate competence must be realistic and reasonable in terms of scale.

Any assessment conducted under simulated conditions must require the candidate to take into consideration what would be typical ambient conditions encountered in the normal workplace as well as reflect the typical workflow involved.

Workplace simulation criteria

In conducting an assessment using a simulation, assessors should review the process prior to its implementation. The simulation must give the candidate the opportunity to meet three critical criteria. These are:

- quality – the work is of the standard required for entry into the industry
- productivity – the work is performed within a time frame appropriate for entry to the industry
- safety – the work is performed in a manner that meets industry safety standards.

Where assessment simulations meet these criteria RTOs can be sure that candidates are ‘work ready’ on successful completion of the assessment task.

In addition, the assessment process should be reviewed to ensure that, wherever applicable, it:

- uses facilities and equipment that meet current industry standards
- includes typical customers, including difficult customers and diverse types of customers
- integrates of various types of work performance – multiple tasks, prioritisation, service standards and OHS
- requires allocation of time to tasks and deadlines
- measures consistent performance over time
- includes work with others in teams
- requires considerations of budget constraints
- includes use of operational procedures and guidelines.

To further enhance the validity of assessment process using simulation, the assessor should consider:

- assessments covering a range of interconnected units of competency
- use of assessment checklists to assist in identifying critical performance criteria
- use of self assessment, peer assessment and debriefing activities
- use of authentic documentation, e.g. workplace roles, OHS regulations, salary advice, marketing information, procedural manuals, policies, enterprise bargaining agreements.

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Training and assessment issues for schools

Implementation of ICT10 Integrated Telecommunications Training Package within the school sector, while encouraged, needs to ensure the following:

- currency of skills and knowledge of those charged with training and assessing students
- access to industry-current equipment, facilities and training resources so that students acquire a realistic view of the realities and conditions within the workplace
- comprehensive coverage of underpinning skills and knowledge as delineated within the units of competency
- appropriateness of learning and assessment experiences to ensure that these are current and realistic.

The units of competency provide more detailed guidance for training and assessment purposes, as well as examples relevant to each unit, and schools are encouraged to use these guidelines when planning training and assessment.

It is recommended that delivery in schools should only include Certificate II level qualifications. The following qualification is recommended as most suitable for VET in schools programs:

- ICT20113 Certificate II in Telecommunications Technology

For more information on VET in Schools, please refer to Appendix A.

Pathways

The competencies in this Training Package may be attained in a number of ways including through:

- formal or informal education and training
- experiences in the workplace
- general life experience, and/or
- any combination of the above.

Assessment under this Training Package leading to an AQF qualification or Statement of Attainment may follow a learning and assessment pathway, an assessment-only or recognition pathway, or a combination of the two as illustrated in the following diagram.

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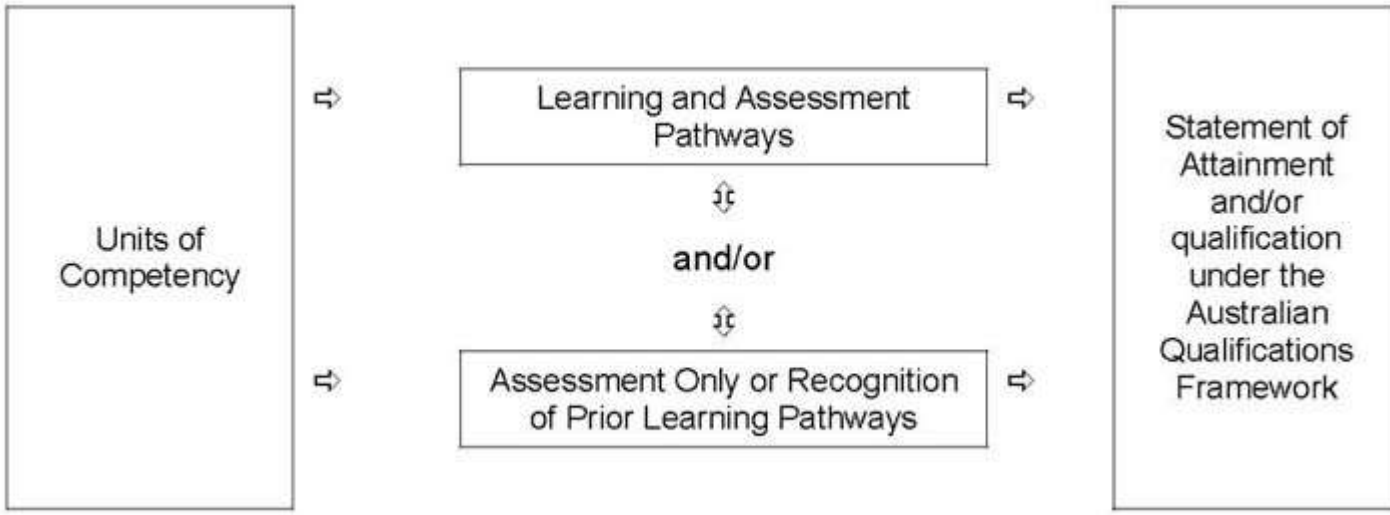

Assessment, by any pathway, must comply with the assessment requirements set out in the Assessment Guidelines of the Training Package and the AQTF 2007.

Learning and Assessment Pathways

Usually, learning and assessment are integrated, with assessment evidence being collected and feedback provided to the candidate at anytime throughout the learning and assessment process.

Learning and assessment pathways may include structured programs in a variety of contexts using a range of strategies to meet different learner needs. Structured learning and assessment programs could be: group-based, work-based, project-based, self-paced, action learning-based; conducted by distance or e-learning; and/or involve practice and experience in the workplace.

Learning and assessment pathways to suit Australian Apprenticeships have a mix of formal structured training and structured workplace experience with formative assessment activities through which candidates can acquire and demonstrate skills and knowledge from the relevant units of competency.

Assessment-Only or Recognition of Prior Learning Pathway

Competencies already held by individuals can be formally assessed against the units of competency in this Training Package, and should be recognised regardless of how, when or where they were achieved.

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In an assessment-only or Recognition of Prior Learning (RPL) pathway, the candidate provides current, quality evidence of their competency against the relevant unit of competency. This process may be directed by the candidate and verified by the assessor, such as in the compilation of portfolios; or directed by the assessor, such as through observation of workplace performance and skills application, and oral and/or written assessment. Where the outcomes of this process indicate that the candidate is competent, structured training is not required. The RPL requirements of the AQTF 2007 must be met (Standard 1).

As with all assessment, the assessor must be confident that the evidence indicates that the candidate is currently competent against the endorsed unit of competency. This evidence may take a variety of forms and might include certification, references from past employers, testimonials from clients, and work samples. The onus is on candidates to provide sufficient evidence to satisfy assessors that they currently hold the relevant competencies. In judging evidence, the assessor must ensure that the evidence of prior learning is:

- authentic (the candidate"s own work)
- valid (directly related to the current version of the relevant endorsed unit of competency)
- reliable (shows that the candidate consistently meets the endorsed unit of competency)
- current (reflects the candidate"s current capacity to perform the aspect of the work covered by the endorsed unit of competency), and
- sufficient (covers the full range of elements in the relevant unit of competency and addresses the four dimensions of competency, namely task skills, task management skills, contingency management skills, and job/role environment skills).

The assessment only or recognition of prior learning pathway is likely to be most appropriate in the following scenarios:

- candidates enrolling in qualifications who want recognition for prior learning or current competencies
- existing workers
- individuals with overseas qualifications
- recent migrants with established work histories
- people returning to the workplace, and
- people with disabilities or injuries requiring a change in career.

Combination of Pathways

Where candidates for assessment have gained competencies through work and life experience and gaps in their competence are identified, or where they require training in new areas, a combination of pathways may be appropriate.

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In such situations, the candidate may undertake an initial assessment to determine their current competency. Once current competency is identified, a structured learning and assessment program ensures that the candidate acquires the required additional competencies identified as gaps.

Assessor Requirements

This section identifies the mandatory competencies for assessors, and clarifies how others may contribute to the assessment process where one person alone does not hold all the required competencies.

Assessor Competencies

The AQTF 2007 specifies mandatory competency requirements for assessors. For information, Standard 1, Element 1.4 from the AQTF 2007 *Essential Standards for Registration* follows:

1.4		*Training and assessment is delivered by trainers and assessors who:*
	a)	*have the necessary training and assessment competencies as determined by the National Quality Council or its successors*
	b)	*have the relevant vocational competencies at least to the level being delivered or assessed*
	c)	*continue developing their vocational and training and assessment competencies to support continuous improvements in the delivery of the RTO"s services.*

Industry Assessment Contextualisation 1

Training and assessment for people with specific needs

Disability Standards for Education were formed under the Disability Discrimination Act 1992 and were introduced in August 2005. They clarify the obligations of education and training providers to ensure that students who have a disability are able to access and participate in education without experiencing discrimination.

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The Department of Education, Employment and Workplace Relations (DEEWR) provides further information in the *Disability Standards for Education 2005 Guidance Notes* , accessible via the DEEWR website (www.deewr.gov.au/Schooling/DisabilityStandardsforEducation/Documents/Disability_Standards_Education_Guidance_Notes_pdf.pdf).

Good vocational training and assessment are often about making adjustments to what we do to meet the learning support needs of individuals. The information provided in this section is aimed at assisting teachers/trainers to meet the reasonable adjustment needs of people who have a disability.

According to the Australian Bureau of Statistics (ABS), 2003, *Survey of Disability, Ageing and Carers (SDAC)* in the section on education and employment:

'In 2003, one in four people (24%) aged 15-64 years with a profound or severe core-activity limitation, who were living in households, had completed Year 12. This compares to half (49%) of those without a disability. People with a profound or severe core-activity limitation were less likely to have completed a diploma or higher qualification (14%) than those without a disability (28%).'

Employment-related findings, for people aged 15-64 years living in households, from the ABS 2003 *SDAC* include:

- those with a profound level of core-activity limitation had a much lower labour force participation rate (15%) than people without a disability (81%)
- people with a disability who were employed were more likely to work part-time (37%)
- than those who were employed and did not have a disability (29%)
- people employed in agriculture, forestry and fishing (16%) had a relatively high disability rate compared to the overall rate for those employed (11%).'

Clearly there is much work still to be done to ensure that people who have a disability are able to participate in employment and vocational education and training as fully as possible.

What is a disability?

A disability presents some impairment to everyday activity. Some people with a disability do not have any impairments resulting from their disability. For example, a person who has a hearing impairment which is compensated for by a hearing aid may function without any adjustments. While some people with a disability may have an impairment because of the environment, not the disability itself. For example, hearing loss can be accentuated in a room with loud, competing noise and poor acoustics.

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A disability may affect or relate to a range of human functions, including mobility, stamina, lifting ability, memory, vision, hearing, speech, comprehension and mood swings. This may be due to accidents, illnesses or birth.

According to the ABS 2003 *SDAC*:

'One in five people in Australia (3,958,300 or 20.0%) had a reported disability. This rate was much the same for males (19.8%) and females (20.1%). Disability was defined as any limitation, restriction or impairment, which has lasted, or is likely to last, for at least six months and restricts everyday activities. Examples range from hearing loss which requires the use of a hearing aid, to difficulty dressing due to arthritis, to advanced dementia requiring constant help and supervision.'

The ABS 2003 *SDAC* information also tells us that:

'15.2% (600,300) of people with a disability reported that the cause of their main health condition was accident or injury, 14% (557 300) that it was disease, illness or heredity, and 11% (423,500) that it was "working conditions, work or over-work".'

Health conditions can also be acquired through sporting accidents, repetitive or over-use (through regular or sporting activities), or the daily activities of life.

There are many resources available that provide information on how to adjust training and assessment for someone who has a disability; some of these are listed in the contacts section below.

Adjustments in training and assessment

An open mind, common sense and tailoring to individual circumstances will, as often as not, ensure individuals achieve the standards that employers and training providers expect. Reasonable adjustments need only be that - reasonable. It is about identifying what adjustments might reasonably be made and how they may be put into place.

Training and assessment can be made more appropriate and fairer for a person who has a disability through attitude, preparation and application.

Attitude

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The attitude of others is often the greatest barrier for people who have a disability. While most people who have a disability will only ever require minor adjustments to ensure learning is positive, some will require additional support. There are many support agencies that can provide advice, however teachers/trainers may need to take additional time to ensure their teaching/training meets the learning support needs of the individual concerned.

Positive language creates an atmosphere of mutual respect, which is essential to learning. For example, using language that identifies learners as people rather than language that identifies them by one of their characteristics conveys that the person is more important than the characteristic, such as the difference between a 'person who has an intellectual disability' and an 'intellectually disabled person'. A person who has an intellectual disability could also be identified by a range of equally important characteristics - height, age, sporting interests, etc. However, the term 'intellectually disabled person' refers to the disability as the major, and often only, defining characteristic.

Preparation

It is important to identify any functional issues arising from the nature and extent of a person's disability. This can usually be done by discussing such issues with the individual. In most cases, this consultation will identify reasonable adjustment needs which can be put into place. There are many simple things that teachers/trainers can do to make reasonable adjustments to enable individuals who have a disability to succeed in training and assessment. In some cases, professional support may be required.

Application

Once reasonable adjustments have been implemented it is important to monitor and evaluate what has been done to ensure the best environment for continuous learning because:

- adjustments may only need to be temporary - i.e. mechanisms may only need to be in place during an induction period or due to a temporary disability, in which case evaluation will ensure appropriateness without the need for ongoing monitoring
- adjustments may need reinforcing - when adjustments need to be ongoing, monitoring may reinforce patterns of behaviour in order for them to become 'natural'
- adjustments may need improving - where adjustments are ongoing or substantial, a commitment to continuous improvement is recommended through monitoring.

In most cases an informal discussion with the person concerned may be all that is necessary. However, should adjustments be substantial, or a learner not be acquiring competence at a reasonable rate, a more formal process may be required. This may include:

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- performance indicators - training providers, learners and employers should have agreed indicators of performance which can be measured and monitored
- independent support - a third party, independent of the training and/or assessment environment, may need to be involved
- experimentation - if existing adjustments are not proving satisfactory, creative solutions may be needed
- continuing review - formal monitoring is encouraged if adjustments are changed or if substantial adjustments are necessary.

For further information on training and assessment for people with specific needs, the DEEWR website has information about the National Disability Coordination Officer Programme, which 'provides information, co-ordination and referral services for people with a disability interested in or enrolled in post-school education and training' (www.deewr.gov.au).

Reasonable adjustment

Below are some of the practical things that can be done as part of providing reasonable adjustment to learners with specific support needs to enable them to undertake training and assessment. Clearly, each case will be different and will need to be discussed with the person and in some cases expert help will be needed, at least in the initial stages.

Type of disability	**Reasonable adjustment**
Acquired brain injury	• Memory aids (posters, notes, etc.) • Reflective listening skills • Stress minimisation • Time and patience
Hearing impairment	• Audio loops for people using hearing aids • Plain English documents • Fire and alarm systems with flashing lights • Sign language interpreters • Telephone typewriters
Intellectual disability	• Additional time • Assessment which is appropriate to the skill (i.e. avoiding written assessment for practical tasks) • Mentors • Plain English documents • Practical learning sessions • Repetition of learning exercises

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Mobility impairment	• Access to aids, such as for holding documents • Adjustable tables • Lifting limits • Note-taking support • Verbal rather than written presentations • Personal computers • Wheelchair access
Psychiatric disability	• Identification and avoidance of stresses • Ongoing rather than formal assessments • Reflective listening skills • 'Time-out' breaks in assessment
Speech impairment	• Information summaries • Stress minimisation • Time and patience • Written rather than verbal opportunities
Vision impairment	• Additional writing time for assignments and tests • Audiotapes • Braille translations • Enlarged computer screen images • Enlarged text and images • Good lighting or reading lamps • Guide dog provision • Informing the person before moving furniture • Voice synthesisers on computers

Designing Assessment Tools

This section provides an overview on the use and development of assessment tools.

Use of Assessment Tools

Assessment tools provide a means of collecting the evidence that assessors use in making judgments about whether candidates have achieved competency.

There is no set format or process for the design, production or development of assessment tools. Assessors may use prepared assessment tools, such as those specifically developed to support this Training Package, or they may develop their own.

Using Prepared Assessment Tools

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If using prepared assessment tools, assessors should ensure these are benchmarked, or mapped, against the current version of the relevant unit of competency. This can be done by checking that the materials are listed on the National Training Information Service < www.ntis.gov.au>. Materials on the list have been noted by the National Quality Council as meeting their quality criteria for Training Package support materials.

Developing Assessment Tools

When developing assessment tools, assessors must ensure that they:

- are benchmarked against the relevant unit or units of competency
- are reviewed as part of the continuous improvement of assessment strategies as required under Standard 1 of the AQTF 2007
- meet the assessment requirements expressed in Standard 1 of the AQTF 2007.

A key reference for assessors developing assessment tools is TAA04 Training and Assessment Training Package and the unit of competency TAAASS403A *Develop assessment tools*. There is no set format or process for the design, production or development of assessment materials.

Conducting Assessment

This section details the mandatory assessment requirements and provides information on equity in assessment including reasonable adjustment.

Assessment Requirements

Assessments must meet the criteria set out in the AQTF 2007 Essential Standards for Registration.

For information, the mandatory assessment requirements from Standard 1 from the AQTF 2007 *Essential Standards for Registration* are as follows:

1.5		*Assessment, including Recognition of Prior Learning:*
	a)	*meets the requirements of the relevant Training Package or accredited course,*

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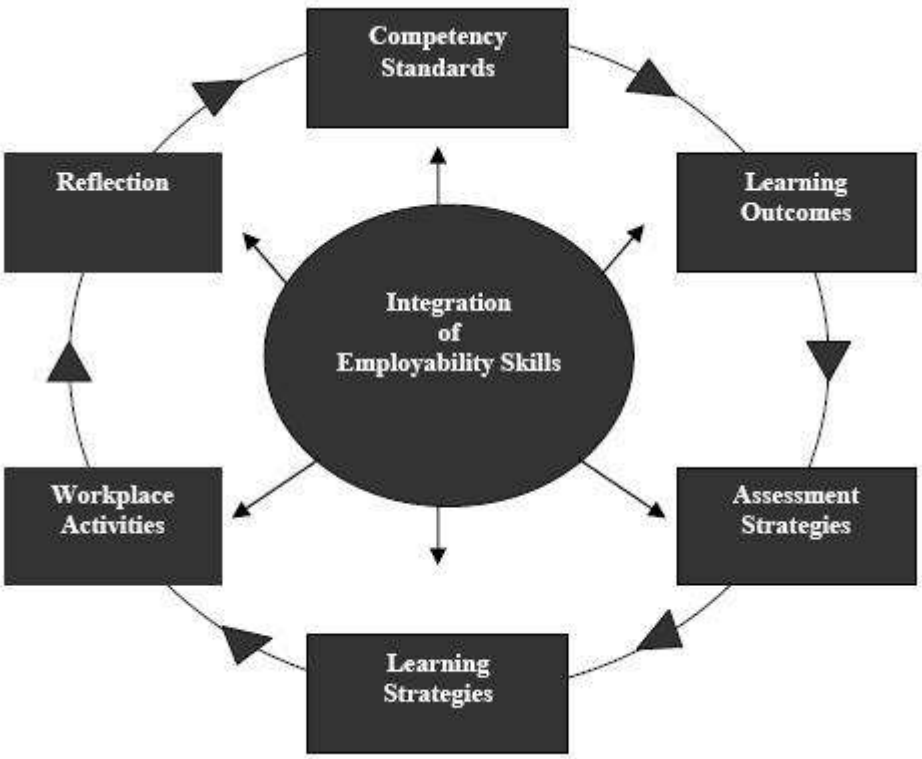
	b)	*is conducted in accordance with the principles of assessment and the rules of evidence, and*
	c)	*meets workplace and, where relevant, regulatory requirements.*

Assessment of Employability Skills

Employability Skills are integral to workplace competency. As such they must be considered in the design, customisation, delivery and assessment of vocational education and training programs in an integrated and holistic way, as represented diagrammatically below.



Employability Skills are embedded and explicit within each unit of competency. Training providers must use Employability Skills information in order to design valid and reliable training and assessment strategies. This analysis could include:

- reviewing units of competency to locate relevant Employability Skills and determine how they are applied within the unit
- analysing the Employability Skills Summary for the qualification in which the unit or units are packaged to help clarify relevant industry and workplace contexts and the application of Employability Skills at that qualification outcome

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- designing training and assessment to address Employability Skills requirements.

Employability Skills in the Integrated Telecommunications context

ICT10 Integrated Telecommunications Training Package seeks to ensure that industry-endorsed employability skills are explicitly embedded in units of competency. The application of each skill and the level of detail included in each part of the unit will vary according to industry requirements and the nature of the unit of competency.

Employability skills are both explicit and embedded within units of competency. This means that employability skills are:

- embedded in units of competency as part of the other performance requirements that make up the competency as a whole
- explicitly described within units of competency to enable Training Package users to identify accurately the performance requirements of each unit with regards to employability skills.

ICT10 Integrated Telecommunications Training Package also seeks to ensure that employability skills are well-defined and written into units of competency so that they are apparent, clear and can be delivered and assessed as an essential component of unit work outcomes.

For more information on Employability Skills in Innovation and Business Industry Skills Council Training Packages go to the Innovation and Business Industry Skills Council website at http://www.ibsa.org.au.

Access and Equity

An individual"s access to the assessment process should not be adversely affected by restrictions placed on the location or context of assessment beyond the requirements specified in this Training Package: training and assessment must be bias-free.

Under the rules for their development, Training Packages must reflect and cater for the increasing diversity of Australia"s VET clients and Australia"s current and future workforce. The flexibilities offered by Training Packages should enhance opportunities and potential outcomes for all people so that we can all benefit from a wider national skills base and a shared contribution to Australia"s economic development and social and cultural life.

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Reasonable adjustments

It is important that education providers take meaningful, transparent and reasonable steps to consult, consider and implement reasonable adjustments for students with disability.

Under the Disability Standards for Education 2005, education providers must make reasonable adjustments for people with disability to the maximum extent that those adjustments do not cause that provider unjustifiable hardship. While "reasonable adjustment" and "unjustifiable hardship" are different concepts and involve different considerations, they both seek to strike a balance between the interests of education providers and the interests of students with and without disability.

An adjustment is any measure or action that a student requires because of their disability, and which has the effect of assisting the student to access and participate in education and training on the same basis as students without a disability. An adjustment is reasonable if it achieves this purpose while taking into account factors such as the nature of the student"s disability, the views of the student, the potential effect of the adjustment on the student and others who might be affected, and the costs and benefits of making the adjustment.

An education provider is also entitled to maintain the academic integrity of a course or program and to consider the requirements or components that are inherent or essential to its nature when assessing whether an adjustment is reasonable. There may be more than one adjustment that is reasonable in a given set of circumstances; education providers are required to make adjustments that are reasonable and that do not cause them unjustifiable hardship.

See Part 4, Chapter 2 of the Training Package Development Handbook (DEST, September 2007) for more information on reasonable adjustment, including examples of adjustments.

Industry Assessment Contextualisation 2

Assessment for Indigenous organisations

Aboriginal and Torres Strait Islander people have expressed concern about the importance of developing appropriate assessment processes.

There are four main areas of concern:

- diversity
- cultural appropriateness

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- community control
- accreditation.

Diversity

The term diversity is used to emphasise the wide range of opinions, aspirations, community circumstances, cultural practices, geographic locations, and social, economic and political conditions that exist throughout Australia and the need to guard against assumptions that all communities are the same.

One approach is to distinguish between remote, rural and urban settings. These settings suggest differences that may be relevant to Aboriginal and Torres Strait Islander organisations, including:

- culture
- language
- history
- social make-up
- geography
- social and economic infrastructure
- economy
- political structure.

These factors suggest that training and assessment, in order to be relevant to the needs of a particular Aboriginal and Torres Strait Islander organisation, should address each situation as unique.

Cultural appropriateness

The term culture is used in a broad sense, it refers to:

- values, social beliefs and customs, such as Aboriginal and Torres Strait Islander law, land, and family and kinship systems
- protocols of behaviour and interaction e.g. cultural authority, gender and kinship
- ways of thinking, including preferred learning styles
- language, both English and Aboriginal English
- lifestyles
- local history
- location, including region and place.

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A particularly important aspect of cultural appropriateness is that of learning styles. There is evidence that Aboriginal and Torres Strait Islander people, both traditional and contemporary, approach learning differently from the Western intellectual tradition, which is relevant to effective training and assessment.

It is understood that Aboriginal and Torres Strait Islander people may:

- learn better in groups than individually
- learn better in the surroundings of their community than in an institutional environment
- prefer oral communications to written forms
- learn on the basis of trial and error in the presence of an experienced person in preference to concept building approaches
- have a highly-developed sense of spatial relations by which they learn; hence stories, maps and pictures would be preferable to oral explanations.

To be effective, it is necessary that training and assessment recognises, adopts and practises appropriate delivery and assessment approaches.

Trainers and assessors who are not Aboriginal or Torres Strait Islanders need information on aspects of Aboriginal and Torres Strait Islander culture. They need to work closely with Aboriginal and Torres Strait Islander people to adopt practices that reflect Aboriginal and Torres Strait Islander approaches. The community should be asked to identify experts to provide information and to assist with assessment of relevant protocols, for example, where required.

There are a number of ways an RTO can establish and maintain culturally appropriate training and assessment practices, including:

- ensuring a high proportion of Aboriginal and Torres Strait Islander participation in all aspects of planning, development, delivery and evaluation
- establishing and maintaining a collaborative relationship with local Aboriginal and Torres Strait Islander communities
- as a mainstream (non-Indigenous) RTO, establishing auspice relationships with Aboriginal and Torres Strait Islander organisations and individuals, including direct and indirect involvement of persons identified as appropriate by the local community
- ensuring ongoing training of non-Aboriginal and Torres Strait Islander staff at all levels of the RTO, delivered by Aboriginal and Torres Strait Islander personnel.

Community control

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The term community control is synonymous with such things as self-determination and self-management, and underpins most community aspirations. It is of fundamental concern to people who see themselves as having been dispossessed by colonisation.

The essence of control is control of decision-making. In order to be able to do this, people need all relevant information, relevant competencies, and recognition of their own structures and processes.

Among other things, Aboriginal and Torres Strait Islander people seek control over their training. It is necessary, therefore, that they participate in meaningful ways in all stages of planning, development, delivery and evaluation. One way to achieve this is for communities to have control of the contract for training initiatives.

It is important that training providers and assessors respect and conform to the practice of community control which underpins this field within the ICT10 Integrated Telecommunications Training Package.

Accreditation

Aboriginal and Torres Strait Islander people have said for a long time that their involvement in training has not been formally recognised and that many of the skills they use in managing their organisations and delivering services to their communities have not been valued.

The first issue may have arisen because much of the training that has been delivered to communities has been customised to particular situations, has not been assessed on an individual basis if at all, and has been delivered by unregistered personnel. Secondly, until this time, recognition of current competencies (RCC) has been under-utilised.

Individuals may demonstrate competence in complete units of competency through formal training, informal training or the recognition of current competencies and skills, resulting in qualifications or statements of attainment being awarded.

In the community group setting, an important feature of likely relevance for assessment is that participants may vary with respect to previous education and training experience, which may result in diverse literacy and numeracy issues. However, literacy and numeracy skills are not a barrier to sophisticated thought, and care must be taken not to use assessment strategies that rely on a person having numeracy and literacy skills that are not intrinsically required by the unit of competency being assessed.

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A flexible approach to assessment will be required by RTOs in order to meet the requirements of Aboriginal and Torres Strait Islander organisations and individuals under this domain within the ICT10 Integrated Telecommunications Training Package.

Assessment in Aboriginal and Torres Strait Islander communities

The guiding principles that underpin assessment include:

- assessment should be transparent, i.e. clearly seen and understood by the candidate and others
- assessment should empower the candidate on the basis of consent, self-assessment and responsibility for the process
- members or prospective members of community management committees should have opportunities to demonstrate their competencies and skills
- activities undertaken by the candidate in a community management role may be used as the context for assessment where possible (known as on-the-job assessment or workplace assessment); there may also be opportunities to include evidence from other relevant situations
- assessment should involve designated community experts working in collaboration with RTO assessors in order to provide appropriate recognition of cultural and community skills and knowledge
- assessments must provide constructive feedback to candidates and support for further competency development
- assessments must provide a statement of attainment or qualification, listing the units of competency achieved
- records of candidate achievement maintained by the RTO must include the statement of attainment, listing the units of competency or qualifications achieved as required by the AQTF 2007
- a record of demonstrated competencies will assist in role clarification and performance appraisals in the workplace.

Given the importance of the assessment to the candidate and community management committees, the assessor must make every effort to ensure that assessment is conducted with the highest level of professionalism and integrity.

Units of competency with cultural content, including the following of local protocols, will require the assessor to have knowledge of these cultural matters. As these matters are often governed by local rules regarding access to such knowledge, only those people with the knowledge can genuinely assess these aspects of the competency or provide guidance on their assessment.

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Discussion must take place with the community and agreement must be reached on how these matters are assessed. For non-Aboriginal and Torres Strait Islander RTOs, this will usually mean the use of auspice arrangements with appropriate people or knowledge experts, identified by the community.

It should be noted that for Aboriginal and Torres Strait Islander people being assessed in aspects of competency, they will almost invariably have been attained through life experience. This must also be taken into account in the assessment procedures relating to cultural matters.

Assessors may exercise limited discretion in response to organisational or individual requirements, but any changes must not alter the meaning of the unit of competency or the elements of competency.

- Candidates must be informed of the right to access grievance procedures.

Further Sources of Information

The section provides a listing of useful contacts and resources to assist assessors in planning, designing, conducting and reviewing of assessments against this Training Package.

Contacts

This section provides a listing of useful contacts and resources to assist assessors in planning, designing, conducting and reviewing of assessments against this Training Package.

Innovation & Business Skills Australia

Level 11, 176 Wellington Parade

EAST MELBOURNE VIC 3002

Telephone: +61 3 9815 7000

Facsimile: +61 3 9815 7001

Email: *virtual@ibsa.org.au*

Web: *www.ibsa.org.au*

Technical and Vocational Education and Training (TVET) Australia Limited

Level 21, 390 St Kilda Road

MELBOURNE VIC 3150

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PO Box 12211, A'Beckett Street Post Office
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Telephone: +61 3 9832 8100
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Email: *sales@tvetaustralia.com.au*
Web: *www.tvetaustralia.com.au*

Regulatory Advice
Australian Communications and Media Authority (ACMA)
PO Box 13112
Law Courts
MELBOURNE VIC 8010
Telephone: (03) 9963 6800
Facsimile: (03) 9963 6970
Website: *www.acma.gov.au*

For information on the TAA04 Training and Assessment Training Package contact:

Innovation & Business Skills Australia
Level 11, 176 Wellington Parade
EAST MELBOURNE VIC 3002
Telephone: +61 3 9815 7000
Facsimile: +61 3 9815 7001
Email: *virtual@ibsa.org.au*
Web: *www.ibsa.org.au*

General resources

Refer to http://antapubs.dest.gov.au/publications/search.asp to locate the following publications.

AQF Implementation Handbook, third edition. Australian Qualifications Framework Advisory Board, 2002, www.aqf.edu.au.

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Australian Quality Training Framework 2007 (AQTF 2007) - for information and resources go to <www.training.com.au/aqtf2007>.

AQTF 2007 *Essential Standards for Registration* . Training organisations must meet these standards in order to deliver and assess nationally recognised training and issue nationally recognised qualifications. They include three standards, a requirement for registered training organisations to gather information on their performance against three quality indicators, and nine conditions of registration.

AQTF 2007 *User's Guide to the Essential Standards for Registration* . A Users' Guide for training organisations who must meet these standards in order to deliver and assess nationally recognised training and issue nationally recognised qualifications.

AQTF 2007 *Standards for Accredited Courses* . State and territory accrediting bodies are responsible for accrediting courses. This standard provides a national operating framework and template for the accreditation of courses.

TAA04 Training and Assessment Training Package . This is available from Innovation and Business Skills Australia (IBSA), the Innovation and Business Industry Skills Council, and can be viewed and components downloaded, from the National Training Information Service (NTIS).

National Training Information Service, an electronic database providing comprehensive information about RTOs, Training Packages and accredited courses (www.ntis.gov.au).

Training Package Development Handbook (DEST, August 2007). Can be downloaded from www.deeewr.gov.au.

Assessment resources

Training Package Assessment Guides - a range of resources to assist RTOs in developing Training Package assessment materials (originally developed by ANTA with funding from the Department of Education, Training and Youth Affairs) and made up of 10 separate titles, as described at the publications page of www.deewr.gov.au. Go to www.resourcegenerator.gov.au.

Printed and/or CD versions of the guides can be purchased from Technical and Vocational Education and Training (TVET) Australia Limited. The resource includes the following guides:

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- Training Package Assessment Materials Kit
- Assessing Competencies in Higher Qualifications
- Recognition Resource
- Kit to Support Assessor Training
- Candidates Kit: Guide to Assessment in New Apprenticeships
- Assessment Approaches for Small Workplaces
- Assessment Using Partnership Arrangements
- Strategies for ensuring Consistency in Assessment
- Networking for Assessors
- Quality Assurance Guide for Assessment.

An additional guide 'Delivery and Assessment Strategies' has been developed to complement these resources.

Assessment tool design and conducting assessment

VETASSESS and Western Australian Department of Training and Employment 2000, Designing Tests - Guidelines for designing knowledge based tests for Training Packages.

Vocational Education and Assessment Centre 1997, Designing Workplace Assessment Tools, A self-directed learning program, NSW TAFE.

Manufacturing Learning Australia 2000, Assessment Solutions, Australian Training Products, Melbourne.

Rumsey, David 1994, Assessment practical guide, Australian Government Publishing Service, Canberra.

Assessor training

Australian Committee on Training Curriculum (ACTRAC) 1994, *Assessor training program - learning materials* , Australian Training Products, Melbourne.

Australian National Training Authority, *A Guide for Professional Development* , ANTA, Brisbane.

Australian Training Products Ltd *Assessment and Workplace Training, Training Package - Toolbox,* ATPL Melbourne (available from TVET).

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Green, M, et al. 1997, *Key competencies professional development package* , Department for Education and Children's Services, South Australia.

Victorian TAFE Association 2000, *The professional development CD: A learning tool* , VTA, Melbourne.

Assessment system design and management

Office of Training and Further Education 1998, *Demonstrating best practice in VET project - assessment systems and processes*, OTFE Victoria (now 'Skills Victoria').

Toop, L., Gibb, J. & Worsnop, P. *Assessment system designs* , Australian Government Publishing Service, Canberra.

Support for employment, training and assessment of people with specific needs

Association of Competitive Employment (ACE) National Network

ACE represents agencies who deliver open employment services for people who have a disability.

PO Box 5198

Alphington VIC 3078

Telephone: 03 9411 4033

Facsimile: 03 9411 4053

Email: info@acenational.org.au

Website: www.acenational.org.au

Australian Disability Clearinghouse on Education and Training (ADCET)

ADECT provides information about inclusive post-secondary education and training teaching, learning and assessment strategies and support services for people who have a disability.

ADCET

Locked Bag 1335

Launceston TAS 7250

Telephone: 03 6324 3787

Facsimile: 03 6324 3788

Website: www.adcet.edu.au

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Australian Association of the Deaf

PO Box 1083

Stafford QLD 4053

Telephone: 07 3357 8266

Facsimile: 07 3357 8377

TTY: 07 3357 8277

Email: aad@aad.org.au

Website: www.aad.org.au

Australian Federation of Deaf Societies

PO Box 1060

Parramatta NSW 2124

Telephone: 02 8833 3615

Facsimile: 02 9893 8333

TTY: 02 9893 8858

Australian Federation of Disability Organisations

247 Flinders lane

Melbourne VIC 3000

Telephone: 03 9662 3324

Facsimile: 03 9662 3325

Email: office@afdo.org.au

Website: www.afdo.org.au

Blind Citizens Australia

PO Box 24

Sunshine VIC 3020

Telephone: 03 9372 6400

Facsimile: 03 9372 6466

TTY: 03 9372 9275

Freecall: 1800 033 660

Email: bca@bca.org.au Website: www.bca.org.au

Brain Injury Australia

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PO Box 82

Mawson ACT 2607

Telephone: 02 6290 2253

Facsimile: 02 6290 2252

Email: bianational@apex.net.au

Carers Australia

PO Box 73

Deakin West ACT 2600

Telephone: 02 6122 9900

Facsimile: 02 6122 9999

Email: caa@carersaustralia.com.au

Website: www.carersaustralia.com.au

Commonwealth Disability Services Program Contacts

www.facs.gov.au or by telephone:

ACT: 02 6274 5206

New South Wales: 02 263 3818

Northern Territory: 08 8946 3555

Queensland: 07 3360 2800

South Australia: 08 8236 6111

Tasmania: 03 6221 1411

Victoria: 03 9285 8523

Western Australia: 08 9346 5311

Deafness Forum of Australia

The forum coordinates the annual National Hearing Awareness Week, held in the last complete week of August.

218 Northbourne Avenue

Braddon ACT 2612

Telephone: 02 6262 7808

Facsimile: 02 6262 7810

TTY: 02 6262 7809

Email: info@deafnessforum.org.au

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Website: www.deafnessforum.org.au
Website: www.hearingawareness.org.au

Mental Health Foundation Australia
270 Church Street
Richmond VIC 3121
Telephone: 03 9427 0407
Facsimile: 03 9427 1294
Email: admin@mhfa.org.au
Website: www.mhfa.org.au

National Council on Intellectual Disability
PO Box 771
Mawson ACT 2607
Telephone: 02 6296 4400
Facsimile: 02 6296 4488
Email: ncid@dice.org.au
Website: www.dice.org.au

National Ethnic Disability Alliance
PO Box 381
Harris Park NSW 2150
Telephone: 02 9687 8933
Facsimile: 02 9635 5355
TTY: 02 9687 6325
Website: www.neda.org.au

Physical Disability Council of Australia Ltd
PO Box 77
Northgate QLD 4013
Telephone: 07 3267 1057
Facsimile: 07 3267 1733
Email: pdca@pdca.org.au
Website: www.pdca.org.au

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SANE Australia

PO Box 226

South Melbourne VIC 3205

Telephone: 03 9682 5933

Facsimile: 03 9682 5944

Freecall: 1800 18 SANE

Email: info@sane.org

Email: helpline@sane.org

Website: www.sane.org

SAI Global

Standards Australia publications distributor.

Telephone: 131 242

Facsimile: 1300 65 49 49

Email: sales@sai-global.com

Website: www.saiglobal.com

Standards Australia

Standards Australia develops standards and codes for building access.

Standards Australia Limited

Level 10, The Exchange Centre

20 Bridge Street

Sydney NSW 2000

Telephone: 1800 035 822

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Women with Disabilities Australia

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General Resources

Refer to http://antapubs.dest.gov.au/publications/search.asp to locate the following publications.

AQF Implementation Handbook, third Edition. Australian Qualifications Framework Advisory Board, 2002, aqf.edu.au

Australian Quality Training Framework 2007 (AQTF 2007) - for information and resources go to <www.training.com.au/aqtf2007>.

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AQTF 2007 *Essential Standards for Registration*. Training organisations must meet these standards in order to deliver and assess nationally recognised training and issue nationally recognised qualifications. They include three standards, a requirement for registered training organisations to gather information on their performance against three quality indicators, and nine conditions of registration.

AQTF 2007 *User's Guide to the Essential Standards for Registration*. A Users" Guide for training organisations who must meet these standards in order to deliver and assess nationally recognised training and issue nationally recognised qualifications.

AQTF 2007 *Standards for Accredited Courses*. State and Territory accrediting bodies are responsible for accrediting courses. This standard provides a national operating framework and template for the accreditation of courses.

TAA04 Training and Assessment Training Package. This is available from the Innovation and Innovation & Business Skills Australia (IBSA) Industry Skills Council and can be viewed, and components downloaded, from the National Training Information Service (NTIS).

National Training Information Service, an electronic database providing comprehensive information about RTOs, Training Packages and accredited courses (www.ntis.gov.au).

Training Package Development Handbook (DEST, August 2007). Can be downloaded from www.dest.gov.au

Assessment resources

Training Package Assessment Guides - a range of resources to assist RTOs in developing Training Package assessment materials (originally developed by ANTA with funding from the Department of Education, Training and Youth Affairs) and made up of 10 separate titles, as described at the publications page of www.dest.gov.au.Go to www.resourcegenerator.gov.au/loadpage.asp?TPAG.htm

Printed and/or CD ROM versions of the Guides can be purchased from Technical and Vocational Education and Training (TVET) Australia Limited. The resource includes the following guides:

- Training Package Assessment Materials Kit
- Assessing Competencies in Higher Qualifications
- Recognition Resource
- Kit to Support Assessor Training

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- Candidates Kit: Guide to Assessment in New Apprenticeships
- Assessment Approaches for Small Workplaces
- Assessment Using Partnership Arrangements
- Strategies for ensuring Consistency in Assessment
- Networking for Assessors
- Quality Assurance Guide for Assessment

An additional guide "Delivery and Assessment Strategies" has been developed to complement these resources.

Assessment Tool Design and Conducting Assessment

VETASSESS & Western Australian Department of Training and Employment 2000, Designing Tests - Guidelines for designing knowledge based tests for Training Packages.

Vocational Education and Assessment Centre 1997, Designing Workplace Assessment Tools, A self-directed learning program, NSW TAFE.

Manufacturing Learning Australia 2000, Assessment Solutions, Australian Training Products, Melbourne.

Rumsey, David 1994, Assessment practical guide, Australian Government Publishing Service, Canberra.

Assessor Training

Australian Committee on Training Curriculum (ACTRAC) 1994, *Assessor training program - learning materials*, Australian Training Products, Melbourne.

Australian National Training Authority, *A Guide for Professional Development*, ANTA, Brisbane.

Australian Training Products Ltd *Assessment and Workplace Training, Training Package - Toolbox*, ATPL Melbourne (available from TVET).

Green, M, et al. 1997, *Key competencies professional development Package*, Department for Education and Children"s Services, South Australia.

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Victorian TAFE Association 2000, *The professional development CD: A learning tool*, VTA, Melbourne.

Assessment System Design and Management

Office of Training and Further Education 1998, *Demonstrating best practice in VET project - assessment systems and processes*, OTFE (now OTTE) Victoria.

Toop, L., Gibb, J. & Worsnop, P. *Assessment system designs*, Australian Government Publishing Service, Canberra.

Competency Standards - Industry Contextualisation

Competency Standards

What is competency?

The broad concept of industry competency concerns the ability to perform particular tasks and duties to the standard of performance expected in the workplace. Competency requires the application of specified skills, knowledge and attitudes relevant to effective participation in an industry, industry sector or enterprise.

Competency covers all aspects of workplace performance and involves performing individual tasks; managing a range of different tasks; responding to contingencies or breakdowns; and, dealing with the responsibilities of the workplace, including working with others. Workplace competency requires the ability to apply relevant skills, knowledge and attitudes consistently over time and in the required workplace situations and environments. In line with this concept of competency Training Packages focus on what is expected of a competent individual in the workplace as an outcome of learning, rather than focussing on the learning process itself.

Competency standards in Training Packages are determined by industry to meet identified industry skill needs. Competency standards are made up of a number of units of competency each of which describes a key function or role in a particular job function or occupation. Each unit of competency within a Training Package is linked to one or more AQF qualifications.

Contextualisation of Units of Competency by RTOs

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Registered Training Organisation (RTOs) may contextualise units of competency to reflect local outcomes required. Contextualisation could involve additions or amendments to the unit of competency to suit particular delivery methods, learner profiles, specific enterprise equipment requirements, or to otherwise meet local needs. However, the integrity of the overall intended outcome of the unit of competency must be maintained.

Any contextualisation of units of competency in this endorsed Training Package must be within the bounds of the following advice. In contextualising units of competency, RTOs:

- must not remove or add to the number and content of elements and performance criteria
- may add specific industry terminology to performance criteria where this does not distort or narrow the competency outcomes
- may make amendments and additions to the range statement as long as such changes do not diminish the breadth of application of the competency and reduce its portability, and/or
- may add detail to the evidence guide in areas such as the critical aspects of evidence or resources and infrastructure required where these expand the breadth of the competency but do not limit its use.

Components of Units of Competency

The components of units of competency are summarised below, in the order in which they appear in each unit of competency.

Unit Title

The unit title is a succinct statement of the outcome of the unit of competency. Each unit of competency title is unique, both within and across Training Packages.

Unit Descriptor

The unit descriptor broadly communicates the content of the unit of competency and the skill area it addresses. Where units of competency have been contextualised from units of

competency from other endorsed Training Packages, summary information is provided. There may also be a brief second paragraph that describes its relationship with other units of competency, and any licensing requirements.

Employability Skills statement

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A standard Employability Skills statement appears in each unit of competency. This statement directs trainers and assessors to consider the information contained in the Employability Skills Summary in which the unit of competency is packaged.

Prerequisite Units (optional)

If there are any units of competency that must be completed before the unit, these will be listed.

Application of the Unit

This sub-section fleshes out the unit of competency's scope, purpose and operation in different contexts, for example, by showing how it applies in the workplace.

Competency Field (Optional)

The competency field either reflects the way the units of competency are categorised in the Training Package or denotes the industry sector, specialisation or function. It is an optional component of the unit of competency.

Sector (optional)

The industry sector is a further categorisation of the competency field and identifies the next classification, for example an elective or supervision field.

Elements of Competency

The elements of competency are the basic building blocks of the unit of competency. They describe in terms of outcomes the significant functions and tasks that make up the competency.

Performance Criteria

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The performance criteria specify the required performance in relevant tasks, roles, skills and in the applied knowledge that enables competent performance. They are usually written in passive voice. Critical terms or phrases may be written in bold italics and then defined in range statement, in the order of their appearance in the performance criteria.

Required Skills and Knowledge

The essential skills and knowledge are either identified separately or combined. Knowledge identifies what a person needs to know to perform the work in an informed and effective manner. Skills describe the application of knowledge to situations where understanding is converted into a workplace outcome.

Range Statement

The range statement provides a context for the unit of competency, describing essential operating conditions that may be present with training and assessment, depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts. As applicable, the meanings of key terms used in the performance criteria will also be explained in the range statement.

Evidence Guide

The evidence guide is critical in assessment as it provides information to the Registered Training Organisation (RTO) and assessor about how the described competency may be demonstrated. The evidence guide does this by providing a range of evidence for the

assessor to make determinations, and by providing the assessment context. The evidence guide describes:

- conditions under which competency must be assessed including variables such as the assessment environment or necessary equipment
- relationships with the assessment of any other units of competency
- suitable methodologies for conducting assessment including the potential for workplace simulation
- resource implications, for example access to particular equipment, infrastructure or situations
- how consistency in performance can be assessed over time, various contexts and with a range of evidence, and expectations at the AQF qualification level involved

Employability Skills in units of competency

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The detail and application of Employability Skills facets will vary according to the job-role requirements of each industry. In developing Training Packages, industry stakeholders are consulted to identify appropriate facets of Employability Skills which are incorporated into the relevant units of competency and qualifications.

Employability Skills are not a discrete requirement contained in units of competency (as was the case with Key Competencies). Employability Skills are specifically expressed in the context of the work outcomes described in units of competency and will appear in elements, performance criteria, range statements and evidence guides. As a result, users of Training Packages are required to review the entire unit of competency in order to accurately determine Employability Skills requirements.

How Employability Skills relate to the Key Competencies

The eight nationally agreed Employability Skills now replace the seven Key Competencies in Training Packages. Trainers and assessors who have used Training Packages prior to the introduction of Employability Skills may find the following comparison useful.

Employability Skills	**Mayer Key Competencies**
Communication	Communicating ideas and information
Teamwork	Working with others and in teams
Problem solving	Solving problems Using mathematical ideas and techniques
Initiative and enterprise	
Planning and organising	Collecting, analysing and organising information Planning and organising activities
Self-management	
Learning	
Technology	Using technology

When analysing the above table it is important to consider the relationship and natural overlap of Employability Skills. For example, using technology may involve communication skills and combine the understanding of mathematical concepts.

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Explicitly embedding Employability Skills in units of competency

This Training Package seeks to ensure that industry-endorsed Employability Skills are explicitly embedded in units of competency. The application of each skill and the level of detail included in each part of the unit will vary according to industry requirements and the nature of the unit of competency.

Employability Skills must be both explicit and embedded within units of competency. This means that Employability Skills will be:

- embedded in units of competency as part of the other performance requirements that make up the competency as a whole
- explicitly described within units of competency to enable Training Packages users to identify accurately the performance requirements of each unit with regards to Employability Skills.

This Training Package also seeks to ensure that Employability Skills are well-defined and written into units of competency so that they are apparent, clear and can be delivered and assessed as an essential component of unit work outcomes.

The following table contains examples of embedded Employability Skills for each component of a unit of competency. Please note that in the examples below the bracketed skills are provided only for clarification and will not be present in units of competency within this Training Package.

Competency Standards - Industry Contextualisation

As indicated elsewhere, RTOs may contextualise units of competency imported from other Training Packages to reflect outcomes relevant to the ICT10 Integrated Telecommunications Training Package industry. Units from the ICA05 Information and Communications Technology Training Package, ICA11 Information and Communications Technology Training Package BSB07 Business Services Training Package, CPP07 Property Services Training Package, HLT07 Heath Training Package and FNS04 Financial Services Training Package have been imported into the telecommunications qualifications to support those units which address specific aspects of the ICT industry, such as computer networking and security, project management, small business needs and customer service.

Using ‘BSBSUS501A Develop workplace policy and procedures for sustainability' as an example, RTOs could add the development of policies and procedures in sustainability whilst formulating planning and design specifications to ICT projects.

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Similarly if ‘ICASAS305A Provide IT advice to clients' were imported, examples of ‘customer service and support’ in the context of the ICT could be added.

This update to ICT10 Version 3.0 has retained the current versions of imported units for ICT10 qualifications that have not been updated. Current versions of imported units have been used in qualifications being submitted for endorsement to the NSSC in Version 3.

It is planned in the next version of ICT10 to update all imported units to current versions.

Examples from this Training Package of Employability Skills

Examples from this Training Package of Employability Skills embedded within unit components. Analytical, literacy, numeracy and technical skills are obtained in unit ICTOPN5123A Analyse and integrate specialised optical devices in the network	
Unit component	**Example of embedded Employability Skill**
Unit Title	Analyse and integrate specialised optical devices in the network.
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse and integrate specialised optical devices into existing optical networks to support the higher bandwidths associated with Next Generation Networks (NGN). Carriers and service providers regularly upgrade existing infrastructures and extend the length of their networks' optical links due to expansion of NGN services such as voice, data and video. Performance testing of specialised optical devices is covered in a separate unit ICTOPN5122A Test the performance of specialised optical devices. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.
Element	2. Integrate the specialised optical device in the network.

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Examples from this Training Package of Employability Skills embedded within unit components.

Analytical, literacy, numeracy and technical skills are obtained in unit ICTOPN5123A Analyse and integrate specialised optical devices in the network

Unit component	**Example of embedded Employability Skill**
Performance Criteria	2.1. Install and integrate ***specialised optical devices*** into existing network according to design plan 2.2. Test the network and evaluate the results to ***verify optical network performance*** with the integrated specialised optical devices in operation
Range Statement	***Specialised optical devices*** may include: • Bragg grating • coupler • dispersion compensation device (DCD) • DWDM multiplexer • erbium doped fibre amplifier (EDFA) • gain equaliser • Raman amplifier • ROADM. ***Verify optical network performance*** may include: • stability test • bit error ratio test (BERT).
Required Skills and Knowledge	**Required skills** • analytical skills to evaluate technical information and develop integration options **Required knowledge** • attenuation characteristics of optical fibres • dense wavelength division multiplexing (DWDM) principles of operation

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Examples from this Training Package of Employability Skills embedded within unit components.

Analytical, literacy, numeracy and technical skills are obtained in unit ICTOPN5123A Analyse and integrate specialised optical devices in the network

Unit component	**Example of embedded Employability Skill**

	• features and operating requirements of test equipment including:
	  • hand held optical power meter
	  • optical spectrum analyser
	  • transmission test set
	  • dispersion characteristics of optical fibres
	  • dispersion compensation devices
	  • electrostatic discharge precaution
	  • functions of optical add drop multiplexer (OADM) and reconfigurable optical add-drop
	  • multiplexer (ROADM)
	• gain equalisation
	• ITU wavelength grid for DWDM
	• measurement of dispersion
	• optical amplifier operation
	• optical fibre connector types and characteristics
	• optical fibre types and characteristics
	• optical return loss (ORL)
	• path protection and protection switching
	• protocols used on optical DWDM systems
	• reflectance
	• ring topologies and linear network topologies
	• specific OHS requirements that impact on the safe inspection of optical connectors and the
	• safe measurement of optical power from laser transmission systems
	• tunable laser sources and their characteristics.

Evidence Guide	**Critical aspects for assessment and evidence required to demonstrate competency in this unit** Evidence of the ability to: • analyse a specialised optical device and prepare a design to

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Examples from this Training Package of Employability Skills embedded within unit components. Analytical, literacy, numeracy and technical skills are obtained in unit ICTOPN5123A Analyse and integrate specialised optical devices in the network	
Unit component	**Example of embedded Employability Skill**
	integrate it with a network • integrate and test the device • document the integration to the network and recommend enhancements.

Appendices

Appendix A: VET in Schools

What is VET in schools?

Vocational education and training in schools (VETiS) provides for nationally recognised vocational education and training undertaken as part of a senior secondary certificate and based on industry standards.

Successful completion of a VETiS program enables students to gain a nationally-recognised Australian Qualifications Framework (AQF) qualification, usually at the same time as their school-based qualification.

How are VET in schools programs structured?

VETiS programs are packaged and delivered in a variety of ways across Australia. There are three main types of delivery arrangements for VETiS programs:

- schools can be a registered training organisation (RTO) in their own right
- school sectoral bodies (such as Boards of Studies or regional offices) can hold RTO status on behalf of a group of schools
- schools can work together in a partnership with an RTO.

Appropriate qualifications for VET in schools

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IBSA encourages links between schools, businesses and the community, and strongly supports young people combining schooling with VET and workplace learning.

It is essential that all VET qualifications gained through a VETiS program are consistent with the outcomes detailed in the Training Package.

The following qualification is recommended as most suitable for a VETiS program:

- ICT20113 Certificate II in Telecommunications Technology

The AQTF 2007 Standards for Registered Training Organisations set out minimum competency standards for staff responsible for the delivery of training and the conducting of assessments; and they ensure that VET specialists have skills and competencies consistent with Training Package requirements. All schools using their own teachers for VET delivery must also be aware of the AQTF 2007 requirement for assessors to hold relevant vocational competencies, at least equal to that being delivered and assessed, in addition to teaching and assessment competence.

Schools are encouraged to establish partnerships with industry and effective work placement arrangements to maximise the quality of outcomes for students and industry alike. Recognition of competence gained through voluntary, part-time or vacation work not directly related to the industry focus of the qualification should also be considered.

Work placement

Work placement usually involves students spending an extended period of time in a workplace gaining experience and skills, and undergoing an assessment process related to the attainment of a qualification in a specific occupational field.

An essential feature of school-industry programs is that they involve students spending some time learning in a workplace. In recent years an increasing number of effective structured workplace learning programs have made significant progress towards greater workplace integrity for those industry training programs that are delivered predominantly off-the-job. The implementation of Training Packages means that structured workplace learning must be a consideration for all RTOs, not only schools, in the delivery of training programs.

Principles for quality workplace learning

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The Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) endorsed the Principles for Quality Workplace Learning for school students engaged in VET programs throughout Australia. All states and territories apply the principles to their work placement programs, although the nature and extent of work placement programs vary across states and territories.

The broad MCEETYA principles are documented below.

Quality workplace learning is integrated into a program

- It operates within a framework which provides the opportunity for all students to access it, though not all students may choose to do so; and
- It operates within the context of vocational courses, which are recognised by industry, are responsive to industry needs and forms part of a student's exit credential.

Quality workplace learning is structured

- It has a clearly articulated and documented purpose;
- There are clearly identified and documented learning outcomes for students within accredited programs, which are linked to post-school qualifications;
- They are of sufficient duration and depth to enable students to acquire a reasonable understanding of the enterprise/industry to demonstrate competence according to industry standards of at least level 1 of the AQF;
- There is a matching between the students' skills and interests and the work placements; and
- Students, teachers and employers are thoroughly prepared beforehand so that the expectations and outcomes of the work placement are clearly understood by all parties.

Quality workplace learning is monitored

- The learning is coordinated by personnel with appropriate expertise and adequate resources; and
- Support should be made available to students and employers throughout the course of the work placement.

Quality workplace learning is regulated

There are clearly stated procedures designed to ensure that:

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- Students are protected from moral and physical danger;
- Students work in a non-discriminatory and harassment-free environment;
- Students receive appropriate training and instruction in occupational health and safety;
- Students are not exploited by being continuously engaged in a production or service capacity or used to substitute for the employment of employees and payment of appropriate wages; and
- Students are required to understand the roles and responsibilities of employees in the workplace and are expected to follow the directions of the workplace supervisors and other employees.

Quality workplace learning is assessed

- The assessment, according to industry standards, is of students' competencies achieved in the workplace which contributes to the overall assessment of the program; and
- There are mechanisms for the recording and reporting of students' competencies.

There is a strong correlation between these MCEETYA quality principles and the OECD characteristics of high quality learning programs detailed below.

The major 14-country study entitled *From Initial Education to Working Life: Making Transitions Work* by the OECD identified 10 characteristics of high quality workplace learning programs. These are:

1. Work placements that are long enough for real learning to take place.

2. Systematic analysis of the training capacity of the workplace, to see what it can realistically supply.

3. A formal training plan, setting out what has to be taught and learned, and clarifying the work-based and school-based parts of a student's program.

4. Employer involvement in student selection for work placements.

5. The presence of a trained program coordinator, able to liaise between the school and the firm and troubleshoot when problems occur.

6. The use of qualified, highly competent workers as workplace trainers or mentors.

7. Regular face-to-face contact between the coordinators and employers and in-firm supervisors.

8. Monitoring of the students on the job by the program coordinator.

9. The evaluation of student performance against the training plan at the end of the placement, with the evaluation carried out by the job supervisor and coordinator jointly.

10. Deliberate efforts by schools to relate what has been learned at work to students' school-based learning.[1]

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[1] OECD, 2000, *From Initial Education to Working Life: Making Transitions Work*. Organisation for Economic Cooperation and Development, Paris.

Effective work placement is characterised by:

- activities that complement off-the-job learning programs
- clearly articulated and documented purpose
- development of appropriate attitudes towards work
- development of competence in designated industry skills and employability skills
- facility for on-the-job practice of skills acquired in a classroom
- flexibility
- learning in a range of behaviours appropriate to the relevant industry
- opportunities for work-based assessment
- regular and frequent use of current technology and equipment
- relevance to the VET qualification being undertaken
- recognition of student readiness
- support of industry partners.

Beyond the above, a number of other provisions are necessary for a successful work placement program. The credibility of work placements and any resultant recognition of competence requires a degree of 'seriousness' if the outcomes are to be valued by individuals and industry clients of the VET system.

It is suggested that stakeholders involved in the planning and management of work placements carefully consider and implement the following general principles.

1. That the RTO assume responsibility for finding placements and validating the arrangements.

2. That the workplace has the appropriate resources, tools and staff to conduct the placement, with compliance with any legislative requirements.

3. That there be regular validation by the RTO that the student and assessor, where relevant, are operating according to RTO AQTF 2007 standards.

4. That a student on work placement must be covered by injury insurance.

5. That there is a formal contract setting out each party's responsibilities and obligations.

6. That, where possible, the workplace has on site a qualified workplace trainer and assessor in 'direct line' control of the student (to avoid training and assessment by 'proxy').

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7. That if the placement is for assessment only then there must be clearly documented assessment tasks specifically related to the unit being assessed and evidence retained to support achievement of competence (for both best practice recording purposes and audit/appeal).

8. That if the placement also includes training, then any 'academic pass' cannot be bestowed prior to the placement as clearly all of the learning components have not been undertaken nor can they be assessed in advance if they have not been learned.

9. That the training be directly related to achievement of competence while recognising the likely acquisition of other skills and knowledge.

10. That where assessment occurs it be clearly related to a unit of competency relevant to the work placement.

11. That where more than one performance criterion (possibly over more than one unit) is being assessed there must be a clearly linked and documented relationship between the assessment and the performance criterion.

12. That the qualifications level be appropriate in context, i.e. if it is advanced programming there must be an advanced programming task observed and assessed.

13. That the actual variables of the performance criterion be documented for audit purposes and for verification of appropriateness of the range of activities in the work placement.

In some state and territory school systems, part-time student work in an appropriate workplace may be used to fulfil work placement requirements and virtual or simulated work placements may also be legitimate.

Appendix B: Australian Apprenticeships

All qualifications within ICT10 Integrated Telecommunications Training Package can be achieved by a variety of pathways and delivery methods – either on-the-job or through a combination of on- and off-the-job training and recognition processes.

Qualifications at AQF levels III to IV particularly facilitate Australian Apprenticeship pathways. The following qualifications are examples of those that can be achieved through contracted training as Apprenticeships:

- ICT30113 Certificate III in Broadband and Wireless Networks Technology
- ICT40613 Certificate IV in Telecommunication Network Engineering Technology

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ICT20113 Certificate II in Telecommunications Technology

Modification History

Release	Comments
Release 2	This version first released with *ICA10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification has been designed as a pathway for students for entry to the industry.

This qualification provides students with skills and knowledge to enhance their entry-level employment prospects in apprenticeships and traineeships in a range of industries, including telecommunications, information technology and electronics.

Cabling Technician Stream

This qualification reflects the role of operators in the telecommunications industry who apply a broad range of competencies in a varied work context of installation of telecommunications and data cabling and cabling products on customer premises according to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner.

Digital Reception Stream

This qualification reflects the role of operators in the telecommunications industry who apply a broad range of competencies in a varied work context of installation of a limited range of digital reception equipment for either a customer or an enterprise. They would perform limited fault finding on a range of digital reception equipment for both cable TV and free to air TV reception.

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Networking Stream

This qualification reflects the role of operators in the telecommunications industry who apply a broad range of competencies of converging technologies in a varied work context to install and maintain IP networks with security in the home and small to medium enterprise networks. They would install software, and configure and test emerging technology network elements in IP networks, including secure wireless LANs, servers and routers for enterprise networks.

Job Roles

Job roles and titles vary across different industry sectors. Dependent on the stream completed, possible job titles relevant to a pathway for this qualification include:

- cabler and installer
- data cabler
- equipment installer
- IP-based network installer
- SME business network installer
- subscription TV installer
- telecommunications equipment operator
- TV and digital TV antenna installer.
-

Prerequisite requirements

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving ICT20113 Certificate II in Telecommunications Technology, candidates may undertake ICT30213 Certificate III in Telecommunications, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Certificate III qualifications.

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Licensing/Regulatory Information

The completion of unit ICTWHS2170B and the four unit set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B and ICTCMP2022B meets the ACMA requirements for Cabling Provider Rules (CPR) restricted registration.

All training programs are undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• documenting and communicating work-related information, including reporting of faults and problems
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict
Problem solving	• determining cable routes, taking into account building services, safety, industry codes and practices, and customer requirements • determining IP network configurations to suit the SME business requirements • assessing the compatibility and interoperability of proposed network installation to existing network • following up promptly on difficulties and known problem

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	areas
Initiative and enterprise	• reading and understanding plans and designs to acknowledge local physical conditions • identifying issues and possible solutions within established guidelines
Planning and organising	• planning and organising installation and operation of telecommunications equipment and products • planning and setting up the addressing scheme to allow for enterprise network growth
Self-management	• relating own role to the industry and establishing own work schedule • applying all related WHS requirements and work practices
Learning	• seeking assistance from team members • giving and receiving feedback • interpreting technical information from vendor installation instructions
Technology	• configuring, installing and testing IP-based customer telecommunications network equipment • implementing security measures to meet the SME network requirements

Packaging Rules

Total number of units = 11

5 core units, plus

6 elective units from Group A, or

6 elective units from Group B, or

6 elective units from Group C

There is no substitution of elective units.

CORE UNITS

BSBSUS201A Participate in environmentally sustainable work practices

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2219A Install and test internet protocol devices in convergence networks

ICTTEN2140B Use hand and power tools

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ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Cabling Technician Stream (Restricted Registration)

BSBCUS201B Deliver a service to customers

ICTCBL2005B Install customer cable support systems

ICTCBL2006B Place and secure customer cable

ICTCBL2008B Terminate metallic conductor customer cable

ICTCBL3049A Install systems and equipment on customer premises

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

Group B - Digital Reception Stream

ICTCBL2163A Install a cable lead-in

ICTCBL3011B Install and terminate coaxial cable

ICTDRE3156B Install digital reception equipment

ICTDRE3157B Locate and rectify digital reception equipment faults

ICTRFN2163B Install a satellite antenna

ICTRFN2164B Install a terrestrial antenna

Group C - Networking Stream

ICAICT206A Install software applications

ICASAS203A Connect hardware peripherals

ICTTEN2207A Install and configure a home or small office network

ICTTEN2208A Install and configure a small to medium business network

ICTTEN2209A Build and maintain a secure network

ICTTEN2218A Operate new media software packages

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ICT20213 Certificate II in Telecommunications

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies in a varied work context from installation to operation of telecommunications equipment and products.

Cabling at the customer premises must be carried out according to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner.

This qualification prepares an individual for entry to the industry.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- cabler and installer
- equipment installer
- security alarm installer
- telecommunications equipment operator
- telecommunications tradesperson.
-

Prerequisite requirements

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There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving ICT20213 Certificate II in Telecommunications, candidates may undertake ICT30213 Certificate III in Telecommunications, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Certificate III qualifications.

Licensing/Regulatory Information

The completion of unit ICTWHS2170B and the four unit set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B and ICTCMP2022B that meets the ACMA requirements for Cabling Provider Rules (CPR) restricted registration, is generally used as a part of a more specialised customer cabling qualification. This set is regarded as more suitable for new entrants where limited or no industry experience has been obtained and forms the major part of specialised qualifications such as ICT20313 Certificate II in Telecommunications Cabling.

For cablers with restricted CPR qualifications there will be a requirement for the specialised competency unit ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule to be achieved when working on specialised broadband cabling.

All training programs must be undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

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Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict
Problem solving	• determining network equipment power consumption and current from measurements and specification data • evaluating probable solutions to faults involving telecommunications networks and equipment
Initiative and enterprise	• reading and understanding plans and designs to acknowledge local physical conditions • identifying issues and possible solutions within established guidelines
Planning and organising	• planning and organising installation and operation of telecommunications equipment and products
Self-management	• relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers
Learning	• seeking assistance from team members • giving and receiving feedback
Technology	• installing and operating telecommunications equipment and products

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Packaging Rules

Total number of units = 11

5 core units, plus

1 elective unit from Group A workplace units, plus

5 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate II or Certificate III level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

If the four unit set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B and ICTCMP2022B has been selected, unit ICTCBL2136B cannot also be selected as an elective unit.

CORE UNITS

BSBSUS201A Participate in environmentally sustainable work practices

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN2219A Install and test internet protocol devices in convergence networks

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Workplace elective units

BSBCUS201B Deliver a service to customers

BSBSMB306A Plan a home based business

ICTWOR2141A Work effectively in a telecommunications technology team

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Group B - General elective units

Cabling

ICTCBL2005B Install customer cable support systems

ICTCBL2006B Place and secure customer cable

ICTCBL2008B Terminate metallic conductor customer cable

ICTCBL2016A Joint metallic conductor cable on customer premises

ICTCBL2017B Alter services to existing cable system

ICTCBL2064A Haul underground cable

ICTCBL2066B Joint and terminate coaxial cable

ICTCBL2068A Install a telecommunications service to a building

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2132A Erect aerial cable supports

ICTCBL2133A Construct underground telecommunications infrastructure

ICTCBL2134A Fix aerial cable

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA

Restricted Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

ICTCBL2163A Install a cable lead-in

Compliance

ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

Digital reception technology

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ICTCBL2163A Install a cable lead-in
ICTRFN2163B Install a satellite antenna
ICTRFN2164B Install a terrestrial antenna

ICT use

ICAICT206A Install software applications
ICASAS203A Connect hardware peripherals

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry
ICTOHS2153B Work safely near power infrastructure
ICTOHS2080A Provide telecommunications services safely on roofs

Project management

ICTPMG2130A Prepare site for support installation
ICTPMG2173A Plan, organise and undertake work activities

Radio frequency networks

ICTRFN2163B Install a satellite antenna
ICTRFN2164B Install a terrestrial antenna

Telecommunications engineering networks

ICTTEN3056A Install telecommunications network equipment
ICTTEN3074A Recover customer premises equipment

(IP networks)

ICTTEN2207A Install and configure a home or small office network
ICTTEN2208A Install and configure a small to medium business network

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ICTTEN2209A Build and maintain a secure network

ICTTEN2218A Operate new media software packages

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ICT20313 Certificate II in Telecommunications Cabling

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies in a varied work context of installation of telecommunications and data cabling and cabling products on customer premises.

Cabling at the customer premises must be carried out according to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner.

This qualification prepares an individual for entry to the industry.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- data cabler
- carrier services cabler
- security alarm cabler
- telecommunications access network cabler
- telecommunications tradesperson
- infrastructure cabler.
-

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Prerequisite units

The following units within this qualification have prerequisites. This is detailed as follows:

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving ICT20313 Certificate II in Telecommunications Cabling, candidates may undertake ICT30313 Certificate III in Telecommunications Cabling, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Certificate III qualifications.

Licensing/Regulatory Information

The completion of unit ICTWHS2170B and the six unit set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B that meets the Australian Communications and Media Authority (ACMA) requirements for Cabling Provider Rules (CPR) open registration, is generally used as a part of a more specialised customer cabling qualification. This set is regarded as more suitable for new entrants where limited or no industry experience has been obtained and forms the major part of specialised qualifications in this qualification.

All training programs must be undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

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Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict
Problem solving	• determining cable routes, taking into account building services, safety, industry codes and practices, and customer requirements • evaluating earthing needs for cable systems on customer premises • following up promptly on difficulties and known problem areas
Initiative and enterprise	• reading and understanding plans and designs to acknowledge local physical conditions • identifying issues and possible solutions within established guidelines
Planning and organising	• planning and organising installation and operation of telecommunications equipment and products
Self-management	• relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers
Learning	• seeking assistance from team members • giving and receiving feedback

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Employability Skill	Industry/enterprise requirements for this qualification include:
	• providing suitable training and assessment opportunities for work team members
Technology	• installing and operating telecommunications customer equipment, customer products and test equipment

Packaging Rules

Total number of units = 12

5 core units, plus

1 elective unit from Group A workplace units, plus

6 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate II or Certificate III level. One of those two units from Group B general electives may be substituted with a Group A workplace elective unit where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

If the six unit set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B has been selected, units ICTCBL2136B and ICTCBL2137B cannot also be selected as elective units.

CORE UNITS

BSBSUS201A Participate in environmentally sustainable work practices

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN2219A Install and test internet protocol devices in convergence networks

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ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Workplace elective units

BSBCUS201B Deliver a service to customers

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

ICTSMB4160A Set up and operate a contractor business

ICTWOR2141A Work effectively in a telecommunications technology team

Group B - General elective units

Cabling

ICTCBL2005B Install customer cable support systems

ICTCBL2006B Place and secure customer cable

ICTCBL2008B Terminate metallic conductor customer cable

ICTCBL2012B Install functional and protective telecommunications earthing system

ICTCBL2016A Joint metallic conductor cable on customer premises

ICTCBL2017B Alter services to existing cable system

ICTCBL2064A Haul underground cable

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2066B Joint and terminate coaxial cable

ICTCBL2068A Install a telecommunications service to a building

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2132A Erect aerial cable supports

ICTCBL2133A Construct underground telecommunications infrastructure

ICTCBL2134A Fix aerial cable

ICTCBL2135A Joint metallic conductor cable in access network

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2138A Install, maintain and modify customer premises communications cabling: ACMA Lift Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

ICTCBL2163A Install a cable lead-in

ICTCBL3009B Install, terminate and certify structured cabling installation

Compliance

ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry

ICTOHS2080A Provide telecommunications services safely on roofs

ICTOHS2153B Work safely near power infrastructure

Project management

ICTPMG2130A Prepare site for support installation

ICTPMG2173A Plan, organise and undertake work activities

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Access network cabler

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Core units plus one Group A workplace elective unit plus:

- ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
- ICTCBL2135A Joint metallic conductor cable in access network
- ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule
- ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule
- ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits
- plus one additional unit from Group B general elective unit as appropriate to the specific job role

CPE cabler for Open Registration (new entrant)

Core units plus one Group A workplace elective unit plus:

- ICTCBL2005B Install customer cable support systems
- ICTCBL2006B Place and secure customer cable
- ICTCBL2008B Terminate metallic conductor customer cable
- ICTCBL2012B Install functional and protective telecommunications earthing system
- ICTCBL2017B Alter services to existing cable system
- ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

CPE cabler for Open Registration

Core units plus one Group A workplace elective unit plus:

- ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule
- ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule
- ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits
- plus three additional units from Group B general elective units, with a maximum of one of those units from Group A workplace elective units as appropriate to the specific job role

Network infrastructure or security cabler

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Core units plus one Group A workplace elective unit plus:

- ICTCBL2066B Joint and terminate coaxial cable
- ICTCBL3009B Install, terminate and certify structured cabling installation
- ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule
- ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits
- plus one additional unit from Group B general elective units and one unit from Group A workplace elective units as appropriate to the specific job role.

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ICT20413 Certificate II in Telecommunications Digital Reception Technology

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies in a varied work context of installation of a limited range of digital reception equipment for either a customer or an enterprise. They would perform limited fault finding on a range of digital reception equipment for both cable TV and free to air TV reception.

Cabling at the customer premises must be carried out according to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner.

This qualification prepares an individual for entry to the industry.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- TV and digital TV antenna installer
- subscription TV installer
- satellite TV installer
- free to air TV installer.

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Prerequisite requirements

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving ICT20413 Certificate II in Telecommunications Digital Reception Technology, candidates may undertake ICT30413 Certificate III in Telecommunications Digital Reception Technology, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Certificate III qualifications.

Licensing/Regulatory Information

All training programs must be undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

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Employability Skills Summary

Employability Skill	Industry/enterprise requirements for this qualification include:
Communication	• confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems • providing correct literature to the customer, including explanatory booklets, manuals, training aids, user guides, equipment plans and configuration • providing feedback to customers on operating the equipment
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors
Problem solving	• determining cable routes and antenna siting taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas • ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification
Initiative and enterprise	• identifying issues and possible solutions within established guidelines • providing customers with temporary or replacement equipment similar to existing equipment • regularly verifying continued existence of problem
Planning and organising	• planning and organising installation and operation of TV equipment and products • prioritising work according to organisation guidelines
Self-management	• relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards • applying all related WHS requirements and work practices
Learning	• seeking assistance from team members • giving and receiving feedback

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Employability Skill	Industry/enterprise requirements for this qualification include:
	• providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• installing and operating TV equipment and products • checking tools and test equipment for accuracy • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 12

8 core units, plus

1 elective unit from Group A workplace units, plus

1 elective unit from Group B specialist units, plus

2 elective units from Group C general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group C general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate II or Certificate III level. One of those two units from Group C general elective units may be substituted with a Group A workplace elective unit where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS201A Participate in environmentally sustainable work practices

ICTCBL3011B Install and terminate coaxial cable

ICTDRE3156B Install digital reception equipment

ICTDRE3157B Locate and rectify digital reception equipment faults

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ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN2219A Install and test internet protocol devices in convergence networks

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Workplace elective units

BSBCUS201B Deliver a service to customers

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

ICTEDU3053A Train customers in new technology

ICTPMG2173A Plan, organise and undertake work activities

ICTSMB4160A Set up and operate a contractor business

ICTWOR2141A Work effectively in a telecommunications technology team

Group B - Specialist elective units

ICTCBL2163A Install a cable lead-in

ICTRFN2163B Install a satellite antenna

ICTRFN2164B Install a terrestrial antenna

Group C - General elective units

Cabling

ICTCBL2016A Joint metallic conductor cable on customer premises

ICTCBL2017B Alter services to existing cable system

ICTCBL2066B Joint and terminate coaxial cable

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

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ICTCBL3015A Locate and identify cable system faults

Compliance

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

ICT use

ICAICT206A Install software applications

ICASAS203A Connect hardware peripherals

Occupational health and safety

ICTOHS2080A Provide telecommunications services safely on roofs

ICTOHS2153B Work safely near power infrastructure

CPCCOHS1001A Work safely in the construction industry

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Antenna installer

Core units plus one Group A workplace elective unit plus:

- ICTRFN2164B Install a terrestrial antenna
- two Group C general elective units

Contractor

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Core units plus one Group B specialist elective unit as appropriate to the specific job role plus:

- ICTSMB4160A Set up and operate a contractor business
- two Group C general elective units

Free to air TV installer

Core units plus one Group A workplace elective unit plus:

- ICTRFN2163B Install a satellite antenna
- two Group C general elective units

Subscription TV installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL2163A Install a cable lead-in
- two Group C general elective units

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ICT20513 Certificate II in Telecommunications Fixed Wireless and Rigging Installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This qualification first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies in a varied work context from installation and maintenance of telecommunications equipment installed in base stations or mounted on structures requiring rigging skills.

This qualification has two streams that prepare an individual for entry to the industry in a specialised area of installation of telecommunication equipment on high structures including radio towers or for installation and connection of wireless base stations.

An operator uses rigging skills to install and maintain radio antennas on radio towers and build and mount sections of radio masts for a complete radio structure.

Job roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- installer of radio telecommunications equipment on structures
- installer of radio equipment and cabling on radio towers
- installer of radio base stations
- telecommunications rigger tradesperson.

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Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving the ICT20513 Certificate II in Telecommunications Rigging Installation, candidates may undertake the ICT30513 Certificate III in Telecommunications Rigging Installation, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Certificate III qualifications.

Licensing/Regulatory Information

Cabling

The completion of unit ICTWHS2170B, ICTWHS2170A or ICTOHS2170A and the set of the following four units ICTCBL2005B, ICTCBL2006B, ICTCBL2008B and ICTCMP2022B that meet the Australian Communications and Media Authority (ACMA) requirements for Cabling Provider Rules (CPR) restricted registration, is generally used as a part of a more specialised customer cabling qualification. This set is regarded as more suitable for new entrants where limited or no industry experience has been obtained and forms the major part of specialised qualifications such as ICT20310 Certificate II in Telecommunications Cabling.

For cablers with restricted CPR qualifications there will be a requirement for the specialised competency unit ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule, to be achieved when working on specialised broadband cabling.

All training programs must be undertaken with reference to the regulatory regime of the prevailing statutory authority for cabling (currently ACMA) and rigging.

National Standard for Licensing Persons Performing High Risk Work

The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels.

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- CPCCLDG3001A Licence to perform dogging
- CPCCLRG3001A Licence to perform rigging basic level
- CPCCLRG3002A Licence to perform rigging intermediate level
- CPCCLRG4001A Licence to perform rigging advanced level

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Volume of Learning

The volume of learning of a Certificate II is typically 0.5 – 1 year.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability skill	**Industry/enterprise requirements for this qualification include:**
Communication	• confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict
Problem solving	• determining cable routes, taking into account building services, safety, industry codes and practices, and customer requirements • evaluating earthing needs for cable systems on customer premises
Initiative and enterprise	• reading and understanding plans and designs to acknowledge local physical conditions • identifying issues and possible solutions within established guidelines

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Planning and organising	• planning and organising installation and operation of telecommunications equipment and products
Self-management	• relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers
Learning	• seeking assistance from team members • giving and receiving feedback
Technology	• installing and operating telecommunications equipment and products

Packaging Rules

Total number of units = 13

6 core units, ***plus***

7 elective units, ***of which:***

- **4 units from Group A Fixed wireless or Group B Rigging installation**
- **3 units must be from Group C General elective units, up to 2 of which** may be substituted with two units from elsewhere in this Training Package, another Training Package or accredited course at Certificate II or III level.

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

If the four unit set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B and ICTCMP2022B has been selected, unit ICTCBL2136B cannot also be selected as an elective unit.

Core units

CPCCOHS1001A Work safely in the construction industry

ICTTCR2189A Use operational safety in a telecommunications rigging environment

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ICTWOR2141A Work effectively in a telecommunications technology team

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Elective units

Group A Fixed wireless specialist stream

ICTCBL2012B Install functional and protective telecommunications earthing system

ICTRFN3055A Install a radio communications antenna and feedline

ICTRFN4177A Install radio communications base station equipment

ICTTEN2219A Install and test an internet protocol device in convergence networks

Group B Rigging installation specialist stream

CPCCLDG3001A Licence to perform dogging

CPCCLRG3001A Licence to perform rigging basic level

ICTTCR2188A Use rigging practices and systems on telecommunications network structures

ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures

Group C General elective units

BSBCUS201B Deliver a service to customers

BSBSUS201A Participate in environmentally sustainable work practices

CPCCLRG3002A Licence to perform rigging intermediate level

CPCCLRG4001A Licence to perform rigging advanced level

ICTCBL2005B Install customer cable support systems

ICTCBL2006B Place and secure customer cable

ICTCBL2008B Terminate metallic conductor customer cable

ICTCBL2016A Joint metallic conductor cable on customer premises

ICTCBL2017A Alter services to existing cable system

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2066B Joint and terminate coaxial cable

ICTCBL2068A Install a telecommunications service to a building

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2132A Erect aerial cable supports

ICTCBL2133A Construct underground telecommunications infrastructure

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ICTCBL2134A Fix aerial cable

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2139B Apply safe technical work practices for cabling registration

ICTCBL2163A Install a cable lead-in

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

ICTOHS2080A Provide telecommunications services safely on roofs

ICTOHS2153B Work safely near power infrastructure

ICTPMG2130A Prepare site for support installation

ICTPMG2173A Plan, organise and undertake work activities

ICTRFN2163B Install a satellite antenna

ICTRFN2164B Install a terrestrial antenna

ICTWHS2081A Work safely in a radio frequency electromagnetic radiation environment

Prerequisite Units

The following units in this qualification have the prerequisite units detailed below.

Code and title	**Prerequisite units require**
CPCCLRG3002A Licence to perform rigging intermediate level	CPCCLRG3001A Licence to perform rigging basic level
CPCCLRG4001A Licence to perform rigging advanced level	CPCCLRG3002A Licence to perform rigging intermediate level

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ICT20613 Certificate II in National Broadband Network Construction

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This qualification first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This qualification has been designed as a pathway for entry into work on the National Broadband Network (NBN).

This qualification provides the skills and knowledge required to enhance entry-level employment prospects in apprenticeships and traineeships in a range of NBN industry occupations specifically for the national rollout of high speed broadband network infrastructure.

In conjunction with safe working practices, one of two specialist streams is to be undertaken as described:

Telecommunications linesworker

This stream reflects the role of operators in performing cable and infrastructure work underground. This involves safe civil and construction work in site preparation, building of enclosures, installing mounting brackets, hauling of underground cables and providing traffic management. It also reflects the role of operators in performing work safely aboveground to install fibre or metallic aerial cable and infrastructure. These will also include installation of aerial lead-in cables to customer premises.

Telecommunications installer

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This stream reflects the role of operators in performing equipment and system installation work on customer network to enable efficient access and interconnection to the NBN services. This includes diagnosing and rectifying cable system faults to maximise benefits of the high speed broadband connection.

Job roles

Job roles and titles are dependent on the stream completed, possible job titles relevant to a pathway for this qualification include:

- telecommunications linesworker
- telecommunications broadband network installer.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving the ICT20613 Certificate II in National Broadband Network Construction, candidates may undertake the ICT30713 Certificate III in National Broadband Network Construction, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Certificate III qualifications.

Licensing/Regulatory Information

The completion of unit ICTWHS2170B, ICTWHS2170A or ICTOHS2170A and the unit set of ICTCBL2136B and ICTCBL2137B meets the ACMA requirements for Cabling Provider Rules (CPR) open registration.

All training programs are undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

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Much of the NBN cabling and installation work falls within the definition of construction work in a cable provisioning construction site. If so, anyone entering the construction site is required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package as part of the core group of this qualification, fulfils this requirement.

Note: ICTOHS2153A Work safely near power infrastructure should be included in the qualification packaging where there is a likelihood of working near power infrastructure. If state or territory law requires a licence to operate an elevated work platform (EWP), TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more) should be completed concurrently with ICTOHS2153A.

Volume of learning

The volume of learning of a Certificate II is typically 0.5 – 1 year.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability skill	**Industry/enterprise requirements for this qualification include:**
Communication	• communicating benefits of high speed broadband to community for successful NBN rollout • notifying any safety aspects to supervisor • conducting and communicating traffic management instructions for improved public safety • documenting test methods and results • completing cable and equipment labelling and cable records • conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • interpreting plan as a set of basic functions to be implemented • confirming approval for time and method of site access with

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	customers • documenting and communicating work-related information, including reporting of faults and problems
Teamwork	• continually fostering effective teamwork for effective NBN rollout • identifying members and roles of team between management and workforce, between aerial and underground teams and between installation and testing teams • working with team members to work with clients and provide service • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking sequences of operations from site preparation to cabling to ensure a methodical and effective approach to NBN rollout • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • continually suggesting ways for improving practices to suit specific site of NBN infrastructure rollout • prioritising urgent requests and acting according to organisational guidelines • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• developing NBN rollout plans to ensure minimal disruption to the workplace and the public • identifying realistic short and long-term career objectives • planning and provisioning to meet key milestones • gathering data for the installation of cable systems and NBN

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	specific equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• identifying and setting realistic short and long-term career objectives • managing personal time to assist effective rollout • identifying work to be completed • checking that tools and equipment are in safe working order and comply to manufacturer specification • personally applying all related OHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• learning from previous experiences in order to improve future practices in NBN rollout • learning of methodologies of fibre splicing and adapting to current practices • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist with higher broadband speed offered by NBN and offering training information on upgrades and additional services • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members on NBN technologies by equipment suppliers • providing training to customers on system, product, product features and facilities • relating current or intended role to career objectives in a positive manner
Technology	• familiarising with new fibre technologies for NBN deployment • ensuring that range of technologies (optical & radio) used in NBN infrastructure rollout are effectively and efficiently deployed to manufacturers specifications • checking that advanced tools and equipment are in safe working order and adjusted to manufacturer specifications • testing and measuring of broadband network infrastructure • installing, configuring and operating NBN optical and radio

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	equipment and products • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 12

7 core units *plus*

5 elective units, ***of which***:

- **3 units must be from Group A Telecommunications linesworker or Group B Telecommunications broadband network installer**
- **2 units must be from Group C General elective units or** from elsewhere in this Training Package, another Training Package or accredited course at Certificate II or III level.

Elective units chosen must be relevant to the work and industry context for project practice.

This qualification meets the requirements for the NBN infrastructure rollout and has been developed for specific occupational outcomes. Due to the specialised technical nature of the work, there is provision for choice of specialisation streams but there is no allowance for substitution of elective units in the specialised group. However, the two elective units from Group C can be selected to meet relevant national broadband work outcome and local industry requirements

Core units

CPCCOHS1001A Work safely in the construction industry

ICTCBL2064A Haul underground cable

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2163A Install a cable lead-in

ICTTEN2008A Use electrical skills in telecommunications work

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ICTWOR2141A Work effectively in a telecommunications technology team

Elective units

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Group A Telecommunications linesworker

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2133A Construct underground telecommunications infrastructure

ICTCBL2134A Fix aerial cable

Group B Telecommunications broadband network installer

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule

Group C General elective units

BSBSUS201A Participate in environmentally sustainable work practices

HLTAID001 Provide cardiopulmonary resuscitation

HLTAID003 Provide first aid

ICTOHS2153B Work safely near power infrastructure

ICTTEN2219A Install and test an internet protocol device in convergence networks

ICTTEN2140B Use hand and power tools

TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more)

Prerequisite Units

The following unit in this qualification has the prerequisite unit detailed below.

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open	ICTCBL2136B Install, maintain and modify customer premises communications cabling:

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Rule	ACMA Restricted Rule
ICTCMP2239A Perform restricted customer premises broadband cabling work: ACMA Restricted Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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ICT30113 Certificate III in Broadband and Wireless Networks Technology

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit. Additional elective units included.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a tradesperson with a range of telecommunications skills who can:

- install and maintain access network cabling and equipment for high speed broadband as part of the national network
- install and maintain optical and wireless equipment for high speed internet broadband network infrastructure
- install and maintain telecommunications, data cabling and cabling products on customer premises according to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner
- install voice and data telecommunications equipment
- install and maintain telecommunications access network cabling and infrastructure, systems and simple customer premises equipment.

This role includes assessing installation requirements, planning and performing installations, testing installed equipment and fault-finding. It involves a degree of autonomy and may include limited supervision of others.

This qualification also introduces the skills required for the broadband deployment using fibre optic devices.

Job Roles

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Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- broadband installer
- optical broadband installer
- wireless broadband network installer
- broadband network infrastructure installer
- access network cabling installer
- installer of telecommunications aerial cable access network
- installer of telecommunications underground cable access network.

Prerequisite Units

The following unit within this qualification has a prerequisite. This is detailed as follows:

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving ICT30113 Certificate III in Broadband and Wireless Networks Technology, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

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Licensing/Regulatory Information

All training programs must be undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• documenting test methods and results • conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • interpreting plan as a set of functions to be implemented • confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • applying all related WHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	• relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisational goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • installing and configuring access network devices • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 15

6 core units, plus

1 elective unit from Group A workplace units, plus

8 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level. A minimum of five of these electives must be taken from Certificate III level.

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A maximum of three units from Group B general elective units may be substituted with three units of competency from any endorsed Training Package or accredited course at Certificate III or Certificate IV level. One of those three units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS301A Implement and monitor environmentally sustainable work practises

ICTBWN3205B Use optical and radio frequency measuring instruments

ICTCBL3015A Locate and identify cable system faults

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Workplace elective units

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

ICASAS305A Provide IT advice to clients

ICTEDU3053A Train customers in new technology

ICTWOR2141A Work effectively in a telecommunications technology team

ICTWOR3028A Organise resources

ICTWOR3035A Organise material supply

ICTWOR3041A Schedule resources

ICTWOR3093A Manage spare parts

ICTWOR3127A Supervise worksite activities

Group B - General elective units

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Broadband and wireless networks

ICTBWN3082B Perform tests on optical communication system and components

ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

Cabling

ICTCBL2017B Alter services to existing cable system

ICTCBL2064A Haul underground cable

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2066B Joint and terminate coaxial cable

ICTCBL2068A Install a telecommunications service to a building

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2132A Erect aerial cable supports

ICTCBL2133A Construct underground telecommunications infrastructure

ICTCBL2134A Fix aerial cable

ICTCBL2135A Joint metallic conductor cable in access network

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

ICTCBL2163A Install a cable lead-in

ICTCBL3009B Install, terminate and certify structured cabling installation

ICTCBL3010B Install and terminate optical fibre cable on customer premises

ICTCBL3011B Install and terminate coaxial cable

ICTCBL3014A Hand over systems and equipment

ICTCBL3018A Install underground enclosures and conduit

ICTCBL3019A Install underground cable

ICTCBL3020A Construct aerial cable supports

ICTCBL3021A Install aerial cable

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ICTCBL3067A Modify and cut over cable

ICTCBL3069A Install network cable equipment

ICTCBL3103A Maintain cable network

Occupational health and safety

ICTOHS2080A Provide telecommunications services safely on roofs

ICTOHS2153B Work safely near power infrastructure

CPCCOHS1001A Work safely in the construction industry

Radio frequency networks

ICTRFN3055A Install a radio communications antenna and feedline

ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment

ICTRFN4095A Conduct radio frequency measurements

ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

Telecommunications engineering networks

ICTTEN3056A Install telecommunications network equipment

ICTTEN3063A Locate, identify and rectify recurrent network faults

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Aerial cable installer

Core units plus one Group A workplace elective unit plus:

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- ICTCBL2017B Alter services to existing cable system
- ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
- ICTCBL2163B Install a cable lead-in
- ICTCBL3021A Install aerial cable
- four additional elective units from Group B general elective units, with a maximum of one those additional units from Group A workplace elective units as appropriate to the specific job role

Broadband network infrastructure installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
- ICTCBL3009B Install, terminate and certify structured cabling installation
- ICTCBL3011B Install and terminate coaxial cable
- ICTCBL3069A Install network cable equipment
- four additional elective units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Optical broadband network installer

Core units plus one Group A workplace elective unit plus:

- ICTBWN3082B Perform tests on optical communication system and components
- ICTBWN3088B Install optical fibre splitters in fibre distribution hubs
- ICTBWN3090B Install lead-in module and cable for fibre to the premises
- ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation
- four additional elective units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Underground cable installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL2064A Haul underground cable

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- ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
- ICTCBL2133A Construct underground telecommunications infrastructure
- ICTCBL2163A Install a cable lead-in
- ICTCBL3018A Install underground enclosures and conduit
- ICTCBL3019A Install underground cable
- two additional elective units from Group B general elective units, with a maximum of one of those additional units from the Group A workplace elective units as appropriate to the specific job role

Wireless broadband network installer

Core units plus one Group A workplace elective unit plus:

- ICTRFN3055A Install a radio communications antenna and feedline
- ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment
- ICTRFN4095A Conduct radio frequency measurements
- ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network
- four additional elective units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

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ICT30213 Certificate III in Telecommunications

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit. Additional elective units included.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies using a defined range of skills where some discretion and judgement is required in the selection, installation and configuration of equipment in convergence technologies that integrate radio, optical and internet protocol (IP) based applications.

This role includes assessing installation requirements, planning and performing installations, testing installed equipment and fault finding. It involves a degree of autonomy and may include some supervision of others involving known routines and procedures and some accountability for the quality of outcomes.

This qualification prepares an individual for entry to the industry into the mainstream of telecommunications convergence technologies of radio, optical, data and IP networks.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- telecommunications network equipment installer
- telecommunications voice and data equipment installer
- IP-based security alarms installer
- telecommunications equipment operator

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- telecommunications tradesperson.
-

Prerequisite units

The following units within this qualification have prerequisites. This is detailed as follows:

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule
ICAICT304A Implement system software changes	ICAICT302A Install and optimise operating system software

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving a Certificate II qualification from this or another accredited Training Package or accredited course

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving ICT30213 Certificate III in Telecommunications, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

Licensing/Regulatory Information

All training programs must be undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

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National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • communicating with customers to arrange time and access for the installation of systems and equipment • documenting and communicating work-related information, including reporting of faults and problems • providing feedback to customers on operating the equipment
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • working with team members to work with clients and install equipment • relating personal role to the industry • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services,

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas • ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification
Initiative and enterprise	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• gathering data for the installation of systems and equipment • developing a plan for the recovery of equipment from customer premises • planning the installation of cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • applying all related WHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• assessing customer's expertise and training needs and conducting training in the use of systems and equipment • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • giving and receiving feedback • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• installing and operating telecommunications broadband equipment and products

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Employability Skill	Industry/enterprise requirements for this qualification include:
	• installing and operating CPE equipment and products • installing and configuring access network devices • checking tools and test equipment for accuracy • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 12

6 core units, plus

1 elective unit from Group A workplace units, plus

5 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate III or Certificate IV level. One of those two units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS301A Implement and monitor environmentally sustainable work practices

ICTCBL3015A Locate and identify cable system faults

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN3056A Install telecommunications network equipment

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

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Group A - Workplace elective units

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

ICASAS305A Provide IT advice to clients

ICTEDU3053A Train customers in new technology

ICTSMB4160A Set up and operate a contractor business

ICTSMB4161A Operate a contractor business with employees

ICTWOR3028A Organise resources

ICTWOR3035A Organise material supply

ICTWOR3041A Schedule resources

ICTWOR3093A Manage spare parts

ICTWOR3127A Supervise worksite activities

ICTWOR3231A Resolve technical enquiries using multiple information systems

ICTWOR3232A Collect and analyse technical information

Group B - General elective units

Broadband and wireless networks

ICTBWN3082B Perform tests on optical communication system and components

ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

ICTBWN3205B Use optical and radio frequency measuring instruments

Cabling

ICTCBL2064A Haul underground cable

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule (where ACMA Restricted Registration is necessary)

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ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

ICTCBL3009B Install, terminate and certify structured cabling installation

ICTCBL3010B Install and terminate optical fibre cable on customer premises

ICTCBL3011B Install and terminate coaxial cable

ICTCBL3013A Perform cable and system test on customer premises

ICTCBL3014A Hand over systems and equipment

ICTCBL3018A Install underground enclosures and conduit

ICTCBL3019A Install underground cable

ICTCBL3020A Construct aerial cable supports

ICTCBL3021A Install aerial cable

ICTCBL3049A Install systems and equipment on customer premises

ICTCBL3052A Cut over new systems and equipment on customer premises

ICTCBL3067A Modify and cut over cable

ICTCBL3069A Install network cable equipment

ICTCBL3103A Maintain cable network

Digital reception technology

ICTDRE3156B Install digital reception equipment

ICTDRE3157B Locate and rectify digital reception equipment faults

ICTDRE3165A Install a complex digital reception system

ICT use

ICAICT302A Install and optimise operating system software

ICAICT303A Connect internal hardware components

ICAICT304A Implement system software changes

ICAICT306A Migrate to new technology

ICANWK305A Install and manage network protocols

ICASAS303A Care for computer hardware

ICASAS304A Provide basic system administration

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ICASAS301A Run standard diagnostic tests

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry

ICTOHS2153B Work safely near power infrastructure

ICTOHS2080A Provide telecommunications services safely on roofs

Radio frequency networks

ICTRFN3055A Install a radio communications antenna and feedline

ICTRFN3070A Install mobile telecommunications in motor vehicles

ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment

ICTRFN3155A Construct and test a radio communications device

ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment

Telecommunications engineering networks

ICTTEN2219A Install and test internet protocol devices in convergence networks

ICTTEN3054B Provide infrastructure for telecommunications network equipment

ICTTEN3063A Locate, identify and rectify recurrent network faults

ICTTEN3074A Recover customer premises equipment

ICTTEN3075A Refurbish customer premises equipment

ICTTEN3077B Commission an electronic unit

ICTTEN3089A Repair and replace telecommunications network hardware

ICTTEN3104A Maintain an electronic system

ICTTEN4198A Install, configure and test an internet protocol network

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

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The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Broadband optical network installer

Core units plus one Group A workplace elective unit plus:

- ICTBWN3082B Perform tests on optical communication system and components
- ICTBWN3088B Install optical fibre splitters in fibre distribution hubs
- ICTBWN3090B Install lead-in module and cable for fibre to the premises
- ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation
- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

Broadband wireless network installer

Core units plus one Group A workplace elective unit plus:

- ICTRFN3055A Install a radio communications antenna and feedline
- ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment
- ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment
- two additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Home network installer

Core units plus one Group A workplace elective unit plus:

- ICTDRE3156B Install digital reception equipment
- ICTDRE3157B Locate and rectify digital reception equipment faults
- ICTDRE3165A Install a complex digital reception system
- ICTTEN4198A Install, configure and test an internet protocol network
- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

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IP equipment installer

Core units plus one Group A workplace elective unit plus:

- ICAICT302A Install and optimise operating system software
- ICAICT304A Implement system software changes
- ICANWK305A Install and manage network protocols
- ICASAS301A Run standard diagnostic tests
- ICTTEN4198A Install, configure and test an internet protocol network

Network infrastructure installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL3009B Install, terminate and certify structured cabling installation
- ICTCBL3011B Install and terminate coaxial cable
- ICTCBL3069A Install network cable equipment
- two additional units from Group B general elective units, with a maximum of one those additional units from Group A workplace elective units as appropriate to the specific job role

Technical support

Core units plus one Group A workplace elective unit plus:

- ICASAS304A Provide basic system administration
- ICASAS305A Provide IT advice to clients
- ICTWOR3231A Resolve technical enquiries using multiple information systems
- ICTWOR3232A Collect and analyse technical information
- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

Voice and data installer

Core units plus one Group A workplace elective unit plus:

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- ICTCBL3009B Install, terminate and certify structured cabling installation
- ICTCBL3010B Install and terminate optical fibre cable on customer premises
- ICTCBL3011B Install and terminate coaxial cable
- two additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

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ICT30313 Certificate III in Telecommunications Cabling

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit. Additional elective units included.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies in a varied work context from installation to operation of telecommunications equipment and products.

This qualification prepares an individual for entry to the industry.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- cabler and installer
- equipment installer
- security alarm installer
- telecommunications equipment operator
- telecommunications tradesperson.
-

Prerequisite units

The following units within this qualification have prerequisites. This is detailed as follows:

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Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule
ICAICT304A Implement system software changes	ICAICT302A Install and optimise operating system software

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving a Certificate II qualification from this or another accredited Training Package or accredited course

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving ICT30313 Certificate III in Telecommunications Cabling, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

Licensing/Regulatory Information

The completion of unit ICTWHS2170B and the four unit set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B and ICTCMP2022B that meets the Australian Communications and Media Authority (ACMA) requirements for Cabling Provider Rules (CPR) restricted registration, is generally used as a part of a more specialised customer cabling qualification. This set is regarded as more suitable for new entrants where limited or no industry experience has been obtained and forms the major part of specialised qualifications, such as ICT20313 Certificate II in Telecommunications Cabling.

All training programs must be conducted with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

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National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • interpreting plan as a set of functions to be implemented • confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems • providing feedback to customers on operating the equipment
Teamwork	• working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	• rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas • ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification
Initiative and enterprise	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• gathering data for the installation of systems and equipment • planning the installation of cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • applying all related WHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • giving and receiving feedback • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• installing and operating telecommunications equipment and products • installing and operating CPE equipment and products • installing and configuring access network devices

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Employability Skill	Industry/enterprise requirements for this qualification include:
	• checking tools and test equipment for accuracy • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 12

6 core units, plus

1 elective units from Group A workplace units, plus

5 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level. A minimum of two of these electives must be taken from Certificate III level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate III or Certificate IV level. One of those two units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS301A Implement and monitor environmentally sustainable work practices

ICTCBL3015A Locate and identify cable system faults

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN3250A Provide infrastructure for telecommunications customer equipment

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

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Group A - Workplace elective units

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

ICASAS305A Provide IT advice to clients

ICTEDU3053A Train customers in new technology

ICTSMB4160A Set up and operate a contractor business

ICTSMB4161A Operate a contractor business with employees

ICTWOR3028A Organise resources

ICTWOR3035A Organise material supply

ICTWOR3041A Schedule resources

ICTWOR3093A Manage spare parts

ICTWOR3127A Supervise worksite activities

ICTWOR3231A Resolve technical enquiries using multiple information systems

ICTWOR3232A Collect and analyse technical information

Group B - General elective units

Broadband and wireless networks

ICTBWN3082B Perform tests on optical communication system and components

ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

Cabling

ICTCBL2017B Alter services to existing cable system

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

ICTCBL3009B Install, terminate and certify structured cabling installation

ICTCBL3010B Install and terminate optical fibre cable on customer premises

ICTCBL3011B Install and terminate coaxial cable

ICTCBL3013A Perform cable and system test on customer premises

ICTCBL3014A Hand over systems and equipment

ICTCBL3018A Install underground enclosures and conduit

ICTCBL3019A Install underground cable

ICTCBL3020A Construct aerial cable supports

ICTCBL3021A Install aerial cable

ICTCBL3049A Install systems and equipment on customer premises

ICTCBL3052A Cut over new systems and equipment on customer premises

ICTCBL3067A Modify and cut over cable

ICTCBL3069A Install network cable equipment

ICTCBL3103A Maintain cable network

Digital reception technology

ICTDRE3156B Install digital reception equipment

ICTDRE3157B Locate and rectify digital reception equipment faults

ICTDRE3165A Install a complex digital reception system

ICT use

ICAICT302A Install and optimise operating system software

ICAICT303A Connect internal hardware components

ICAICT304A Implement system software changes

ICASAS301A Run standard diagnostic tests

ICASAS303A Care for computer hardware

ICASAS304A Provide basic system administration

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Occupational health and safety

CPCCOHS1001A Work safely in the construction industry

ICTOHS2153B Work safely near power infrastructure

Telecommunications engineering networks

ICTTEN2219A Install and test internet protocol devices in convergence networks

ICTTEN3054B Provide infrastructure for telecommunications network equipment

ICTTEN3056A Install telecommunications network equipment

ICTTEN3063A Locate, identify and rectify recurrent network faults

ICTTEN3074A Recover customer premises equipment

ICTTEN3075A Refurbish customer premises equipment

ICTTEN3077B Commission an electronic unit

ICTTEN3104A Maintain an electronic system

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Access network installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL3020A Construct aerial cable supports
- ICTCBL3021A Install aerial cable
- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

CPE installer

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Core units plus one Group A workplace elective unit plus:

- ICTCBL3009B Install, terminate and certify structured cabling installation
- ICTCBL3010B Install and terminate optical fibre cable on customer premises
- ICTCBL3011B Install and terminate coaxial cable
- two additional units from Group B general elective units, with a maximum of one of those additional units from the workplace group as appropriate to the specific job role

Home network installer

Core units plus one workplace unit plus:

- ICTDRE3156B Install digital reception equipment
- ICTDRE3157B Locate and rectify digital reception equipment faults
- ICTDRE3165A Install a complex digital reception system
- two additional units from Group B general elective units, with a maximum of one of those additional units from the workplace group as appropriate to the specific job role

Network cable infrastructure installer

Core units plus one workplace unit plus:

- ICTCBL3009B Install, terminate and certify structured cabling installation
- ICTCBL3011B Install and terminate coaxial cable
- ICTCBL3069A Install network cable equipment
- two additional units from Group B general elective units, with a maximum of one of those additional units from the workplace group as appropriate to the specific job role

Optical broadband network installer

Core units plus one workplace unit plus:

- ICTBWN3082B Perform tests on optical communication system and components
- ICTBWN3088B Install optical fibre splitters in fibre distribution hubs
- ICTBWN3090B Install lead-in module and cable for fibre to the premises
- ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

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- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

Technical support

Core units plus one workplace unit plus:

- ICASAS304A Provide basic system administration
- ICASAS305A Provide IT advice to clients
- ICTWOR3231A Resolve technical enquiries using multiple information systems
- ICTWOR3232A Collect and analyse technical information
- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role.

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ICT30413 Certificate III in Telecommunications Digital Reception Technology

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual in the telecommunications industry who can apply a broad range of competencies in a varied work context of installation of a limited range of digital reception equipment for either a customer or an enterprise. Fault-finding skills on a range of digital reception equipment for Subscription TV and Free-to-air TV reception are acquired.

Any cabling at the customer premises must be carried out in accordance to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- audiovisual systems integrator
- field service technician – RF services
- free to air TV installers – multiple services
- subscription TV installer – multiple services.
-

Prerequisite units

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The following unit within this qualification has a prerequisite. This is detailed as follows:

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving ICT20413 Certificate II in Telecommunications Digital Reception Technology or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for ICT20413 Certificate II in Telecommunications Digital Reception Technology or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving ICT30413 Certificate III in Telecommunications Digital Reception Technology, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

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National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• reading drawings and recognising drawing symbols • interpreting plan as a set of functions to be implemented • confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems • providing correct literature to the customer, including explanatory booklets, manuals, training aids, user guides, equipment plans and configuration • providing feedback to customers on operating the equipment
Teamwork	• relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes and antenna siting taking into account building services, safety, industry codes and practices, and customer requirements

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	• following up promptly on difficulties and known problem areas • ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification
Initiative and enterprise	• adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • providing customers with temporary or replacement equipment similar to existing equipment
Planning and organising	• interpreting design and relating to site characteristics • planning and organising installation and operation of TV equipment and products • prioritising work according to organisation guidelines
Self-management	• applying all related WHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• seeking assistance from team members when necessary • giving and receiving feedback • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• installing and operating TV equipment and products • installing and configuring passive and active devices • checking tools and test equipment for accuracy • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 9

4 core units, plus

1 elective unit from Group A workplace units, plus

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4 elective units from Group B general units

Units completed in ICT20413 Certificate II in Telecommunications Digital Reception Technology cannot be selected in this qualification.

Elective units must be relevant to the work outcome, local industry requirements and the qualification level. A minimum of 5 of these electives must be taken from Certificate III level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or any accredited course at Certificate III or Certificate IV level. The two units from Group B general elective units may be substituted with Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS301A Implement and monitor environmentally sustainable work practices

ICTDRE3165A Install a complex digital reception system

ICTRFN2163B Install a satellite antenna

ICTRFN2164B Install a terrestrial antenna

ELECTIVE UNITS

Group A - Workplace elective units

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB401A Establish legal and risk management requirements of small business

BSBSMB405B Monitor and manage small business operations

BSBSMB407A Manage a small team

ICASAS305A Provide IT advice to clients

ICTSMB4161A Operate a contractor business with employees

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Group B - General elective units

Cabling

ICTCBL2017B Alter services to existing cable system

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

ICTCBL2163A Install a cable lead-in

ICTCBL3015A Locate and identify cable system faults

Broadband and wireless networks

ICTBWN3082B Perform tests on optical communication system and components

ICTBWN3205B Use optical and radio frequency measuring instruments

Digital reception technology

ICTDRE3156B Install digital reception equipment

ICTDRE3157B Locate and rectify digital reception equipment faults

ICTDRE3248A Design communications wiring systems for customer premises

ICTDRE3249A Develop integrated digital reception systems

ICTDRE4166A Integrate customer digital reception equipment

ICTDRE4167A Integrate data delivery modes

ICTTEN4126A Install and configure internet protocol TV in a home network

ICT use

ICAICT302A Install and optimise operating system software

ICAICT303A Connect internal hardware components

Occupational health and safety

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CPCCOHS1001A Work safely in the construction industry

ICTOHS2080A Provide telecommunications services safely on roofs

ICTOHS2153B Work safely near power infrastructure

Radio frequency networks

ICTRFN4095A Conduct radio frequency measurements

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Audiovisual systems integrator – includes integration of diverse technologies including RF services, and telephony services in complex equipment systems

Core units plus one Group A workplace elective unit plus:

- ICTDRE3165A Install a complex digital reception system
- ICTDRE4166A Integrate customer digital reception equipment
- ICTDRE4167A Integrate data delivery modes
- two additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Field service technician – ongoing maintenance of customer equipment

Core units plus one Group A workplace elective unit plus:

- ICTCBL3015A Locate and identify cable system faults
- ICTCBL2017B Alter services to existing cable system
- ICTRFN4095A Conduct radio frequency measurements

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- two additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Home network installer

Core units plus one Group A workplace elective unit plus:

- ICTDRE3156B Install digital reception equipment
- ICTDRE3157B Locate and rectify digital reception equipment faults
- ICTDRE3165A Install a complex digital reception system
- ICTDRE3248A Design communications wiring systems for customer premises
- ICTDRE3249A Develop integrated digital reception systems
- ICTTEN4126A Install and configure internet protocol TV in a home network
- one additional unit from Group B general elective units or from Group A workplace elective units as appropriate to the specific job role

Installer of free-to-air TV

Core units plus one Group A workplace elective unit plus:

- ICTBWN3205B Use optical and radio frequency measuring instruments
- ICTDRE3165A Install a complex digital reception system
- ICTRFN4095A Conduct radio frequency measurements
- two additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Installer – subscription TV (multiple services) – includes campus installations

Core units plus one Group A workplace elective unit plus:

- ICTDRE3165A Install a complex digital reception system
- ICTDRE4166A Integrate customer digital reception equipment
- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

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Small to medium contracting business operator

Core units plus one Group A workplace elective unit plus:

- ICTSMB4161A Operate a contractor business with employees
- four additional units from Group B general elective units, with a maximum of two of those additional units from Group A workplace elective units as appropriate to the specific job role

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ICT30513 Certificate III in Telecommunications Rigging Installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This qualification first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies in a varied work context from installation and maintenance of telecommunications equipment mounted on structures requiring rigging skills.

This role includes assessing installation requirements, planning and performing installations, testing installed equipment and fault-finding. It involves a degree of autonomy and may include some supervision of others involving known routines and procedures and some accountability for the quality of outcomes in a specialised area of installation of telecommunication equipment on high structures, including radio towers.

This qualification prepares an individual for entry to the industry into the mainstream of telecommunications convergence technologies of radio, optical, data and internet protocol (IP) networks.

An operator uses rigging skills to install and maintain radio antennas on radio towers and build and mount sections of radio masts for a complete radio structure.

Job roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

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- installer of telecommunications network equipment on structures
- installer of radio equipment and cabling on radio towers
- maintainer and tester of telecommunications radio network equipment on structures
- telecommunications rigger technician.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving the ICT20513 Certificate II in Telecommunications Rigging Installation or another relevant endorsed Training Package qualification or relevant endorsed course

or

- providing evidence of competency in the core units required for the ICT20513 Certificate II in Telecommunications Rigging Installation or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving the ICT30513 Certificate III in Telecommunications Rigging Installation, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

Licensing/Regulatory Information

Cabling

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Standard for Licensing Persons Performing High Risk Work

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The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels.

- CPCCLDG3001A Licence to perform dogging
- CPCCLRG3001A Licence to perform rigging basic level
- CPCCLRG3002A Licence to perform rigging intermediate level
- CPCCLRG4001A Licence to perform rigging advanced level
-

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Volume of learning

The volume of learning of a Certificate III is typically 1-2 years.

Up to 4 years may be required to achieve the learning outcomes through a program of indentured training/employment.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability skill	**Industry/enterprise requirements for this qualification include:**
Communication	• conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • communicating with customers to arrange time and access for the installation of systems and equipment

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	• documenting and communicating work-related information, including reporting of faults and problems • providing feedback to customers on operating the equipment
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • working with team members to work with clients and install equipment • relating personal role to the industry • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas • ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification
Initiative and enterprise	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting a plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• gathering data for the installation of systems and equipment • developing a plan for the recovery of equipment from customer premises • planning the installation of cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • applying all related OHS requirements and work practices, including job safety analysis (JSA), protective clothing and

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	personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• assessing customer's expertise and training needs and conducting training in the use of systems and equipment • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • giving and receiving feedback • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• installing and operating telecommunications broadband equipment and products • installing and operating CPE equipment and products • installing and configuring access network devices • checking tools and test equipment for accuracy • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 9

6 core units, ***plus***

3 elective units, ***of which***:

- **1 unit must be from Group A Workplace units**
- **2 units must be from Group B General elective units, up to 2 of which** may be substituted with units from elsewhere in this Training Package, another Training Package or accredited course at Certificate II, III or IV level.

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

Core units

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CPCCLDG3001A Licence to perform dogging

CPCCLRG3001A Licence to perform rigging basic level

ICTBWN3205B Use optical and radio frequency measuring instruments

ICTTCR3191A Install radio plant and equipment on telecommunications structures

ICTTCR3192A Protect against electromagnetic radiation and system hazards when working on telecommunications radio sites

ICTWHS2170B Follow work health and safety and environmental policies and procedures

Elective units

Group A Workplace

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

BSBSUS201A Participate in environmentally sustainable work practices

BSBSUS301A Implement and monitor environmentally sustainable work practices

ICASAS305A Provide IT advice to clients

ICTEDU3053A Train customers in new technology

ICTWOR3028A Organise resources

ICTWOR3035A Organise material supply

ICTWOR3041A Schedule resources

ICTWOR3093A Manage spare parts

ICTWOR3127A Supervise worksite activities

Group B General elective units

CPCCLRG3002A Licence to perform rigging intermediate level

CPCCLRG4001A Licence to perform rigging advanced level

CPCCOHS1001A Work safely in the construction industry

ICTCBL2017B Alter services to existing cable system

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2068A Install a telecommunications service to a building

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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ICTCBL2137A Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2139B Apply safe technical work practices for cabling registration

ICTCBL3010B Install and terminate optical fibre cable on customer premises

ICTCBL3011B Install and terminate coaxial cable

ICTCBL3013A Perform cable and system test on customer premises

ICTCBL3014A Hand over systems and equipment

ICTCBL3015A Locate and identify cable system faults

ICTCBL3020A Construct aerial cable supports

ICTCBL3021A Install aerial cable

ICTCBL3049A Install systems and equipment on customer premises

ICTCBL3052A Cut over new systems and equipment on customer premises

ICTCBL3069A Install network cable equipment

ICTCBL3103A Maintain cable network

ICTOHS2080A Provide telecommunications services safely on roofs

ICTOHS2153B Work safely near power infrastructure

ICTRFN3055A Install a radio communications antenna and feedline

ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment

ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment

ICTTCR2188A Use rigging practices and systems on telecommunications network structures

ICTTCR2189A Use operational safety in a telecommunications rigging environment

ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures

ICTTCR3062A Build a telecommunications radio structure

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN3054B Provide infrastructure for telecommunications network equipment

ICTTEN3056A Install telecommunications network equipment

ICTTEN3063A Locate, identify and rectify recurrent network faults

ICTTEN3077B Commission an electronic unit

ICTTEN3089A Repair and replace telecommunications network hardware

ICTTEN3104A Maintain an electronic system

ICTTEN3250B Provide infrastructure for telecommunications customer equipment

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Prerequisite Units

The following units in this qualification have the prerequisite units detailed below.

Code and title	Prerequisite units required
CPCCLRG3002A Licence to perform rigging intermediate level	CPCCLRG3001A Licence to perform rigging basic level
CPCCLRG4001A Licence to perform rigging advanced level	CPCCLRG3002A Licence to perform rigging intermediate level
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule
ICTTCR3062A Build a telecommunications radio structure	ICTTCR2188A Use rigging practices and systems on telecommunications network structures ICTTCR2189A Use operational safety in a telecommunications rigging environment ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures
ICTTCR3191A Install radio plant and equipment on telecommunications structures	ICTTCR2188A Use rigging practices and systems on telecommunications network structures ICTTCR2189A Use operational safety in a telecommunications rigging environment ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures

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ICT30613 Certificate III in Broadband and Wireless Networks

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a tradesperson with a range of telecommunications skills who can:

- install and maintain access network cabling and equipment for high speed broadband as part of the national network
- install and maintain optical and wireless equipment for high speed internet broadband network infrastructure
- install and maintain telecommunications, data cabling and cabling products on customer premises Cabling at the customer premises in accordance to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner
- install voice and data telecommunications equipment
- install and maintain telecommunications access network cabling and infrastructure, systems and basic customer premises equipment.

This role includes assessing installation requirements, planning and performing installations, testing installed equipment and fault-finding. It involves a degree of autonomy and may include limited supervision of others.

This qualification also introduces the skills required for the broadband deployment using fibre optic devices.

Job Roles

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Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- broadband installer
- optical broadband installer
- wireless broadband network installer
- broadband network infrastructure installer
- access network cabling installer
- installer of telecommunications and data cabling
- installer of telecommunications aerial cable access network
- installer of telecommunications underground cable access network.
-

Prerequisite units

The following unit within this qualification has a prerequisite. This is detailed as follows:

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving a Certificate II qualification from this or another accredited Training Package or accredited course

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

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After achieving ICT30613 Certificate III in Broadband and Wireless Networks, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• documenting test methods and results • conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • interpreting plan as a set of functions to be implemented • confirming approval for time and method of site access with customers • documenting and communicating work-related information, including reporting of faults and problems • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	• recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • developing installation plans to ensure minimal disruption

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Employability Skill	Industry/enterprise requirements for this qualification include:
	to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • applying all related WHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisational goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • installing and configuring access network devices • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 12

6 core units, plus

1 elective unit from Group A workplace units, plus

5 elective units from Group B general units

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Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate III or Certificate IV level. One of those two units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS301A Implement and monitor environmentally sustainable work practises

ICTBWN3205B Use optical and radio frequency measuring instruments

ICTCBL3015A Locate and identify cable system faults

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Workplace elective units

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

ICASAS305A Provide IT advice to clients

ICTEDU3053A Train customers in new technology

ICTWOR3028A Organise resources

ICTWOR3035A Organise material supply

ICTWOR3041A Schedule resources

ICTWOR3093A Manage spare parts

ICTWOR3127A Supervise worksite activities

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Group B - General elective units

Broadband and wireless networks

ICTBWN3082B Perform tests on optical communication system and components

ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

Cabling

ICTCBL2017B Alter services to existing cable system

ICTCBL2064A Haul underground cable

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2066B Joint and terminate coaxial cable

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2133A Construct underground telecommunications infrastructure

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

ICTCBL2163A Install a cable lead-in

ICTCBL3009B Install, terminate and certify structured cabling installation

ICTCBL3010B Install and terminate optical fibre cable on customer premises

ICTCBL3011B Install and terminate coaxial cable

ICTCBL3013A Perform cable and system test on customer premises

ICTCBL3014A Hand over systems and equipment

ICTCBL3018A Install underground enclosures and conduit

ICTCBL3019A Install underground cable

ICTCBL3020A Construct aerial cable supports

ICTCBL3021A Install aerial cable

ICTCBL3049A Install systems and equipment on customer premises

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ICTCBL3067A Modify and cut over cable

ICTCBL3069A Install network cable equipment

ICTCBL3103A Maintain cable network

ICT use

ICAICT302A Install and optimise operating system software

ICAICT303A Connect internal hardware components

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry

ICTOHS2153B Work safely near power infrastructure

Radio frequency networks

ICTRFN3055A Install a radio communications antenna and feedline

ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment

ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment

ICTRFN4095A Conduct radio frequency measurements

ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

Telecommunications engineering networks

ICTTEN2219A Install and test internet protocol devices in convergence networks

ICTTEN3063A Locate, identify and rectify recurrent network faults

ICTTEN3074A Recover customer premises equipment

ICTTEN3075A Refurbish customer premises equipment

ICTTEN3077B Commission an electronic unit

ICTTEN3104A Maintain an electronic system

Selecting electives for different outcomes

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The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Aerial cable installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL2017B Alter services to existing cable system
- ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
- ICTCBL2163B Install a cable lead-in
- ICTCBL3021A Install aerial cable
- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

Broadband Network Infrastructure Installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
- ICTCBL3009B Install, terminate and certify structured cabling installation
- ICTCBL3011B Install and terminate coaxial cable
- ICTCBL3069A Install network cable equipment
- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

Optical broadband network installer

Core units plus one Group A workplace elective unit plus:

- ICTBWN3082B Perform tests on optical communication system and components
- ICTBWN3088B Install optical fibre splitters in fibre distribution hubs
- ICTBWN3090B Install lead-in module and cable for fibre to the premises
- ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

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- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

Underground cable installer

Core units plus one Group A workplace elective unit plus:

- ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
- ICTCBL2133A Construct underground telecommunications infrastructure
- ICTCBL2163B Install a cable lead-in
- ICTCBL3018A Install underground enclosures and conduit
- ICTCBL3019A Install underground cable

Wireless broadband network Installer

Core units plus one Group A workplace elective unit plus:

- ICTRFN3055A Install a radio communications antenna and feedline
- ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment
- ICTRFN4095A Conduct radio frequency measurements
- ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network
- one additional unit from Group B general elective units or Group A workplace elective units as appropriate to the specific job role

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ICT30713 Certificate III in National Broadband Network Construction

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This qualification first released with *ICT10 Integrated Telecommunications Training Package Version 2.0.*

Description

This qualification has been designed as a pathway for specialised work on the National Broadband Network (NBN).

This qualification provides students with skills and knowledge to enhance employment prospects in apprenticeships and traineeships in a range of specialised NBN industry occupations specifically for the national rollout of the high speed broadband infrastructure.

In conjunction with safe working practices, one of two specialist streams is to be undertaken as described:

Telecommunications linesworker/Installer

This stream reflects the role of operators in performing equipment and system installation work on customer network to enable efficient access and interconnection to the NBN services. This includes diagnosing and rectifying complex cable system faults to maximise benefits of the high speed broadband connection.

Telecommunications Fibre Splicer

This stream reflects the role of operators in applying optical fibre handling skills to splicing, testing and fault finding on live fibre cable in the fibre distribution network for NBN.

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Job roles

Job roles and titles are dependent on the stream completed, possible job titles relevant to a pathway for this qualification include:

- Telecommunications installer
- Broadband network linesworker
- Broadband network fibre splicer
- Telecommunications customer network cable installer.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving the ICT20613 Certificate II in National Broadband Network Installation or equivalent qualification from this or another endorsed Training Package or endorsed course

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving the ICT30713 Certificate III in National Broadband Network Construction, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

Licensing/Regulatory Information

The completion of unit ICTWHS2170B, ICTWHS2170A or ICTOHS2170A and the unit set of ICTCBL2136B and ICTCBL2137B meets the ACMA requirements for Cabling Provider Rules (CPR) open registration.

All training programs are undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

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National Code of Practice for Induction for Construction Work

Much of the NBN installation work falls within the definition of construction work in the context of infrastructure provisioning. If so, anyone entering the construction site is required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package as part of the core group of this qualification fulfils this requirement.

Note: ICTOHS2153A Work safely near power infrastructure should be included in the qualification packaging where there is a likelihood of working near power infrastructure. If state or territory law requires a licence to operate an elevated work platform (EWP), TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more) should be completed concurrently with ICTOHS2153A.

Volume of Learning

The volume of learning of a Certificate III is typically 1-2 years.

Up to 4 years may be required to achieve the learning outcomes through a program of indentured training/employment.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability skill	Industry/enterprise requirements for this qualification include:
Communication	• communicating benefits of high speed broadband to community for successful NBN rollout • notifying any safety aspects to supervisor • documenting test methods and results • completing cable and equipment labelling and records in cabinets and distribution hubs • interpreting plan as a set of basic functions to be

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	implemented • conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • communicating with customers to arrange time and access for the installation of systems and equipment • documenting and communicating work-related information, including reporting of faults and problems • providing feedback to customers on operating the equipment
Teamwork	• continually fostering effective teamwork for effective NBN rollout • identifying members and roles of team between management and workforce, between cable and network equipment teams and between installation and testing teams • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • working with team members to work with clients and install equipment • relating personal role to the industry • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking sequences of operations from planning to site preparation to cabling to equipment installation in order to ensure a methodical and effective approach to NBN rollout • working out contingencies in event of problems arising • ensuring compatibility of technologies deployed by NBN rollout • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas • ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification

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Initiative and enterprise	• continually suggesting of ways for improving practices to suit specific site of NBN infrastructure rollout • prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• preparing project specifications for deployment of NBN access network • organising work schedules for deployment of access network architectures • developing NBN rollout plans to ensure minimal disruption to the workplace and the public • identifying realistic short and long-term career objectives • planning and provisioning to meet key milestones • gathering data for the installation of systems and equipment • developing a plan for the recovery of equipment from customer premises • planning the installation of ribbon fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• managing personal time to assist effective rollout • identifying work to be completed • identifying and setting realistic short and long-term career objectives • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • personally applying all related OHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• learning from previous experiences in order to improve future practices in NBN rollout

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	• learning of methodologies of new ribbon fibre splicing and adapting to current practices • assessing customer's expertise and training needs and conducting training in the use of systems and equipment • making clients aware of opportunities that exist for with higher broadband speed offered by NBN and offering training • seeking assistance from team members when necessary • giving and receiving feedback to assist in meeting team and organisation goals • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members on NBN technologies by equipment suppliers • providing training to customers on system, product, product features and facilities • relating current or intended role to career objectives in a positive manner
Technology	• familiarising with new ribbon fibre technologies for NBN deployment • ensuring that range of technologies used in NBN infrastructure rollout are effectively and efficiently deployed to manufacturers specifications • checking that advanced tools and equipment are in safe working order and adjusted to manufacturer specifications • testing and measuring of broadband network infrastructure • installing, configuring and operating NBN equipment and products • identifying, replacing or repairing faulty parts and equipment • ensuring compatibility and interoperability between newly deployed NBN infrastructure and existing customer network • providing solutions for improved compatibility • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 14

9 core units *plus*

5 elective units, ***of which***:

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- **2 units must be from Group A Linesworker/installer or Group B Fibre splicer**
- **3 units from Group C General elective units or** from elsewhere in this Training Package, another Training Package or endorsed course at Certificate II, III or IV level.

Elective units chosen must be relevant to the work and industry context for project practice.

This qualification meets the requirements for the NBN infrastructure rollout and has been developed for specific occupational outcomes. Due to the specialised technical nature of the work, there is provision for choice of specialisation but there is no allowance for substitution of elective units in the specialised group. However, remaining elective units from Group C can be selected to meet relevant work outcome, local industry requirements and the qualification level.

Core units

CPCCOHS1001A Work safely in the construction industry

ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

ICTBWN3205B Use optical and radio frequency measuring instruments

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL3018A Install underground enclosures and conduit

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN3056A Install telecommunications network equipment

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ICTWOR3127A Supervise worksite activities

Elective units

Group A Linesworker/installer

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTCBL3019A Install underground cable

Group B Fibre splicer

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ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

ICTCBL3240B Install ribbon fibre cable in the FTTX distribution network

Group C General elective units

BSBSUS201A Participate in environmentally sustainable work practices

HLTAID001 Provide cardiopulmonary resuscitation

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2133A Construct underground telecommunications infrastructure

ICTCBL2134A Fix aerial cable

ICTCBL2136A Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2162B Install a cable lead-in

ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule

ICTOHS2153B Work safely near power infrastructure

ICTTEN2219A Install and test an internet protocol device in convergence networks

ICTTEN2140B Use hand and power tools

TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more)

Prerequisite Units

The following units in this qualification have the prerequisite units detailed below.

Code and title	**Prerequisite units required**
ICTCBL3240B Install ribbon fibre cable in the FTTX distribution network	ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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ICT30813 Certificate III in Telecommunications Fixed Wireless Installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This qualification first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This qualification reflects the role of an operator in the telecommunications industry who can apply a broad range of competencies using a defined range of skills where some discretion and judgement is required in the selection, installation and configuration of equipment in convergence technologies that integrate radio, optical and internet protocol (IP) based applications.

This role includes assessing installation requirements, planning and performing installations, testing installed equipment and fault finding. It involves a degree of autonomy and may include some supervision of others involving known routines and procedures and some accountability for the quality of outcomes.

This qualification prepares an individual for entry to the industry into the mainstream of telecommunications convergence technologies of radio, optical, data and IP networks.

An operator uses skills to install and maintain radio antennas on domestic and commercial buildings for fixed wireless broadband services and install and maintain Network Terminal Devices in domestic and commercial premises connected to the radio antennas.

Job roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

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- telecommunications fixed wireless network equipment installer
- telecommunications voice and data equipment installer
- telecommunications tradesperson.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving a Certificate II qualification from this or another endorsed Training Package or endorsed course

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving the ICT30813 Certificate III in Telecommunications Fixed Wireless Installation, candidates seeking to develop more specialised technical skills and knowledge, may select from a range of Certificate IV qualifications in the ICT10 Integrated Telecommunications Training Package.

Licensing/Regulatory Information

The completion of units ICTWHS2170B, ICTWHS2170A or ICTOHS2170A and ICTCBL136B meets the ACMA requirements for Cabling Provider Rules (CPR) restricted registration.

For cablers with restricted CPR qualifications there will be a requirement for the specialised unit ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule, to be achieved when working on specialised broadband cabling.

All training programs must be undertaken with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

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Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Note: ICTOHS2153A Work safely near power infrastructure should be included in the qualification packaging where there is a likelihood of working near power infrastructure. If state or territory law requires a licence to operate an elevated work platform (EWP), TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more) should be completed concurrently with ICTOHS2153A.

Volume of Learning

The volume of learning of a Certificate III is typically 1-2 years.

Up to 4 years may be required to achieve the learning outcomes through a program of indentured training/employment.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability skill	**Industry/enterprise requirements for this qualification include:**
Communication	• conveying information to clients, colleagues and other site personnel • completing job reports and compliance forms • communicating with customers to arrange time and access for the installation of systems and equipment • documenting and communicating work-related information, including reporting of faults and problems • providing feedback to customers on operating the equipment
Teamwork	• participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict

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	• working with team members to work with clients and install equipment • relating personal role to the industry • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas • ranking likely causes of fault in order of probability to ensure a methodical approach to fault identification
Initiative and enterprise	• identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting a plan to suit specific features of site • identifying issues and possible solutions within established guidelines
Planning and organising	• gathering data for the installation of systems and equipment • developing a plan for the recovery of equipment from customer premises • planning the installation of cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines
Self-management	• developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • applying all related OHS requirements and work practices, including job safety analysis (JSA), protective clothing and personal safety items • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• assessing customer's expertise and training needs and

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	conducting training in the use of systems and equipment • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • giving and receiving feedback • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• installing and operating telecommunications broadband equipment and products • installing and operating CPE equipment and products • installing and configuring access network devices • checking tools and test equipment for accuracy • identifying, replacing or repairing faulty parts and equipment

Packaging Rules

Total number of units = 12

5 core units, ***plus***

7 elective units, ***of which***:

- 1 unit must be from Group A Workplace
- 3 units must be from Group B Fixed wireless installer, one of which may be substituted with a Group A unit if required by a specific job role
- 3 units must be from Group C General elective units, up to two of which may be from elsewhere in this Training Package, another Training Package or endorsed course at Certificate II, III or IV level.

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

Core units

ICTBWN3205A Use optical and radio frequency measuring instruments

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

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ICTTEN3056A Install telecommunications network equipment

ICTWHS2170B Follow work health and safety and environmental policies and procedures

Elective units

Group A Workplace

BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

BSBSMB306A Plan a home based business

BSBSUS201A Participate in environmentally sustainable work practices

BSBSUS301A Implement and monitor environmentally sustainable work practices

ICASAS305A Provide IT advice to clients

ICTEDU3053A Train customers in new technology

ICTSMB4160A Set up and operate a contractor business

ICTSMB4161A Operate a contractor business with employees

ICTWOR3028A Organise resources

ICTWOR3035A Organise material supply

ICTWOR3127A Supervise worksite activities

Group B Fixed wireless installer

ICTDRE3156B Install digital reception equipment

ICTDRE3157B Locate and rectify digital reception equipment faults

ICTDRE3165A Install a complex digital reception system

ICTRFN3055A Install a radio communications antenna and feedline

Group C General elective units

CPCCOHS1001A Work safely in the construction industry

ICAICT302A Install and optimise operating system software

ICAICT303A Connect internal hardware components

ICANWK305A Install and manage network protocols

ICANWK417A Build an enterprise wireless network

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ICASAS301A Run standard diagnostic tests

ICTBWN3082B Perform tests on optical communication system and components

ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTBWN3100A Work safely with live fibre to test and commission a fibre to the x installation

ICTCBL2064A Haul underground cable

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule (where ACMA Restricted Registration is necessary)

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL2139B Apply safe technical work practices for cabling registration

ICTCBL3009B Install, terminate and certify structured cabling installation

ICTCBL3010B Install and terminate optical fibre cable on customer premises

ICTCBL3011B Install and terminate coaxial cable

ICTCBL3013A Perform cable and system test on customer premises

ICTCBL3014A Hand over systems and equipment

ICTCBL3015A Locate and identify cable system faults

ICTCBL3018A Install underground enclosures and conduit

ICTCBL3019A Install underground cable

ICTCBL3020A Construct aerial cable supports

ICTCBL3021A Install aerial cable

ICTCBL3049A Install systems and equipment on customer premises

ICTCBL3052A Cut over new systems and equipment on customer premises

ICTCBL3067A Modify and cut over cable

ICTCBL3069A Install network cable equipment

ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule

ICTOHS2080A Provide telecommunications services safely on roofs

ICTOHS2153B Work safely near power infrastructure

ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment

ICTRFN3155A Construct and test a radio communications device

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ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment

ICTTEN2219A Install and test an internet protocol device in convergence networks

ICTTEN3054B Provide infrastructure for telecommunications network equipment

ICTTEN3063A Locate, identify and rectify recurrent network faults

ICTTEN3074A Recover customer premises equipment

ICTTEN3075A Refurbish customer premises equipment

ICTTEN3077B Commission an electronic unit

ICTTEN4198A Install, configure and test an internet protocol network

TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more).

Prerequisite Units

The following unit in this qualification has the prerequisite unit detailed below.

Code and title	**Prerequisite unit required**
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule
ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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ICT40110 Certificate IV in Optical Networks

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a technician with a range of telecommunications skills who can:

- install and maintain switching and transmission optical equipment in the enterprise network
- install and maintain optical and wireless equipment for high speed broadband network infrastructure
- install and maintain telecommunications, data cabling and cabling products on customer premises Cabling at the customer premises in accordance to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner
- install and maintain internet protocol (IP) based network telecommunications equipment
- install and maintain telecommunications access network cabling and infrastructure, systems and basic customer premises equipment using optical networking technology
- assess installation requirements of converging voice, video and data IP networks
- plan and perform installations
- test installed equipment and fault find.

This role also involves a degree of autonomy and may include limited supervision of others.

Job Roles

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Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- customer equipment installer
- IP based network installer
- optical network infrastructure installer
- optical network technician
- secure IT network installer
- telecommunications technician.
-

Prerequisite requirements

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving the ICT30110 Certificate III in Broadband and Wireless Networks Technology or ICT30210 Certificate III in Telecommunications or ICT30310 Certificate III in Telecommunications Cabling or ICT30610 Certificate III in Broadband and Wireless Networks or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for the ICT30110 Certificate III in Broadband and Wireless Networks Technology or ICT30210 Certificate III in Telecommunications or ICT30310 Certificate III in Telecommunications Cabling or ICT30610 Certificate III in Broadband and Wireless Networks or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving the ICT40110 Certificate IV in Optical Networks, candidates may undertake the ICT50110 Diploma of Optical Networks, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Diploma qualifications.

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Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction and Plumbing Services Integrated Framework Training Package fulfils this requirement.

Prerequisite requirements

There are no prerequisite requirements for individual units of competency.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals

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	• recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines

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	• running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 11

6 core units, plus

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1 elective unit from Group A workplace units, plus

4 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group B general elective units may be substituted with two units from any endorsed Training Package or accredited course at Certificate IV or Diploma level. One of those two units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTOPN4115B Install and test a dense wavelength division multiplexing system

ICTOPN4116A Use advanced optical test equipment

ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation

ICTPMG4152A Manage the delivery of network infrastructure

ICTSUS4185A Install and test power management software

ICTTEN4081A Locate, diagnose and rectify faults

ELECTIVE UNITS

Group A - Workplace elective units

BSBSMB401A Establish legal and risk management requirements of small business

BSBSMB405B Monitor and manage small business operations

BSBSMB407A Manage a small team

ICAICT401A Determine and confirm client business requirements

ICTTEN4003B Estimate and quote for customer telecommunications equipment installation

Group B - General elective units

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Cabling

ICTCBL4002B Prepare design drawings and specification for a cable installation
ICTCBL4004B Schedule and supply cabling installation
ICTCBL4023B Supervise cabling project
ICTCBL4057B Test cable bearers
ICTCBL4099A Remotely locate and identify cable network faults

Digital reception technology

ICTDRE4166A Integrate customer digital reception equipment
ICTDRE4167A Integrate data delivery modes

ICT use

IP networks

ICAICT405A Develop detailed technical design
ICANWK406A Install, configure and test network security
ICANWK416A Build security into virtual private networks
ICANWK417A Build an enterprise wireless network
ICANWK410A Install network hardware to a network
ICANWK411A Install software to networked computers

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry
ICTOHS2153B Work safely near power infrastructure

Project management

ICTPMG4048B Schedule installation of customer premises equipment

Radio frequency networks

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ICTRFN4095A Conduct radio frequency measurements

ICTRFN4158A Select an antenna system for radio communications

ICTRFN4159A Test and repair cellular network equipment

ICTRFN4174A Undertake radio communications signals monitoring

ICTRFN4177A Install radio communications base station equipment

ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

Sustainability

ICTSUS4183A Install and test renewable energy system for ICT networks

ICTSUS4184A Install and test power saving hardware

ICTSUS4186A Install thin client applications for power over ethernet

Telecommunications engineering networks

ICTTEN4001B Identify requirements for customer telecommunications equipment

ICTTEN4040A Assign a transmission path

ICTTEN4051A Install configuration programs on PC based customer equipment

ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment

ICTTEN4073A Cut over customer premises equipment major upgrades

ICTTEN4076A Complete equipment and software upgrades

ICTTEN4078A Commission an electronic system

ICTTEN4085A Monitor, analyse and action telecommunications network alarms

ICTTEN4086A Undertake routine maintenance of the telecommunications network

ICTTEN4087A Undertake remote diagnosis and repair of network faults

ICTTEN4102A Repair telecommunication system faults

Emerging technologies

ICTTEN4050A Install and configure a wireless mesh network

ICTTEN4126A Install and configure internet protocol TV in a home network

ICTTEN4202A Install and test a radio frequency identification system

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ICTTEN4215A Install and configure internet protocol TV in a service provider network
ICTTEN4229B Design, install and configure a customer smart technology network

IP networks

ICTTEN4198A Install, configure and test an internet protocol network
ICTTEN4199A Install, configure and test a router
ICTTEN4210A Implement and troubleshoot enterprise routers and switches
ICTTEN4211A Design, install and configure an internetwork
ICTTEN4212A Apply advanced routing protocols to network design
ICTTEN4213A Configure and troubleshoot advanced network switching
ICTTEN4214A Install and maintain a wide area network

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ICT40210 Certificate IV in Telecommunications Network Engineering

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a technician with a range of telecommunications skills who can:

- install and maintain enterprise network in emerging and converging technologies
- install and maintain optical and wireless equipment for high speed broadband network infrastructure
- install and maintain internet protocol (IP) based network telecommunications equipment
- install IP based networks in home networks and small and medium enterprises
- install and maintain telecommunications, data cabling and cabling products on customer premises Cabling at the customer premises in accordance to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner
- install and maintain telecommunications access network cabling and infrastructure, systems and basic customer premises equipment
- assess installation requirements of converging voice, video and data IP networks
- plan and perform installations
- test installed equipment and fault find.

This role also involves a degree of autonomy and may include limited supervision of others.

Job Roles

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Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- customer computer system installer
- customer premises equipment installer
- home network installer
- IP based network installer
- network security equipment installer
- optical network equipment installer
- radio technician
- RFID system installer
- secure IT network installer
- SME network installer
- sustainability network equipment installer
- telecommunications network technician
- wireless LAN installer
- wireless network equipment installer.
-

Prerequisite requirements

There are no prerequisite requirements for individual units of competency.

Pathways Information

Qualification Pathways

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving the ICT30110 Certificate III in Broadband and Wireless Networks Technology or ICT30210 Certificate III in Telecommunications or ICT30310 Certificate III in Telecommunications Cabling or ICT30610 Certificate III in Broadband and Wireless Networks or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for the ICT30110 Certificate III in Broadband and Wireless Networks Technology or ICT30210 Certificate III in Telecommunications or ICT30310 Certificate III in Telecommunications Cabling or ICT30610 Certificate III in Broadband and Wireless Networks or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

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Pathways from the qualification

After achieving the ICT40210 Certificate IV in Telecommunications Network Engineering, candidates may undertake the ICT50210 Diploma of Telecommunications Network Engineering, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Diploma qualifications.

Licensing/Regulatory Information

Licensing, legislative, regulatory or certification considerations

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction and Plumbing Services Integrated Framework Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel

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	• providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations

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	• interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 11

3 core units, plus

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1 elective unit from Group A workplace units, plus

7 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate IV or Diploma level. One of those two units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTPMG4152A Manage the delivery of network infrastructure

ICTTEN4081A Locate, diagnose and rectify faults

ICTSUS4185A Install and test power management software

ELECTIVE UNITS

Group A - Workplace elective units

BSBSMB401A Establish legal and risk management requirements of small business

BSBSMB405B Monitor and manage small business operations

BSBSMB407A Manage a small team

ICAICT401A Determine and confirm client business requirements

ICTTEN4003B Estimate and quote for customer telecommunications equipment installation

Group B - General elective units

Cabling

ICTCBL4002B Prepare design drawings and specification for a cable installation

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ICTCBL4004B Schedule and supply cabling installation
ICTCBL4023B Supervise cabling project
ICTCBL4057B Test cable bearers
ICTCBL4099A Remotely locate and identify cable network faults

Digital reception technology

ICTDRE4166A Integrate customer digital reception equipment
ICTDRE4167A Integrate data delivery modes

ICT use

IP networks

ICAICT405A Develop detailed technical design
ICANWK406A Install, configure and test network security
ICANWK410A Install network hardware to a network
ICANWK411A Install software to networked computers
ICANWK416A Build security into virtual private networks
ICANWK417A Build an enterprise wireless network
ICASAS301A Run standard diagnostic tests

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry
ICTOHS2153B Work safely near power infrastructure

Optical networks

ICTOPN4115B Install and test a dense wavelength division multiplexing system
ICTOPN4116A Use advanced optical test equipment
ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation

Project management

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ICTPMG4048B Schedule installation of customer premises equipment

Radio frequency networks

ICTRFN4095A Conduct radio frequency measurements

ICTRFN4158A Select an antenna system for radio communications

ICTRFN4159A Test and repair cellular network equipment

ICTRFN4174A Undertake radio communications signals monitoring

ICTRFN4177A Install radio communications base station equipment

ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

Sustainability

ICTSUS4183A Install and test renewable energy system for ICT networks

ICTSUS4184A Install and test power saving hardware

ICTSUS4186A Install thin client applications for power over ethernet

Telecommunications engineering networks

ICTTEN3056A Install telecommunications network equipment

ICTTEN4001B Identify requirements for customer telecommunications equipment

ICTTEN4040A Assign a transmission path

ICTTEN4051A Install configuration programs on PC based customer equipment

ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment

ICTTEN4073A Cut over customer premises equipment major upgrades

ICTTEN4076A Complete equipment and software upgrades

ICTTEN4078A Commission an electronic system

ICTTEN4085A Monitor, analyse and action telecommunications network alarms

ICTTEN4086A Undertake routine maintenance of the telecommunications network

ICTTEN4087A Undertake remote diagnosis and repair of network faults

ICTTEN4102A Repair telecommunication system faults

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Emerging technologies

ICTTEN4050A Install and configure a wireless mesh network
ICTTEN4126A Install and configure internet protocol TV in a home network
ICTTEN4202A Install and test a radio frequency identification system
ICTTEN4215A Install and configure internet protocol TV in a service provider network
ICTTEN4229B Design, install and configure a customer smart technology network

IP networks

ICTTEN4198A Install, configure and test an internet protocol network
ICTTEN4199A Install, configure and test a router
ICTTEN4210A Implement and troubleshoot enterprise routers and switches
ICTTEN4211A Design, install and configure an internetwork
ICTTEN4212A Apply advanced routing protocols to network design
ICTTEN4213A Configure and troubleshoot advanced network switching
ICTTEN4214A Install and maintain a wide area network
ICTTEN5201A Install, configure and test a server

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Customer computer system installer

Core units plus one Group A workplace elective unit plus:

- ICAICT405A Develop detailed technical design
- ICTTEN4076A Complete equipment and software upgrades
- ICTTEN4198A Install, configure and test an internet protocol network

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- four additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Customer premises equipment installer

Core units plus one Group A workplace elective unit plus:

- ICTTEN4051A Install configuration programs on PC based customer equipment
- ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment
- ICTTEN4073A Cut over customer premises equipment major upgrades
- ICTTEN4078A Commission an electronic system
- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Emerging technology installer

Core units plus one Group A workplace elective unit plus:

- ICTTEN4050A Install and configure a wireless mesh network
- ICTTEN4126A Install and configure internet protocol TV in a home network
- ICTTEN4198A Install, configure and test an internet protocol network
- ICTTEN4202A Install and test a radio frequency identification system
- ICTTEN4229B Design, install and configure a customer smart technology network
- two additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Home network installer

Core units plus one Group A workplace elective unit plus:

- ICTTEN4126A Install and configure internet protocol TV in a home network
- ICTDRE4166A Integrate customer digital reception equipment
- ICTDRE4167A Integrate data delivery modes
- ICTTEN4198A Install, configure and test an internet protocol network

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- ICTTEN4229B Design, install and configure a customer smart technology network
- two additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Optical network equipment installer

Core units plus one Group A workplace elective unit plus:

- ICTOPN4115B Install and test a dense wavelength division multiplexing system
- ICTOPN4116A Use advanced optical test equipment
- ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation
- ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network
- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Network Security equipment installer

Core units plus one Group A workplace elective unit plus:

- ICANWK406A Install, configure and test network security
- ICANWK416A Build security into virtual private networks
- ICTTEN4198A Install, configure and test an internet protocol network
- ICTTEN4199A Install, configure and test a router
- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

RFID system installer

Core units plus one Group A workplace elective unit plus:

- ICANWK411A Install software to networked computers
- ICTTEN4078A Commission an electronic system
- ICTTEN4198A Install, configure and test an internet protocol network
- ICTTEN4202A Install and test a radio frequency identification system

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- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

SME network installer

Core units plus one Group A workplace elective unit plus:

- ICTTEN4210A Implement and troubleshoot enterprise routers and switches
- ICTTEN4211A Design, install and configure an internetwork
- ICTTEN4212A Apply advanced routing protocols to network design
- ICTTEN4213A Configure and troubleshoot advanced network switching
- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Sustainability network equipment installer

Core units plus one Group A workplace elective unit plus:

- ICTSUS4183A Install and test renewable energy system for ICT networks
- ICTSUS4184A Install and test power saving hardware
- ICTSUS4186A Install thin client applications for power over ethernet
- four additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Wireless LAN installer

Core units plus one Group A workplace elective unit plus:

- ICANWK416A Build security into virtual private networks
- ICANWK417A Build an enterprise wireless network
- ICANWK411A Install software to networked computers
- ICTTEN4198A Install, configure and test an internet protocol network
- three additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

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Wireless network equipment installer

Core units plus one Group A workplace elective unit plus:

- ICTRFN4158A Select an antenna system for radio communications
- ICTRFN4159A Test and repair cellular network equipment
- ICTRFN4177A Install radio communications base station equipment
- four additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

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ICT40313 Certificate IV in Telecommunications Radio Communications

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. ICTWOR2141 Work effectively in a telecommunications technology team moved to elective bank. Elective unit requirement increased by one.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a technician with a range of telecommunications skills who can:

- install and maintain digital radio telecommunications equipment
- conduct field operations of radio networks
- install and maintain worldwide interoperability for microwave access (WiMAX) and wireless fidelity (WiFi) networks for high speed broadband network infrastructure
- monitor radio frequency (RF) operation and conduct field audits for compliance.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- radio communications technician
- radio frequency technician
- radio frequency field technician
- radio frequency compliance officer
- radio frequency auditor
- telecommunications radio technician

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- WiMAX or WiFi system installer
- wireless system installer.
-

Prerequisite requirements

The following unit within this qualification have prerequisites. This is detailed as follows:

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

After achieving ICT40313 Certificate IV in Telecommunications Radio Communications, candidates may undertake ICT50210 Diploma of Telecommunications Network Engineering, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Diploma qualifications.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

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Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining radio interference problems and conducting compliance audits • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related WHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule

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Employability Skill	Industry/enterprise requirements for this qualification include:
	• using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisational goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 17

9 core units, plus

8 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level. All these electives must be taken from Certificate IV level.

A maximum of three elective units may be substituted with three units of competency from any endorsed Training Package or any accredited course at Certificate IV or Diploma level.

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Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTCBL2066B Joint and terminate coaxial cable

ICTRFN3055A Install a radio communications antenna and feedline

ICTRFN3155A Construct and test a radio communications device

ICTSUS4185A Install and test power management software

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN3104A Maintain an electronic system

ICTTEN4081A Locate, diagnose and rectify faults

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Cabling

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL4004B Schedule and supply cabling installation

ICTCBL4099A Remotely locate and identify cable network faults

Compliance

ICTCMP5176A Undertake radio communications site audit

Customer Service

BSBCUS402B Address customer needs

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First aid

HLTAID003 Provide first aid

ICT use

IP networks

ICANWK410A Install network hardware to a network

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry

CPPSEC3034A Operate information gathering equipment

ICTOHS2153B Work safely near power infrastructure

Project management

ICTPMG4048B Schedule installation of customer premises equipment

ICTPMG4152A Manage the delivery of network infrastructure

Radio frequency networks

ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment

ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment

ICTRFN4095A Conduct radio frequency measurements

ICTRFN4158A Select an antenna system for radio communications

ICTRFN4159A Test and repair cellular network equipment

ICTRFN4174A Undertake radio communications signals monitoring

ICTRFN4177A Install radio communications base station equipment

ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

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ICTRFN5148A Test and measure cellular phone and network equipment performance

Telecommunications engineering networks

ICTTEN3054B Provide infrastructure for telecommunications network equipment

ICTTEN3056A Install telecommunications network equipment

ICTTEN3077B Commission an electronic unit

ICTTEN3089A Repair and replace telecommunications network hardware

ICTTEN3104A Maintain an electronic system

ICTTEN4001B Identify requirements for customer telecommunications equipment

ICTTEN4003B Estimate and quote for customer telecommunications equipment installation

ICTTEN4040A Assign a transmission path

ICTTEN4051A Install configuration programs on PC based customer equipment

ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment

ICTTEN4073A Cut over customer premises equipment major upgrades

ICTTEN4076A Complete equipment and software upgrades

ICTTEN4078A Commission an electronic system

ICTTEN4086A Undertake routine maintenance of the telecommunications network

ICTTEN4087A Undertake remote diagnosis and repair of network faults

ICTTEN4102A Repair telecommunication system faults

Emerging technologies

ICTTEN4050A Install and configure a wireless mesh network

ICTTEN4126A Install and configure internet protocol TV in a home network

ICTTEN4202A Install and test a radio frequency identification system

ICTTEN4215A Install and configure internet protocol TV in a service provider network

ICTTEN4229B Design, install and configure a customer smart technology network

IP networks

ICTTEN4198A Install, configure and test an internet protocol network

ICTTEN4199A Install, configure and test a router

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ICTTEN4210A Implement and troubleshoot enterprise routers and switches

Small and micro business

BSBSMB401A Establish legal and risk management requirements of small business
BSBSMB405B Monitor and manage small business operations
BSBSMB407A Manage a small team

Sustainability

ICTSUS4183A Install and test renewable energy system for ICT networks
ICTSUS4184A Install and test power saving hardware
ICTSUS4186A Install thin client applications for power over ethernet

Workplace effectiveness

ICTWOR2141A Work effectively in a telecommunications technology team
ICTWOR4032A Undertake a civil site survey
ICTWOR4079A Schedule equipment maintenance

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Radio Installation

Core units plus:

- ICTTEN3056A Install telecommunications network equipment
- ICTTEN3077B Commission an electronic unit
- ICTTEN3089A Repair and replace telecommunications network hardware
- ICTTEN4078A Commission an electronic system

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- ICTTEN4102A Repair telecommunication system faults
- two additional units from elective units as appropriate to the specific job role

Radio field operations

Core units plus:

- CPPSEC3034A Operate information gathering equipment
- HLTFA311A Apply first aid
- BSBCUS402B Address customer needs
- four additional units from elective units as appropriate to the specific job role

Field monitoring and compliance

Core units plus:

- ICTCMP5176A Undertake radio communications site audit
- ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment
- ICTRFN4174A Undertake radio communications signals monitoring
- four additional units from elective units as appropriate to the specific job role

Wireless network equipment installer

Core units:

- ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment
- ICTRFN4158A Select an antenna system for radio communications
- ICTRFN4159A Test and repair cellular network equipment
- ICTRFN4177A Install radio communications base station equipment
- three additional units from elective units as appropriate to the specific job role

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ICT40410 Certificate IV in Radio Frequency Networks

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a technician with a range of telecommunications skills who can:

- install and maintain switching and transmission radio frequency (RF) equipment in the enterprise network
- install and maintain RF and wireless equipment for high speed broadband network infrastructure
- install and maintain telecommunications, data cabling and cabling products on customer premises Cabling at the customer premises in accordance to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner
- install and maintain internet protocol (IP) based network telecommunications equipment
- install and maintain telecommunications access network cabling and infrastructure, systems and basic customer premises equipment using optical networking technology
- assess installation requirements of converging voice, video and data IP networks
- plan and perform installations
- test installed equipment and fault find.

This role also involves a degree of autonomy and may include limited supervision of others.

Job Roles

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Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- customer equipment installer
- IP based network installer
- RF network infrastructure installer
- RF network technician secure IT network installer
- telecommunications radio technician
-

Prerequisite requirements

There are no prerequisite requirements for individual units of competency.

Pathways Information

Preferred pathways for candidates considering this qualification include:

- after achieving ICT30113 Certificate III in Broadband and Wireless Networks Technology or ICT30213 Certificate III in Telecommunications or ICT30313 Certificate III in Telecommunications Cabling or ICT30613 Certificate III in Broadband and Wireless Networks or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for ICT30113 Certificate III in Broadband and Wireless Networks Technology or ICT30213 Certificate III in Telecommunications or ICT30313 Certificate III in Telecommunications Cabling or ICT30613 Certificate III in Broadband and Wireless Networks or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving ICT40410 Certificate IV in Radio Frequency Networks, candidates may undertake ICT50410 Diploma of Radio Frequency Networks, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Diploma qualifications.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

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National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction and Plumbing Services Integrated Framework Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict

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	• applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining coaxial and optical fibre cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working

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	order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 11

5 core units, plus

1 elective unit from Group A workplace units, plus

5 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

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A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or any accredited course at Certificate IV or Diploma level. One of those two units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTPMG4152A Manage the delivery of network infrastructure

ICTRFN4095A Conduct radio frequency measurements

ICTRFN4158A Select an antenna system for radio communications

ICTSUS4185A Install and test power management software

ICTTEN4081A Locate, diagnose and rectify faults

ELECTIVE UNITS

Group A- Workplace elective units

BSBSMB401A Establish legal and risk management requirements of small business

BSBSMB405B Monitor and manage small business operations

BSBSMB407A Manage a small team

ICAICT401A Determine and confirm client business requirements

ICTTEN4003B Estimate and quote for customer telecommunications equipment installation

Group B - General elective units

Cabling

ICTCBL4002B Prepare design drawings and specification for a cable installation

ICTCBL4004B Schedule and supply cabling installation

ICTCBL4023B Supervise cabling project

ICTCBL4057B Test cable bearers

ICTCBL4099A Remotely locate and identify cable network faults

Digital reception technology

ICTDRE4166A Integrate customer digital reception equipment

ICTDRE4167A Integrate data delivery modes

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ICT use

IP networks

ICAICT405A Develop detailed technical design

ICANWK406A Install, configure and test network security

ICANWK416A Build security into virtual private networks

ICANWK417A Build an enterprise wireless network

ICANWK410A Install network hardware to a network

ICANWK411A Install software to networked computers

Occupational health and safety

ICTOHS2153B Work safely near power infrastructure

CPCCOHS1001A Work safely in the construction industry

Optical networks

ICTOPN4115B Install and test a dense wavelength division multiplexing system

ICTOPN4116A Use advanced optical test equipment

ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation

Project management

ICTPMG4048B Schedule installation of customer premises equipment

Radio frequency networks

ICTRFN4159A Test and repair cellular network equipment

ICTRFN4174A Undertake radio communications signals monitoring

ICTRFN4177A Install radio communications base station equipment

ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

Sustainability

ICTSUS4183A Install and test renewable energy system for ICT networks

ICTSUS4184A Install and test power saving hardware

ICTSUS4186A Install thin client applications for power over ethernet

Telecommunications engineering networks

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ICTTEN4001B Identify requirements for customer telecommunications equipment

ICTTEN4040A Assign a transmission path

ICTTEN4051A Install configuration programs on PC based customer equipment

ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment

ICTTEN4073A Cut over customer premises equipment major upgrades

ICTTEN4076A Complete equipment and software upgrades

ICTTEN4078A Commission an electronic system

ICTTEN4085A Monitor, analyse and action telecommunications network alarms

ICTTEN4086A Undertake routine maintenance of the telecommunications network

ICTTEN4087A Undertake remote diagnosis and repair of network faults

ICTTEN4102A Repair telecommunication system faults

Emerging technologies

ICTTEN4050A Install and configure a wireless mesh network

ICTTEN4126A Install and configure internet protocol TV in a home network

ICTTEN4202A Install and test a radio frequency identification system

ICTTEN4215A Install and configure internet protocol TV in a service provider network

ICTTEN4229B Design, install and configure a customer smart technology network

(IP networks)

ICTTEN4198A Install, configure and test an internet protocol network

ICTTEN4199A Install, configure and test a router

ICTTEN4210A Implement and troubleshoot enterprise routers and switches

ICTTEN4211A Design, install and configure an internetwork

ICTTEN4212A Apply advanced routing protocols to network design

ICTTEN4213A Configure and troubleshoot advanced network switching

ICTTEN4214A Install and maintain a wide area network

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ICT40510 Certificate IV in Telecommunications Network Planning

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a technician with a range of telecommunications skills and extensive knowledge of the core and access network capabilities of the service provider who can:

- plan the development of the customer access network infrastructure
- plan the development of the core network for the service provider and asst owner
- plan network capacity for new technology in products and services
- analyse demand data and evaluate network growth and impact on the network.

This qualification prepares an individual for entry in planning and design for network additions and implementations to accommodate network growth and new technologies within the industry. This is required for the national broadband infrastructure network planning.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- access network planner
- telecommunications technician planner.
-

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Prerequisite requirements

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving a Certificate III qualification from this or another accredited Training Package or accredited course

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving the ICT40510 Certificate IV in Telecommunications Network Planning, candidates may undertake the ICT50513 Diploma of Telecommunications Planning and Design, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Diploma qualifications.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• liaising with market research to determine existing capacity and capability of network • liaising with survey researchers to determine potential network growth

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	• documenting survey methods and results • reading, interpreting and using statistical network reports • conveying information to clients, colleagues and other site personnel • providing feedback to customers on market research surveys
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying planning scenarios or optimisation options • determining transmission routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones

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	• gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

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Packaging Rules

Total number of units = 11

6 core units, plus

1 elective unit from Group A workplace units, plus

2 elective units from Group B specialist units, plus

2 elective units from Group C general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group C general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate IV or Diploma level. One of those two units from Group C general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBINM302A Utilise a knowledge management system

ICTNPL4107A Apply business acumen to network planning

ICTNPL4114A Produce planning specifications for end to end service delivery

ICTNPL4150A Apply knowledge of regulation and legislation for the telecommunications industry

ICTPMG4152A Manage the delivery of network infrastructure

ICTSUS4185A Install and test power management software

ELECTIVE UNITS

Group A - Workplace elective units

BSBMGT401A Show leadership in the workplace

BSBWOR401A Establish effective workplace relationships

BSBWOR4032A Undertake a civil site survey

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Group B - Specialist elective units

ICTNPL4108A Plan the deployment of access network architectures

ICTNPL4109A Evaluate the capability of access networks

ICTNPL4110A Evaluate the planning requirements for provisioning a telecommunications building facility

ICTNPL4111A Develop provisioning of telecommunications building works project

ICTNPL4112A Evaluate core network architectures

ICTNPL4113A Plan the deployment of core network

ICTNPL4151A Plan the telecommunications access network for an estate

Group C - General Elective Units

Project management

BSBSMB407A Manage a small team

ICTPMG4048B Schedule installation of customer premises equipment

Telecommunications engineering networks

ICTTEN4040A Assign a transmission path

ICTTEN4085A Monitor, analyse and action telecommunications network alarms

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Access Network

Core units plus one Group A workplace elective unit plus:

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- ICTNPL4108A Plan the deployment of access network architectures
- ICTNPL4109A Evaluate the capability of access networks
- two additional units from Group C general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role.

Building Infrastructure

Core units plus one workplace unit plus:

- ICTNPL4110A Evaluate the planning requirements for provisioning a telecommunications building facility
- ICTNPL4111A Develop provisioning of telecommunications building works project
- two additional units from Group C general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role.

Core Network

Core units plus one Group A workplace elective unit plus:

- ICTNPL4112A Evaluate Core Network architectures
- ICTNPL4113A Plan the deployment of Core Network
- two additional units from Group C general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role.

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ICT40613 Certificate IV in Telecommunications Networks Technology

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Change in WHS core unit. Additional elective units included.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of a technician with a range of telecommunications skills who can:

- install and maintain enterprise network in emerging and converging technologies
- install and maintain optical and wireless equipment for high speed broadband network infrastructure
- install and maintain internet protocol (IP) based network telecommunications equipment
- install IP-based networks in home networks and small and medium enterprises
- install and maintain telecommunications, data cabling and cabling products on customer premises Cabling at the customer premises in accordance to requirements of the Australian Communications and Media Authority (ACMA) and relevant industry registration bodies, and in line with the specifications of the access network owner
- install and maintain telecommunications access network cabling and infrastructure, systems and basic customer premises equipment
- assess installation requirements of converging voice, video and data IP networks
- plan and performing installations
- test installed equipment and fault find.

This role involves a degree of autonomy and may include limited supervision of others.

Job Roles

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Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- customer computer system installer
- customer premises equipment installer
- home network installer
- IP-based network installer
- network security equipment installer
- optical network equipment installer
- radio technician
- RFID system installer
- secure IT network installer
- SME network installer
- sustainability network equipment installer
- telecommunications network technician
- wireless LAN installer wireless network equipment installer.
-

Prerequisite requirements

The following unit within this qualification have prerequisites. This is detailed as follows:

Code and title	Prerequisite unit required
ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule	ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Pathways Information

Pathways into the qualification

Candidates may enter this qualification with limited or no vocational experience and without a relevant lower level qualification.

Pathways from the qualification

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After achieving ICT40613 Certificate IV in Telecommunications Networks Technology, candidates may undertake ICT50210 Diploma of Telecommunications Network Engineering, a qualification for those seeking to develop more specialised technical skills and knowledge, or a range of other Diploma qualifications.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	• identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related WHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisational goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products

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Employability Skill	Industry/enterprise requirements for this qualification include:
	• identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 17

8 core units, plus

1 elective unit from Group A workplace units, plus

8 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of three units from Group B general elective units may be substituted with three units of competency from any endorsed Training Package or any accredited course at Certificate IV or Diploma level. One of those three units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTBWN3205B Use optical and radio frequency measuring instruments

ICTPMG4152A Manage the delivery of network infrastructure

ICTSUS4185A Install and test power management software

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN2140B Use hand and power tools

ICTTEN2219A Install and test internet protocol devices in convergence networks

ICTTEN4081A Locate, diagnose and rectify faults

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ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Workplace elective units

BSBSMB401A Establish legal and risk management requirements of small business

BSBSMB405B Monitor and manage small business operations

BSBSMB407A Manage a small team

ICAICT401A Determine and confirm client business requirements

ICTTEN4003B Estimate and quote for customer telecommunications equipment installation

Group B - General elective units

Cabling

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTCBL4002B Prepare design drawings and specification for a cable installation

ICTCBL4004B Schedule and supply cabling installation

ICTCBL4023B Supervise cabling project

ICTCBL4057B Test cable bearers

ICTCBL4099A Remotely locate and identify cable network faults

Digital reception technology

ICTDRE4166A Integrate customer digital reception equipment

ICTDRE4167A Integrate data delivery modes

ICT use

IP networks

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ICAICT405A Develop detailed technical design
ICANWK406A Install, configure and test network security
ICANWK416A Build security into virtual private networks
ICANWK417A Build an enterprise wireless network
ICANWK410A Install network hardware to a network
ICANWK411A Install software to networked computers
ICASAS301A Run standard diagnostic tests

Occupational health and safety

CPCCOHS1001A Work safely in the construction industry
ICTOHS2153B Work safely near power infrastructure

Optical networks

ICTOPN4115B Install and test a dense wavelength division multiplexing system
ICTOPN4116A Use advanced optical test equipment
ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation

Project management

ICTPMG4048B Schedule installation of customer premises equipment

Radio frequency networks

ICTRFN4095A Conduct radio frequency measurements
ICTRFN4158A Select an antenna system for radio communications
ICTRFN4159A Test and repair cellular network equipment
ICTRFN4174A Undertake radio communications signals monitoring
ICTRFN4177A Install radio communications base station equipment
ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

Sustainability

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ICTSUS4183A Install and test renewable energy system for ICT networks

ICTSUS4184A Install and test power saving hardware

ICTSUS4186A Install thin client applications for power over ethernet

Telecommunications engineering networks

ICTTEN2209A Build and maintain a secure network

ICTTEN3056A Install telecommunications network equipment

ICTTEN4001B Identify requirements for customer telecommunications equipment

ICTTEN4040A Assign a transmission path

ICTTEN4051A Install configuration programs on PC based customer equipment

ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment

ICTTEN4073A Cut over customer premises equipment major upgrades

ICTTEN4076A Complete equipment and software upgrades

ICTTEN4078A Commission an electronic system

ICTTEN4085A Monitor, analyse and action telecommunications network alarms

ICTTEN4086A Undertake routine maintenance of the telecommunications network

ICTTEN4087A Undertake remote diagnosis and repair of network faults

ICTTEN4102A Repair telecommunication system faults

Emerging technologies

ICTTEN4050A Install and configure a wireless mesh network

ICTTEN4126A Install and configure internet protocol TV in a home network

ICTTEN4202A Install and test a radio frequency identification system

ICTTEN4215A Install and configure internet protocol TV in a service provider network

ICTTEN4229B Design, install and configure a customer smart technology network

(IP networks)

ICTTEN4198A Install, configure and test an internet protocol network

ICTTEN4199A Install, configure and test a router

ICTTEN4210A Implement and troubleshoot enterprise routers and switches

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ICTTEN4211A Design, install and configure an internetwork

ICTTEN4212A Apply advanced routing protocols to network design

ICTTEN4213A Configure and troubleshoot advanced network switching

ICTTEN4214A Install and maintain a wide area network

ICTTEN5201A Install, configure and test a server

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Customer computer system installer

Core units plus one Group A workplace elective unit plus:

- ICAICT405A Develop detailed technical design
- ICTTEN4076A Complete equipment and software upgrades
- ICTTEN4198A Install, configure and test an internet protocol network
- five additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Customer premises equipment installer

Core units plus one Group A workplace elective unit plus:

- ICTTEN4051A Install configuration programs on PC based customer equipment
- ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment
- ICTTEN4073A Cut over customer premises equipment major upgrades
- ICTTEN4078A Commission an electronic system
- four additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

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Home network installer

Core units plus Group A workplace elective unit plus:

- ICTDRE4166A Integrate customer digital reception equipment
- ICTDRE4167A Integrate data delivery modes
- ICTTEN4126A Install and configure internet protocol TV in a home network
- ICTTEN4198A Install, configure and test an internet protocol network
- ICTTEN4229B Design, install and configure a customer smart technology network
- three additional units Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Network security equipment installer

Core units plus Group A workplace elective unit plus:

- ICANWK406A Install, configure and test network security
- ICANWK416A Build security into virtual private networks
- ICTTEN4198A Install, configure and test an internet protocol network
- ICTTEN4199A Install, configure and test a router
- four additional units Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Optical network equipment installer

Core units plus Group A workplace elective unit plus:

- ICTOPN4115B Install and test a dense wavelength division multiplexing system
- ICTOPN4116A Use advanced optical test equipment
- ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation
- ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network
- four additional units Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

RFID System installer

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Core units plus Group A workplace elective unit plus:

- ICANWK411A Install software to networked computers
- ICTTEN4202A Install and test a radio frequency identification system
- ICTTEN4198A Install, configure and test an internet protocol network
- ICTTEN4078A Commission an electronic system
- four additional units Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

SME network installer

Core units plus one Group A workplace elective unit plus:

- ICTTEN4210A Implement and troubleshoot enterprise routers and switches
- ICTTEN4211A Design, install and configure an internetwork
- ICTTEN4212A Apply advanced routing protocols to network design
- ICTTEN4213A Configure and troubleshoot advanced network switching
- four additional units Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Sustainability Network equipment installer

Core units plus Group A workplace elective unit plus:

- ICTSUS4183A Install and test renewable energy system for ICT networks
- ICTSUS4184A Install and test power saving hardware
- ICTSUS4186A Install thin client applications for power over ethernet
- five additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Wireless LAN installer

Core units plus Group A workplace elective unit plus:

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- ICANWK411A Install software to networked computers
- ICANWK416A Build security into virtual private networks
- ICANWK417A Build an enterprise wireless network
- ICTTEN4198A Install, configure and test an internet protocol network
- four additional units from Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

Wireless network equipment installer

Core units plus Group A workplace elective unit plus:

- ICTRFN4095A Conduct radio frequency measurements
- ICTRFN4158A Select an antenna system for radio communications
- ICTRFN4159A Test and repair cellular network equipment
- ICTRFN4177A Install radio communications base station equipment
- four additional units Group B general elective units, with a maximum of one of those additional units from Group A workplace elective units as appropriate to the specific job role

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ICT40713 Certificate IV in Telecommunications Network Design

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Description

This qualification reflects the role of a technician with a range of telecommunications skills and extensive knowledge of the access, building and core networks and client capabilities of the service provider, who can:

- design the customer access network
- design the building network
- design the core network for the service provider and asset owner
- design carrier equipment infrastructure.

This qualification prepares an individual for entry into design for network additions and implementations to accommodate network growth and new technologies within the industry. This is required for the national broadband infrastructure network design.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- access, building or core network designer
- telecommunications technician designer
- estimator, surveyor (scoper), or design draftsman.
-

Prerequisite units

The following units within this qualification have prerequisites. This is detailed as follows:

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Code and title	Prerequisite units required
ICTTCR3062A Build a telecommunications radio structure	ICTTCR2188A Use rigging practices and systems on telecommunications network structures ICTTCR2189A Use operational safety in a telecommunications rigging environment ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures
ICTTCR3191A Install radio plant and equipment on telecommunications structures	ICTTCR2188A Use rigging practices and systems on telecommunications network structures ICTTCR2189A Use operational safety in a telecommunications rigging environment ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving a Certificate III in Telecommunications qualification from this Training Package or accredited course

or

- with vocational experience and completion of units ICTCBL2133A, ICTCBL2136B, ICTCBL2137B, ICTCBL3021A and ICTBWN3090B

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

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After achieving ICT40713 Certificate IV in Telecommunications Network Design, candidates may undertake ICT50513 Diploma of Telecommunications Planning and Design, a qualification for those seeking to enter management or to develop more specialised technical skills and knowledge, or a range of other Diploma qualifications.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

National Code of Practice for Induction for Construction Work

Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007).

Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include:**
Communication	• liaising with client, suppliers and consultants for the supply of non-standard services and materials • negotiating with land and premises owners for the location of plant and equipment • negotiating with land and premises owners for the timing and location of installation and activities • negotiating with constructors on installation requirements • documenting survey methods and results • reading, interpreting and using statistical network reports • conveying information to clients, colleagues and other site personnel
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	• working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying design scenarios or optimisation options • determining transmission routes, taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying non-standard or special order services and materials • planning timing and installation activities to meet client and other stakeholder requirements • planning to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the design of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
	• prioritising work according to organisational guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related WHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisational goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and are adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing and repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

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Packaging Rules

Total number of units = 12

6 core units, plus

1 elective unit from Group A workplace units, plus

5 elective units from Group B general units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two units from Group B general elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Certificate IV or Diploma level. One of those two units from Group B general elective units may be substituted from Group A workplace elective units where required by a specific job role.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

CPCCOHS1001A Work safely in the construction industry

ICTTEN4241A Design network projects

ICTTEN4242A Conduct site surveys to identify carrier installation requirements

ICTTEN4243A Prepare design drawings and specifications for telecommunications installations

ICTTEN4244A Estimate and quote for carrier telecommunications equipment installations

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ELECTIVE UNITS

Group A - Workplace elective units

BSBMGT401A Show leadership in the workplace

BSBWOR401A Establish effective workplace relationships

ICAICT401A Determine and confirm client business requirements

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Group B – General elective units

Broadband and wireless networks

ICTBWN3090B Install lead-in module and cable for fibre to the premises

Network Planning

ICTNPL4111A Develop provisioning of telecommunications building works project
ICTNPL4112A Evaluate core network architectures
ICTNPL4113A Plan the deployment of core network
ICTNPL4247A Apply compliance requirements to telecommunications work
ICTNPL4151A Plan the telecommunications access network for an estate

Radio frequency networks

ICTRFN4095A Conduct radio frequency measurements
ICTRFN4158A Select an antenna system for radio communications
ICTRFN4174A Undertake radio communications signals monitoring
ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network
ICTRFN5148A Test and measure cellular phone and network equipment performance

Optical networks

ICTOPN4115B Install and test a dense wavelength division multiplexing system
ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation

Project management

BSBSMB407A Manage a small team
ICTPMG4048B Schedule installation of customer premises equipment
ICTPMG4152A Manage the delivery of network infrastructure

Sustainability

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BSBSUS201A Participate in environmentally sustainable work practices

BSBSUS301A Implement and monitor environmentally sustainable work practices

CPCSUS4001A Implement and monitor environmentally sustainable work practices

Workplace Effectiveness

ICTWOR4032A Undertake a civil site survey

Telecommunications rigging installation

ICTTCR2188A Use rigging practices and systems on telecommunications network structures

ICTTCR2189A Use operational safety in a telecommunications rigging environment

ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures

ICTTCR3062A Build a telecommunications radio structure

ICTTCR3191A Install radio plant and equipment on telecommunications structures

Telecommunications engineering networks

ICTTEN4001B Identify requirements for customer telecommunications equipment

ICTTEN4003B Estimate and quote for customer telecommunications equipment installation

ICTTEN4040A Assign a transmission path

ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment

ICTTEN4073A Cut over customer premises equipment major upgrades

ICTTEN4198A Install, configure and test an internet protocol network

ICTTEN4199A Install, configure and test a router

ICTTEN4211A Design, install and configure an internetwork

ICTTEN4212A Apply advanced routing protocols to network design

ICTTEN4229B Design, install and configure a customer smart technology network

ICTTEN4245A Design infrastructure for telecommunications network installations

ICTTEN4246A Design dense wavelength digital multiplexing installations

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ICT use

ICAICT405A Develop detailed technical design

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ICT50110 Diploma of Optical Networks

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual involving a high level of specialist technical skills and knowledge in telecommunications and IT networks using internet protocol (IP) systems who can:

- install, test and commission voice and data optical communications networks in medium to large enterprises using next generation networks technologies
- provide specialist technical support in monitoring and administering the installation and upgrade of large telecommunications optical networks
- install and maintain IP based optical network telecommunications equipment.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- installer of emerging technologies
- IP based optical network installer
- specialised optical network infrastructure planner
- telecommunications technical specialist
-

Prerequisite requirements

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There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving the ICT40110 Certificate IV in Optical Networks or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for the ICT40110 Certificate IV in Optical Networks or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

For candidates seeking to develop more specialised technical skills and knowledge, the electives selected in the ICT50110 Diploma of Optical Networks should be considered with a view to meeting pathways into the ICT60110 Advanced Diploma of Optical Networks qualification or the ICT60210 Advanced Diploma of Telecommunications Network Engineering or a range of other Advanced Diploma qualifications or University programs.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• Determining options to rectify faults and discussing them with customer so that necessary action is determined

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	• Documenting test methods and results • Making a complete check of installation against installation plans • Reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines

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	• interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related ohs requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment

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	• undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 10

6 core units, plus

4 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Diploma or Advanced Diploma level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS501A Develop workplace policy and procedures for sustainability

ICTOPN5118A Plan and configure dense wavelength division multiplexing systems

ICTOPN5119A Perform acceptance and commissioning tests on optical network

ICTOPN5120A Plan for an optical system upgrade and cut over

ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system

ICTOPN5123A Analyse and integrate specialised optical devices in the network

ELECTIVE UNITS

Compliance

ICTCMP5176A Undertake radio communications site audit

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Education

ICTEDU5025A Develop and deliver training associated with new and modified products

ICT use

IP networks

ICAICT508A Evaluate vendor products and equipment

ICANWK516A Determine best-fit topology for a local network

Optical networks

ICTOPN5122A Test the performance of specialised optical devices

Product skills and advice

ICTPRO5026A Develop training, marketing and sales resources for telecommunications products

Project management

BSBPMG522A Undertake project work

ICTPMG5027A Develop customer premises equipment installation project plans

ICTPMG5031A Prepare a project brief

ICTTEN5037A Design a telecommunications project

ICTPMG5039A Prepare project specifications

Sustainability

ICTSUS5187A Implement server virtualisation for a sustainable ICT system

Telecommunications engineering networks

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ICTITU5144A Test telecommunications network using virtual instruments

ICTTEN5038A Design an electronic system for a telecommunications network

ICTTEN5058A Acceptance test new systems and equipment

ICTTEN5059A Commission telecommunications network equipment

ICTTEN5060A Integrate new systems and equipment into the telecommunications network

ICTTEN5061A Cut over new and replacement network equipment

ICTTEN5083A Locate, diagnose and rectify complex faults

ICTTEN5084A Provide expert advice and support on complex faults

ICTTEN5092A Undertake planned outage management

ICTTEN5204A Produce technical solutions from business specifications

Emerging technologies

ICTTEN5203A Dimension and design a radio frequency identification system

ICTTEN5217A Plan a wireless mesh network

IP networks

ICTTEN5147A Administer a data communications network

ICTTEN5168A Design and implement an enterprise voice over internet protocol and a unified communications network

ICTTEN5201A Install, configure and test a server

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ICT50210 Diploma of Telecommunications Network Engineering

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of individuals involving a high level of specialist technical skills and knowledge in telecommunications and IT networks using internet protocol (IP) systems who can:

- install, test and commission voice and data communications networks in medium to large enterprises using Next Generation Networks (NGN) technologies
- provide specialist technical support in monitoring and administering the installation and upgrade of large telecommunications and IT networks
- cover local area networks (LAN) and wide area networks (WAN), IP based protocol systems, voice over internet protocol (VoIP) and unified communications networks, secured networks, 3G/4G cellular mobile networks, microwave systems, wireless and wired line networks, databases, routers, switches and servers
- install and maintain IP based network telecommunications equipment.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- installer of emerging technologies
- IP based network installer
- specialised network infrastructure installer
- secure IT network installer

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- telecommunications technical specialist.
-

Prerequisite units

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving the ICT40210 Certificate IV in Telecommunications Network Engineering or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for the ICT40210 Certificate IV in Telecommunications Network Engineering or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

For candidates seeking to develop more specialised technical skills and knowledge, the electives selected in the ICT50210 Diploma of Telecommunications Network Engineering, should be considered with a view to meeting pathways into the ICT60110 Advanced Diploma of Optical Networks qualification or the ICT60210 Advanced Diploma of Telecommunications Network Engineering or a range of other Advanced Diploma qualifications or University programs.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

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Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas

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Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications

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	• converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 10

4 core units, plus

6 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Diploma or Advanced Diploma level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBPMG522A Undertake project work

BSBSUS501A Develop workplace policy and procedures for sustainability

ICTPMG5031A Prepare a project brief

ICTTEN5037A Design a telecommunications project

ELECTIVE UNITS

Compliance

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ICTCMP5176A Undertake radio communications site audit

Education

ICTEDU5025A Develop and deliver training associated with new and modified products

ICT use

(IP networks)

ICAICT508A Evaluate vendor products and equipment

ICANWK516A Determine best-fit topology for a local network

Network planning

ICTNPL5071A Develop planning strategies for core network design

ICTNPL5096A Develop planning strategies for access network design

ICTNPL5101A Apply service measures and demand forecasting to products and services planning

ICTNPL5154A Develop planning strategies for building environment design

Optical networks

ICTOPN5118A Plan and configure dense wavelength division multiplexing systems

ICTOPN5119A Perform acceptance and commissioning tests on optical network

ICTOPN5120A Plan for an optical system upgrade and cut over

ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system

ICTOPN5122A Test the performance of specialised optical devices

ICTOPN5123A Analyse and integrate specialised optical devices in the network

Project management

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ICTPMG5027A Develop customer premises equipment installation project plans

ICTPMG5039A Prepare project specifications

Product specific skills and advice

ICTPRO5026A Develop training, marketing and sales resources for telecommunications products

Radio frequency networks

ICTRFN5097A Test cellular handset enhancements and international roaming agreements

ICTRFN5148A Test and measure cellular phone and network equipment performance

ICTRFN5179A Evaluate and analyse radio frequency signal coverage plots

Sustainability

ICTSUS5187A Implement server virtualisation for a sustainable ICT system

Telecommunications engineering networks

ICTITU5144A Test telecommunications network using virtual instruments

ICTTEN5024A Provide consultancy and technical support in the customer premises equipment sector

ICTTEN5038A Design an electronic system for a telecommunications network

ICTTEN5058A Acceptance test new systems and equipment

ICTTEN5059A Commission telecommunications network equipment

ICTTEN5060A Integrate new systems and equipment into the telecommunications network

ICTTEN5061A Cut over new and replacement network equipment

ICTTEN5083A Locate, diagnose and rectify complex faults

ICTTEN5084A Provide expert advice and support on complex faults

ICTTEN5092A Undertake planned outage management

ICTTEN5204A Produce technical solutions from business specifications

Emerging technologies

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ICTTEN5203A Dimension and design a radio frequency identification system

ICTTEN5217A Plan a wireless mesh network

IP networks

ICTTEN5147A Administer a data communications network

ICTTEN5168A Design and implement an enterprise voice over internet protocol and a unified communications network

ICTTEN5200A Install, configure and test a local area network switch

ICTTEN5201A Install, configure and test a server

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Customer business

Core units plus:

- ICAICT508A Evaluate vendor products and equipment
- ICTPMG5027A Develop customer premises equipment installation project plans
- ICTPMG5039A Prepare project specifications
- ICTTEN5024A Provide consultancy and technical support in the customer premises equipment sector
- ICTTEN5204A Produce technical solutions from business specifications
- one additional unit from elective units as appropriate to the specific job role

IP Networks

Core units plus:

- ICANWK516A Determine best-fit topology for a local network

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- ICTTEN5147A Administer a data communications network
- ICTTEN5168A Design and implement an enterprise voice over internet protocol and a unified communications network
- ICTTEN5200A Install, configure and test a local area network switch
- ICTTEN5201A Install, configure and test a server
- one additional unit from elective units as appropriate to the specific job role

Emerging technologies

Core units plus:

- ICTSUS5187A Implement server virtualisation for a sustainable ICT system
- ICTTEN5203A Dimension and design a radio frequency identification system
- ICTTEN5217A Plan a wireless mesh network
- three additional units from elective units as appropriate to the specific job role

Broadband infrastructure

Core units plus:

- ICTOPN5118A Plan and configure dense wavelength division multiplexing systems
- ICTOPN5120A Plan for an optical system upgrade and cut over
- ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system
- ICTRFN5179A Evaluate and analyse radio frequency signal coverage plots
- two additional units from elective units as appropriate to the specific job role

Workplace development

Core units plus:

- ICTEDU5025A Develop and deliver training associated with new and modified products
- ICTPRO5026A Develop training, marketing and sales resources for telecommunications products
- ICTTEN5084A Provide expert advice and support on complex faults
- three additional units from elective units as appropriate to the specific job role

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ICT50310 Diploma of Telecommunications Management

Modification History

Release	Comments
Release 3	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions, including core unit ICTTEN2219A which was updated ICTTEN2219A Install and test internet protocol devices in convergence networks.
Release 2	This version released with *ICT10 Integrated Telecommunications Training Package v2.0*. Updated imported units *FNSICORG517B* to *FNSORG517B.* Qualification outcomes remain unchanged.
Release 1	This qualification first released with *ICT10 Integrated Telecommunications Training Package v1.0.*

Description

This qualification reflects the role of a qualified industry manager entering the telecommunications industry with a potential role involving a fundamental level of technical skills and knowledge in telecommunications and IT networks using internet protocol (IP) systems who can:

- install and test a simple IP device in convergence networks
- apply business acumen to telecommunications network planning
- develop project management plan to appreciate the operational issues of a service provider.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- human resources (HR) manager
- recruitment manager
- customer service manager

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- accounts manager
- finance manager
- operations manager.
-

Prerequisite units

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving a Certificate IV or higher level qualification from an endorsed Training Package qualification or accredited course

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

For candidates seeking to develop more specialised technical skills and knowledge, the electives selected in the ICT50310 Diploma of Telecommunications Management should be considered with a view to meeting pathways into the ICT60210 Advanced Diploma of Telecommunications Network Engineering or a range of other Advanced Diploma qualifications or University programs.

Licensing/Regulatory Information

All training programs must be conducted with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	Industry/enterprise requirements for this qualification

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	include:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies

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	to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and

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	products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 10

6 core units, plus

4 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Diploma or Advanced Diploma level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBSUS501A Develop workplace policy and procedures for sustainability

ICTNPL4107A Apply business acumen to network planning

ICTNPL4150A Apply knowledge of regulation and legislation for the telecommunications industry

ICTNPL5101A Apply service measures and demand forecasting to products and services planning

ICTPMG6033A Develop a project management plan

ICTTEN2219A Install and test internet protocol devices in convergence networks

ELECTIVE UNITS

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Education

ICTEDU5025A Develop and deliver training associated with new and modified products

Financial

FNSORG506A Prepare financial forecasts and projections

ICT use

IP networks

ICAICT508A Evaluate vendor products and equipment

Occupational health and safety

ICTWHS2170B Follow work health and safety and environmental policies and procedures

BSBWHS504A Manage WHS hazards and risks

BSBWHS501A Ensure a safe workplace

Product skills and advice

ICTPRO5026A Develop training, marketing and sales resources for telecommunications products

Project management

BSBPMG521A Manage project integration

ICTPMG5031A Prepare a project brief

ICTPMG5039A Prepare project specifications

Sustainability

ICTSUS5187A Implement server virtualisation for a sustainable ICT system

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Telecommunications engineering networks

ICTTEN5037A Design a telecommunications project

ICTTEN5204A Produce technical solutions from business specifications

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ICT50410 Diploma of Radio Frequency Networks

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. BSBPMG510A Manage projects replaced with equivalent unit BSBPMG522A Undertake project work. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual involving a high level of specialist technical skills and knowledge in telecommunications radio frequency (RF) and IT networks using internet protocol (IP) systems who can:

- install, test and commission voice and data RF communications networks in medium to large enterprises using next generation networks technologies
- provide specialist technical support in monitoring and administering the installation and upgrade of large telecommunications RF networks
- install and maintain IP based RF network telecommunications equipment.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- telecommunications technical specialist
- planner of specialised RF network infrastructure
- installer of IP based RF networks
- installer of emerging technologies.
-

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Prerequisite units

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving the ICT40410 Certificate IV in Radio Frequency Networks or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for the ICT40410 Certificate IV in Radio Frequency Networks or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

For candidates seeking to develop more specialised technical skills and knowledge, the electives selected in the ICT50410 Diploma of Radio Frequency Networks, should be considered with a view to meeting pathways into the ICT60110 Advanced Diploma of Optical Networks qualification or the ICT60210 Advanced Diploma of Telecommunications Network Engineering or a range of other Advanced Diploma qualifications or University programs.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:

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Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site

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	• identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products

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	• identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 10

6 core units, plus

4 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Diploma or Advanced Diploma level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBPMG522A Undertake project work

BSBSUS501A Develop workplace policy and procedures for sustainability

ICTPMG5031A Prepare a project brief

ICTTEN5037A Design a telecommunications project

ICTTEN5217A Plan a wireless mesh network

ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks

ELECTIVE UNITS

Compliance

ICTCMP5176A Undertake radio communications site audit

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Education

ICTEDU5025A Develop and deliver training associated with new and modified products

ICT use

IP networks

ICAICT508A Evaluate vendor products and equipment

ICANWK516A Determine best-fit topology for a local network

IT use

ICTITU5144A Test telecommunications network using virtual instruments

Product skills and advice

ICTPRO5026A Develop training, marketing and sales resources for telecommunications products

Project management

ICTPMG5027A Develop customer premises equipment installation project plans

ICTPMG5039A Prepare project specifications

Radio frequency networks

ICTRFN5097A Test cellular handset enhancements and international roaming agreements

ICTRFN5148A Test and measure cellular phone and network equipment performance

ICTRFN5179A Evaluate and analyse radio frequency signal coverage plots

ICTRFN6098B Monitor the capacity of and recommend changes to the cellular mobile network

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Sustainability

ICTSUS5187A Implement server virtualisation for a sustainable ICT system

Telecommunications

ICTTEN5038A Design an electronic system for a telecommunications network

ICTTEN5058A Acceptance test new systems and equipment

ICTTEN5059A Commission telecommunications network equipment

ICTTEN5060A Integrate new systems and equipment into the telecommunications network

ICTTEN5061A Cut over new and replacement network equipment

ICTTEN5083A Locate, diagnose and rectify complex faults

ICTTEN5084A Provide expert advice and support on complex faults

ICTTEN5092A Undertake planned outage management

ICTTEN5204A Produce technical solutions from business specifications

Emerging technologies

ICTTEN5203A Dimension and design a radio frequency identification system

IP networks

ICTTEN5147A Administer a data communications network

ICTTEN5168A Design and implement an enterprise voice over internet protocol and a unified communications network

ICTTEN5201A Install, configure and test a server

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ICT50513 Diploma of Telecommunications Planning and Design

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Additional elective units included.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual involving a technical specialist with a range of telecommunications skills and extensive knowledge of the core and access network capabilities of the service provider who can:

- plan the development of the customer access network infrastructure
- plan the development of the core network for the service provider and asset owner
- plan network capacity for new technology in products and services
- analyse demand data and evaluate network growth and impact on the network.

This qualification prepares individuals for the industry in planning and design for network additions and implementations to accommodate network growth and new technologies.

This is required for the national broadband infrastructure network planning.

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- service provider network planner
- service provider network designer
- telecommunications planning specialist.

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Prerequisite units

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Preferred pathways for candidates considering this qualification include:

- after achieving ICT40510 Certificate IV in Telecommunications Network Planning or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for ICT40510 Certificate IV in Telecommunications Network Planning or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

For candidates seeking to develop more specialised technical skills and knowledge, the electives selected in ICT50513 Diploma of Telecommunications Planning and Design should be considered with a view to meeting pathways into ICT60110 Advanced Diploma of Optical Networks or ICT60210 Advanced Diploma of Telecommunications Network Engineering or a range of other Advanced Diploma qualifications or university programs.

Licensing/Regulatory Information

All training programs must be conducted with reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

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Employability Skills Summary

Employability Skill	Industry/enterprise requirements for this qualification include:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisational goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas

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Employability Skill	**Industry/enterprise requirements for this qualification include:**
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related WHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisational goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product

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Employability Skill	Industry/enterprise requirements for this qualification include:
	features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 10

6 core units, plus

4 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Diploma or Advanced Diploma level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

BSBPMG521A Manage project integration

BSBSUS501A Develop workplace policy and procedures for sustainability

ICTNPL5071A Develop planning strategies for core network design

ICTNPL5096A Develop planning strategies for access network design

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ICTNPL5101A Apply service measures and demand forecasting to products and services planning

ICTNPL5154A Develop planning strategies for building environment design

ELECTIVE UNITS

Education

ICTEDU5025A Develop and deliver training associated with new and modified products

Financial management

BSBFIM501A Manage budgets and financial plans

FNSORG506A Prepare financial forecasts and projections

Product skills and advice

ICTPRO5026A Develop training, marketing and sales resources for telecommunications products

Project management

ICTPMG5031A Prepare a project brief

ICTPMG5039A Prepare project specifications

ICTPMG6033A Develop a project management plan

Network planning

ICTNPL6029A Plan the development and growth of the telecommunications network

Sustainability

ICTSUS5187A Implement server virtualisation for a sustainable ICT system

Telecommunications engineering networks

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ICTTEN4241A Design network projects

ICTTEN4242A Conduct site surveys to identify carrier installation requirements

ICTTEN4243A Prepare design drawings and specifications for telecommunications installations

ICTTEN4244A Estimate and quote for carrier telecommunications equipment installations

ICTTEN5024A Provide consultancy and technical support in the customer premises equipment sector

(Emerging technologies)

ICTTEN5217A Plan a wireless mesh network

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Commercial business

Core units plus:

- BSBFIM501A Manage budgets and financial plans
- FNSORG506A Prepare financial forecasts and projections.
- two additional units from elective units as appropriate to the specific job role

Project management

Core units plus:

- BSBFIM501A Manage budgets and financial plans
- ICTPMG5039A Prepare project specifications
- two additional units from elective units as appropriate to the specific job role

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Customer focus

Core units plus:

ICTEDU5025A Develop and deliver training associated with new and modified products

ICTPRO5026A Develop training, marketing and sales resources for telecommunications products

two additional units from elective units as appropriate to the specific job role

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ICT60110 Advanced Diploma of Optical Networks

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual involving a high level of specialist technical skills and knowledge in optical telecommunications and IT networks using internet protocol (IP) systems who can:

- forecast network growth for enterprise network planning
- design and manage IP based optical network telecommunications equipment
- implement convergence technologies in enterprise telecommunications networks
- design and manage optical and wireless network telecommunications architectures for high speed broadband capability.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- telecommunications network manager
- optical network designer
- IP based convergence integrator
- IP based optical network designer
- network security manager.
-

Prerequisite units

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There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification through a number of entry points demonstrating potential to undertake vocational education and training at advanced diploma level, including:

- after achieving the ICT50110 Diploma of Optical Networks or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for the ICT50110 Diploma of Optical Networks or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

For candidates seeking to develop more specialised technical skills and knowledge, the electives selected in the ICT60110 Advanced Diploma of Optical Networks should include ICTPMG6034A and ICTTEN6206A with a view to undertaking the ICT70110 Vocational Graduate Certificate in Telecommunications Network. Or, after achieving the ICT60110 Advanced Diploma of Optical Networks, candidates may seek articulation into a University program.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

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Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas

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Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications

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	• converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 10

6 core units, plus

4 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Advanced Diploma or Vocational Graduate Certificate level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or are available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTOPN6124A Manage optical ethernet transmission

ICTOPN6125A Manage dense wavelength division multiplexing transmission system

ICTOPN6128A Design a dense wavelength division multiplexing system

ICTOPN6129A Analyse optical transmission systems

ICTPMG6033A Develop a project management plan

ICTSUS6233A Integrate sustainability in ICT planning and design projects

ELECTIVE UNITS

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ICT use

IP networks

ICANWK502A Implement secure encryption technologies
ICANWK503A Install and maintain valid authentication processes
ICANWK517A Determine best-fit topology for a wide area network
ICANWK518A Design an enterprise wireless local area network
ICANWK509A Design and implement a security perimeter for ICT networks
ICASAS409A Manage risks involving ICT systems and technology
ICASAS505A Review and update disaster recovery and contingency plans

Network planning

ICTNPL6029A Plan the development and growth of the telecommunications network
ICTNPL6030A Forecast service demand
ICTNPL6046A Undertake network performance analysis

Occupational health and safety

BSBWHS501A Ensure a safe workplace
BSBWHS504A Manage WHS hazards and risks

Project management

ICTPMG6034A Prepare a detailed design brief

Radio frequency networks

ICTRFN6098B Monitor the capacity of and recommend changes to the cellular mobile network
ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks

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Sustainability

ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects

Telecommunications engineering networks

ICTTEN6036A Undertake qualification testing of new or enhanced equipment and systems

ICTTEN6042A Undertake system administration

ICTTEN6043A Undertake network traffic management

ICTTEN6044A Coordinate fault rectification and restoration of service following network outages

ICTTEN6045A Implement planned network changes with minimal impact to the customer

ICTTEN6047A Manage a common channel signalling network

ICTTEN6091A Analyse and organise repair of highly complex telecommunications network faults

ICTTEN6094A Verify new software and hardware releases

ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks

ICTTEN6206A Produce an ICT network architecture design

Emerging technologies

ICTTEN6216A Design and manage internet protocol TV in a service provider network

IP networks

ICTTEN6172A Install and configure an IP-MPLS network with virtual private network tunnelling

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ICT60210 Advanced Diploma of Telecommunications Network Engineering

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual involving a high level of specialist technical skills and knowledge in telecommunications and IT networks using internet protocol (IP) systems who can:

- forecast network growth for enterprise network planning
- design and manage IP based network telecommunications equipment
- implement convergence technologies in enterprise telecommunications networks
- design and manage optical and wireless network telecommunications architectures for high speed broadband capability.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- telecommunications network manager
- network designer
- IP based convergence integrator
- IP based network designer
- network security manager.
-

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Prerequisite units

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification through a number of entry points demonstrating potential to undertake vocational education and training at advanced diploma level, including:

- after achieving the ICT50210 Diploma of Telecommunications Network Engineering or another relevant accredited Training Package qualification or relevant accredited course

or

- providing evidence of competency in the core units required for the ICT50210 Diploma of Telecommunications Network Engineering or equivalent units with vocational experience

or

- with substantial vocational experience but without a formal qualification.

Pathways from the qualification

After achieving the ICT60210 Advanced Diploma of Telecommunications Network Engineering, candidates may undertake the ICT70110 Vocational Graduate Certificate in Telecommunications Network Engineering or seek articulation into a University program.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:

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Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site

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	• identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products

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	• identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 10

4 core units, plus

6 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level. A minimum of 2 of these electives must be taken from Advanced Diploma level.

A maximum of two elective units may be substituted with two units of competency from any endorsed Training Package or accredited course at Advanced Diploma or Vocational Graduate Certificate level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or are available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTPMG6033A Develop a project management plan

ICTPMG6034A Prepare a detailed design brief

ICTSUS6233A Integrate sustainability in ICT planning and design projects

ICTTEN6206A Produce an ICT network architecture design

ELECTIVE UNITS

ICT use

(IP networks)

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ICANWK502A Implement secure encryption technologies

ICANWK503A Install and maintain valid authentication processes

ICANWK509A Design and implement a security perimeter for ICT networks

ICANWK517A Determine best-fit topology for a wide area network

ICANWK518A Design an enterprise wireless local area network

ICANWK520A Design IT system security controls

ICASAS409A Manage risks involving ICT systems and technology

ICASAS505A Review and update disaster recovery and contingency plans

Network planning

ICTNPL6029A Plan the development and growth of the telecommunications network

ICTNPL6030A Forecast service demand

ICTNPL6046A Undertake network performance analysis

Occupational health and safety

BSBWHS504A Manage WHS hazards and risks

BSBWHS501A Ensure a safe workplace

Optical networks

ICTOPN6124A Manage optical ethernet transmission

ICTOPN6125A Manage dense wavelength division multiplexing transmission system

ICTOPN6128A Design a dense wavelength division multiplexing system

ICTOPN6129A Analyse optical transmission systems

Radio frequency networks

ICTRFN6098B Monitor the capacity of and recommend changes to the cellular mobile network

ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks

Sustainability

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ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects

Telecommunications engineering networks

ICTTEN6036A Undertake qualification testing of new or enhanced equipment and systems

ICTTEN6042A Undertake system administration

ICTTEN6043A Undertake network traffic management

ICTTEN6044A Coordinate fault rectification and restoration of service following network outages

ICTTEN6045A Implement planned network changes with minimal impact to the customer

ICTTEN6047A Manage a common channel signalling network

ICTTEN6091A Analyse and organise repair of highly complex telecommunications network faults

ICTTEN6094A Verify new software and hardware releases

ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks

Emerging technologies

ICTTEN6216A Design and manage internet protocol TV in a service provider network

IP networks

ICTTEN6172A Install and configure an IP-MPLS network with virtual private network tunnelling

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Network manager

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Core units plus:

- ICTOPN6124A Manage optical ethernet transmission
- ICTTEN6042A Undertake system administration
- ICTTEN6043A Undertake network traffic management
- ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects
- two additional units from elective units as appropriate to the specific job role

Network designer

Core units plus:

- ICTOPN6128A Design a dense wavelength division multiplexing system
- ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks
- ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks
- ICTTEN6216A Design and manage internet protocol TV in a service provider network
- ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects
- one additional unit from elective units as appropriate to the specific job role

Network planner

Core units plus:

- ICTNPL6029A Plan the development and growth of the telecommunications network
- ICTRFN6098B Monitor the capacity of and recommend changes to the cellular mobile network
- ICTTEN6045A Implement planned network changes with minimal impact to the customer
- ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects
- two additional units from elective units as appropriate to the specific job role

IP convergence integrator

Core units plus:

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- ICTOPN6124A Manage optical ethernet transmission
- ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks
- ICTTEN6172A Install and configure an IP-MPLS network with virtual private network tunnelling
- ICTTEN6216A Design and manage internet protocol TV in a service provider network
- ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects
- one additional unit from elective units as appropriate to the specific job role

Network security manager

Core units plus:

- ICASAS505A Review and update disaster recovery and contingency plans
- ICANWK509A Design and implement a security perimeter for ICT networks
- ICANWK502A Implement secure encryption technologies
- ICANWK503A Install and maintain valid authentication processes
- ICANWK520A Design IT system security controls
- one additional unit from elective units as appropriate to the specific job role

Wireless network designer

Core units plus:

- ICANWK518A Design an enterprise wireless local area network
- ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks
- ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks
- three additional units from elective units as appropriate to the specific job role

Optical networks designer

Core units plus:

- ICTOPN6128A Design a dense wavelength division multiplexing system
- ICTOPN6129A Analyse optical transmission systems

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- ICTTEN6036A Undertake qualification testing of new or enhanced equipment and systems
- three additional units from elective units as appropriate to the specific job role

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ICT70110 Vocational Graduate Certificate in Telecommunications Network Engineering

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual involving a high level of technical management skills and knowledge in telecommunications networks and systems who can:

- plan changes and analyse network problems over a wide range of telecommunications technologies at managerial/supervisory levels
- diagnose problems and provide network management support
- plan a project from a design specification, research telecommunications technologies to meet the required specifications and report on the implementation of the project plan
- research and analyse the key concepts in design, construct and modify network management databases
- evaluate management systems and procedures used by the telecommunications industry.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- system engineer
- solutions architect
- applications technology specialist
- network technology specialist
- network testing specialist

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- requirements manager.
-

Prerequisite units

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification through a number of entry points demonstrating potential to undertake study at graduate level, including from:

- the ICT60110 Advanced Diploma of Optical Networks or the ICT60210 Advanced Diploma of Telecommunications Network Engineering or another relevant accredited Training Package qualification or relevant accredited course

or

- a relevant Advanced Diploma or Diploma, or a relevant Certificate IV or Certificate III together with significant relevant vocational practice

or

- a higher education qualification, together with relevant vocational practice

or

- relevant extensive vocational practice, without formal qualifications.

Pathways from the qualification

After achieving the ICT70110 Vocational Graduate Certificate of Telecommunications Network Engineering, candidates seeking to develop more specialised technical skills and knowledge may undertake the ICT80110 Vocational Graduate Diploma of Telecommunications Network Engineering qualification or seek articulation into a university program.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

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Entry Requirements

There are no entry requirements for this qualification.

Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer

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	requirements • following up promptly on difficulties and known problem areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities for work team members • providing training to customers on system, product, product

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	features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 6

3 core units, plus

3 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any currently endorsed Training Package or accredited course at Vocational Graduate Certificate or Vocational Graduate Diploma level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTPMG7145B Undertake a telecommunications project

ICTPMG8142A Manage telecommunications workplace

ICTSUS7235A Use ICT to improve sustainability outcomes

ELECTIVE UNITS

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IT use

(IP networks)

ICTITU7106B Manage automated ICT system applications using Unix

Project management

ICTPMG8143B Manage a telecommunications project

Sustainability

ICTSUS7236A Manage improvements in ICT sustainability

Radio frequency networks

ICTRFN7182B Produce a radio link budget

Telecommunications engineering networks

ICTTEN7193B Plan a transmission network

ICTTEN7219A Manage alignment of systems with product and technology strategy

ICTTEN7220A Translate domain and solution architectures into platform requirements and designs

ICTTEN7221A Manage end to end architectural solutions across multiple domains

ICTTEN7222A Manage solution architecture and impacts in line with organisational processes

ICTTEN7223A Manage application layer solutions

ICTTEN7224A Manage voice, data and internet protocol network solutions

ICTTEN7225A Manage network testing strategies

ICTTEN7226A Manage development and application of testing artefacts

ICTTEN7227B Analyse business specifications to produce technical solutions

ICTTEN7228A Manage project requirements and process implementations

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ICTTEN7230A Scope project requirements and process solutions

Selecting electives for different outcomes

The context of this qualification varies and this must guide the selection of elective units.

The following examples are designed to assist in the selection of appropriate electives for particular outcomes at this level but they are in no way prescriptive.

Systems engineer

Core units plus:

- ICTTEN7219A Manage alignment of systems with product and technology strategy
- ICTTEN7220A Translate domain and solution architectures into platform requirements and designs
- one additional unit from elective units as appropriate to the specific job role.

Solutions architect

Core units plus:

- ICTTEN7221A Manage end to end architectural solutions across multiple domains
- ICTTEN7222A Manage solution architecture and impacts in line with organisational processes
- one additional unit from elective units as appropriate to the specific job role.

Technology specialist (application)

Core units plus:

- ICTTEN7223A Manage application layer solutions
- ICTTEN7227B Analyse business specifications to produce technical solutions
- one additional unit from elective units as appropriate to the specific job role.

Technology specialist (network)

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Core units plus:

- ICTTEN7224A Manage voice, data and internet protocol network solutions
- ICTTEN7227B Analyse business specifications to produce technical solutions
- one additional unit from elective units as appropriate to the specific job role.

Network testing specialist

Core units plus:

- ICTTEN7225A Manage network testing strategies
- ICTTEN7226A Manage development and application of testing artefacts
- one additional unit from elective units as appropriate to the specific job role.

Requirements manager

Core units plus:

- ICTTEN7228A Manage project requirements and process implementations
- ICTTEN7230A Scope project requirements and process solutions
- one additional unit from elective units as appropriate to the specific job role.

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ICT80110 Vocational Graduate Diploma of Telecommunications Network Engineering

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This qualification reflects the role of an individual involving a very high level of technical management skills and knowledge in telecommunications networks and systems who can:

- apply numerical computations and simulation to produce engineering solutions
- investigate the application of cloud networks in telecommunications switching
- evaluate and apply digital signal processing (DSP) to communications system
- analyse cellular and satellite systems
- evaluate and use telecommunications management networks diagnose problems and provide network management support.
-

Job Roles

Job roles and titles vary across different sectors of the industry. Possible job titles relevant to this qualification include:

- network specialist
- network technology specialist
- solutions engineer
- system engineer
- telecommunications manager
- telecommunications network engineer.

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Prerequisite units

There are no prerequisite requirements for individual units of competency.

Pathways Information

Pathways into the qualification

Candidates may enter this qualification through a number of entry points demonstrating potential to undertake study at graduate level, including from:

- the ICT70110 Vocational Graduate Certificate in Telecommunications Network Engineering or another relevant accredited Training Package qualification or relevant accredited course

or

- a relevant Advanced Diploma or Diploma, or a relevant Certificate IV or Certificate III together with significant relevant vocational practice

or

- a higher education qualification, together with relevant vocational practice

or

- relevant extensive vocational practice, without formal qualifications.

Pathways from the qualification

After achieving the ICT80110 Vocational Graduate Diploma of Telecommunications Network Engineering, candidates seeking to develop more specialised technical skills and knowledge may seek articulation into a university program.

Licensing/Regulatory Information

All training programs must be conducted with the reference to the regulatory regime of the prevailing statutory authority (currently ACMA).

Entry Requirements

There are no entry requirements for this qualification.

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Employability Skills Summary

Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• determining options to rectify faults and discussing them with customer so that necessary action is determined • documenting test methods and results • making a complete check of installation against installation plans • reading, interpreting and using equipment/system manuals and specifications and relevant enterprise policy and documentation • conveying information to clients, colleagues and other site personnel • providing feedback to customers on operating the equipment
Teamwork	• identifying members and roles of team • identifying and contributing to team tasks and goals • recognising and responding positively to conflict within team • working with team members to work with clients and install equipment • relating personal role to the industry • participating in a team structure by identifying team members, tasks and goals and recognising and responding positively to conflict • applying interpersonal skills with clients, employer, supervisors, work associates, team members and other contractors • giving and receiving feedback to assist in meeting team and organisation goals
Problem solving	• ranking causes of problems, working from system-wide impacts to specific impacts • diagnosing network security problems to secure the network • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • identifying faults or optimisation options • rectifying faults and adjusting system to optimal operation • determining cable routes taking into account building services, safety, industry codes and practices, and customer requirements • following up promptly on difficulties and known problem

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	areas
Initiative and enterprise	• prioritising urgent requests and acting according to organisational guidelines • identifying barriers to installation and developing strategies to overcome them within time and budget restrictions • adapting plan to suit specific features of site • identifying issues and possible solutions within established guidelines • interacting with enterprise personnel, customers and other contractors keeping a customer focus and considering customer needs
Planning and organising	• identifying realistic short and long-term career objectives • planning and provision to meet key dates and milestones • gathering data for the installation of systems and equipment • planning the installation of fibre cable, taking into account technical, scheduling and financial considerations • interpreting design and relating to site characteristics • prioritising work according to organisation guidelines • running a test of network security arrangements
Self-management	• identifying realistic short and long-term career objectives • identifying work to be completed • complying with all related OHS requirements and work practices • developing installation plans to ensure minimal disruption to the workplace • checking that tools and equipment are in safe working order and adjusted to manufacturer specification • relating own role to the industry and establishing own work schedule • using strategies to present a professional image to customers • interpreting and applying relevant regulations and standards
Learning	• relating current or intended role to career objectives in a positive manner • giving and receiving feedback to assist in meeting team and organisation goals • making clients aware of opportunities that exist for system upgrades, additional services and training • seeking assistance from team members when necessary • providing suitable training and assessment opportunities

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	for work team members • providing training to customers on system, product, product features and facilities
Technology	• checking that tools and equipment are in safe working order and adjusted to manufacturer specifications • converging many integrated and emerging technologies • testing and measuring of broadband network infrastructure • installing and operating telecommunications equipment and products • installing and operating equipment and products • identifying, replacing or repairing faulty parts and equipment • undertaking relevant acceptance tests and analysing results against specified performance criteria

Packaging Rules

Total number of units = 6

3 core units, plus

3 elective units

Elective units must be relevant to the work outcome, local industry requirements and the qualification level.

A maximum of two elective units may be substituted with two units of competency from any currently endorsed Training Package or accredited course at Vocational Graduate Diploma level.

Units selected from other Training Packages or accredited courses must not duplicate units selected from or available within the ICT10 Integrated Telecommunications Training Package.

CORE UNITS

ICTPMG8143B Manage a telecommunications project

ICTTEN8197A Produce engineering solutions using numerical computations and simulation

ICTSUS8237A Lead applied research in ICT sustainability

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ELECTIVE UNITS

Project management

ICTPMG8142A Manage telecommunications workplace

ICTPMG8149B Evaluate and use telecommunications management networks

Radio frequency networks

ICTRFN8180B Analyse a cellular mobile network system

ICTRFN8181B Analyse a satellite communications system

Sustainability

ICTSUS8238A Conduct and manage a life cycle assessment for sustainability

Telecommunications engineering networks

ICTTEN8194A Investigate the application of cloud networks in telecommunications switching

ICTTEN8195B Evaluate and apply network security

ICTTEN8196A Evaluate and apply digital signal processing to communications system

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ICTSS00003 Advanced ICT Sustainability Skill Set

Modification History

Not Applicable

Description

Not Applicable

Pathways Information

Pathway	This skill set provides credit towards ICT50210 Diploma of Telecommunications Network Engineering qualification.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

Units	ICTSUS4186A Install thin client applications for power over ethernet ICTSUS5187A Implement server virtualisation for a sustainable ICT system BSBSUS501A Develop workplace policy and procedures for sustainability

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Target Group

Target Group	This skill set is for experienced personnel in the installation of modern ICT networks using IP convergence and virtualisation technologies.

Suggested words for Statement of Attainment

Suggested form of words for Statement of Attainment	These units of competency meet industry requirements for the installation of specialised ICT network equipment. It prepares the participant to work in the practical application of technologies for sustainability in virtualisation of ICT networks.

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ICTSS00004 Advanced Telecommunications Rigging Installation Skill Set

Modification History

Release	Comments
Release 3	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*. Unit ICTTEN3056A replaced by unit ICTCBL2065A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This skill set is for personnel experienced in basic rigging practices and the installation of telecommunications network infrastructure on structures.

Pathways Information

This skill set provides credit towards ICT30513 Certificate III in Telecommunications Rigging Installation.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTTCR3062A Build a telecommunications radio structure

ICTTCR3191A Install radio plant and equipment on telecommunications structures

ICTTCR3192A Protect against electromagnetic radiation and system hazards when working on telecommunications radio sites

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

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Target Group

This skill set is for personnel experienced in basic rigging practices and the installation of telecommunications network infrastructure on structures.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the installation of a more advanced range of telecommunications network equipment and prepare the participant to work in the practical application of radio network equipment for carriers on structures.

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ICTSS00005 Basic ICT Sustainability Skill Set

Modification History

Release	Comments
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package version 2.0*. Inclusion of unit BSBSUS301A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package version 1.0*.

Description

Not Applicable

Pathways Information

This skill set provides credit towards ICT40210 Certificate IV in Telecommunications Network Engineering.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTSUS4183A Install and test renewable energy system for ICT networks

ICTSUS4184A Install and test power saving hardware

ICTSUS4185A Install and test power management software

BSBSUS301A Implement and monitor environmentally sustainable work practices

Target Group

This skill set is for experienced personnel in the installation of modern ICT networks using technologies to reduce energy consumption for sustainability.

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Suggested words for Statement of Attainment

These units of competency meet industry requirements for the installation of a limited range of ICT network equipment. It prepares the participant to work in the practical application of technologies for sustainability in reducing energy consumption of ICT networks.

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ICTSS00006 Basic Telecommunications Rigging Installation Skill Set

Modification History

Release	Comments
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package version 2.0*. Unit ICTRFN2105A replaced with ICTRFN3055A. Inclusion of CPCCLDG3001A and CPCCLRG3001A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package version 1.0*.

Description

Not Applicable

Pathways Information

This skill set provides credit towards ICT20513 Certificate II in Telecommunications Fixed Wireless and Rigging Installation.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTRFN3055A Install a radio communications antenna and feedline

ICTTCR2188A Use rigging practices and systems on telecommunications network structures

ICTTCR2189A Use operational safety in a telecommunications rigging environment

ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures

CPCCLDG3001A Licence to perform dogging

CPCCLRG3001A Licence to perform rigging basic level

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Target Group

This skill set is for designed for personnel to work in the installation of telecommunications network infrastructure on structures.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the installation of a limited range of telecommunications network equipment and prepare the participant to work in the practical application of installing radio network equipment for carriers on structures.

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ICTSS00009 Commercial Digital Television Antenna Systems Installation Skill Set

Modification History

Release	Comments
Release 3	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package Version 2.0*. Addition of units ICTRFN4095A and ICTWHS2170A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This skill set is for experienced personnel who may have undertaken the domestic antenna installation program or similar wanting to install commercial antenna installation for the digital reception telecommunications industry.

The more complex antenna installations include Master Antenna TV (MATV) and Communal Antenna TV (CATV) systems.

This set of units has been approved by the Department of Broadband for the antenna installer endorsement.

Pathways Information

This skill set provides credit towards ICT30413 Certificate III in Telecommunications Digital Reception Technology.

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Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTCBL2017B Alter services to existing cable system

ICTCBL3015A Locate and identify cable system faults

ICTDRE3165A Install a complex digital reception system

ICTWHS2170B Follow work health and safety and environmental policies and procedures

ICTRFN4095A Conduct radio frequency measurements

Target Group

This skill set is for experienced personnel who may have undertaken the domestic antenna installation program or similar wanting to install commercial antenna installation for the digital reception telecommunications industry.

The more complex antenna installations include Master Antenna TV (MATV) and Communal Antenna TV (CATV) systems.

This set of units has been approved by the Department of Broadband for the antenna installer endorsement.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for antenna installation and prepare the participant in the practical application of providing digital reception services. They install and maintain digital reception equipment for free-to air and subscription TV in customer and enterprise networks.

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ICTSS00010 Convergent Technology installations for home and SME Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This skill set is for experienced personnel in the installation of modern ICT networks using IP converging technologies in home and small to medium enterprises.

Pathways Information

This skill set provides credit towards ICT40210 Certificate IV in Telecommunications Network Engineering.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTTEN4050A Install and configure a wireless mesh network

ICTTEN4126A Install and configure internet protocol TV in a home network

ICTTEN4198A Install, configure and test an internet protocol network

ICTTEN4202A Install and test a radio frequency identification system

ICTTEN4229B Design, install and configure a customer smart technology network

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Target Group

This skill set is for experienced personnel in the installation of modern ICT networks using IP converging technologies in home and small to medium enterprises.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the installation of IP networking telecommunications equipment.

Participants can work in the practical technology convergence application to install and maintain emerging technology networks in the home and small to medium enterprises.

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ICTSS00012 Domestic Digital Television Antenna Installation Skill Set

Modification History

Release	Comments
Release 3	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package Version 2.0*. Unit ICTOHS2170A replaced by unit ICTWHS2170A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This skill set is for personnel wanting to install basic terrestrial antenna system in single dwelling installation for the digital reception telecommunications industry.

This set of units has been approved by the Department of Broadband for the antenna installer endorsement.

Pathways Information

This skill set provides credit towards ICT20413 Certificate II in Telecommunications Digital Reception Technology and the ICT30410 Certificate III in Telecommunications Digital Reception Technology.

Licensing/Regulatory Information

Not Applicable

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Skill Set Requirements

ICTCBL3011B Install and terminate coaxial cable

ICTDRE3156B Install digital reception equipment

ICTRFN2164B Install a terrestrial antenna

ICTRFN4095A Conduct radio frequency measurements

ICTTEN2140B Use hand and power tools

ICTWHS2170B Follow work health and safety and environmental policies and procedures

Target Group

This skill set is for personnel wanting to install basic terrestrial antenna system in single dwelling installation for the digital reception telecommunications industry.

This set of units has been approved by the Department of Broadband for the antenna installer endorsement.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for antenna installation and prepare the participant in the practical application of providing digital reception services. They install and maintain digital reception equipment for free-to air and subscription TV in customer and enterprise networks.

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ICTSS00015 Installing NBN Wireless and infrastructure Skill Set

Modification History

Release	Comments
Release 3	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package Version 2.0*. Unit ICTOHS2170A replaced by unit ICTWHS2170A. Deletion of units ICTBWN3088A and ICTCBL2017A and ICTRFN3146A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This skill set is for open CPR registered customer premises cablers working in the telecommunications industry on specialised cabling for broadband applications in accordance with ACMA requirements.

Pathways Information

This skill set provides credit towards ICT30110 Certificate III in Broadband and Wireless Networks Technology and ICT30610 Certificate III in Broadband and Wireless Networks.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTBWN3090B Install lead-in module and cable for fibre to the premises

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ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

ICTOHS2153B Work safely near power infrastructure

ICTRFN3055A Install a radio communications antenna and feedline

ICTWHS2170B Follow Occupational Health and Safety and environmental policy and procedures

Target Group

This skill set is for experienced personnel in the installation of optical FTTx network and wireless equipment for national broadband implementation in the carrier access network.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the installation of FTTP equipment and prepare the participant to work in the practical application of optical and wireless broadband technologies for the NBN implementation of carrier network.

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ICTSS00016 IP Convergence installations for home and SME Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This skill set is to develop personnel to work in the installation of modern telecommunications networks using IP converging technologies in small to medium enterprises.

Pathways Information

This skill set provides credit towards ICT20213 Certificate II in Telecommunications.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTTEN2207A Install and configure a home or small office network

ICTTEN2208A Install and configure a small to medium business network

ICTTEN2209A Build and maintain a secure network

ICTTEN2218A Operate new media software packages

ICTTEN2219A Install and test internet protocol devices in convergence networks

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Target Group

This skill set is to develop personnel to work in the installation of modern telecommunications networks using IP converging technologies in small to medium enterprises.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the installation of IP networking telecommunications equipment.

Participants can work in the practical application of converging technologies to install and maintain IP networks with security in the home and small to medium enterprise networks.

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ICTSS00017 Radio Technician Skill Set

Modification History

Release	Comments
Release 3	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package version 2.0*. Unit ICTOHS2170A replaced by unit ICTWHS2170A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package version 1.0*.

Description

This skill set is for new entrants learning radio fundamentals.

Pathways Information

This skill set provides credits towards ICT40313 Certificate IV in Telecommunications Radio Communications.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTRFN3055A Install a radio communications antenna and feedline

ICTRFN3155A Construct and test a radio communications device

ICTTEN2008A Use electrical skills in telecommunications work

ICTTEN3056A Install telecommunications network equipment

ICTTEN4081A Locate, diagnose and rectify faults

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ICTTEN4102A Repair telecommunication system faults

ICTWHS2170B Follow work health and safety and environmental policies and procedures

Target Group

This skill set is for personnel who have no experience in the Telecommunications Industry want to work designing ICT access networks.

Suggested words for Statement of Attainment

These units of competency meet industry requirements in applying radio communications technician fundamentals.

They can install, maintain and modify basic radio communications networks for a range of industries.

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ICTSS00019 Technical Help Desk Support Skill Set

Modification History

Release	Comments
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package version 2.0*. Unit ICAS303B replaced by unit ICASAS305A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package version 1.0*.

Description

Not Applicable

Pathways Information

This skill set provides credit towards ICT30210 Certificate III in Telecommunications.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICASAS305A Provide IT advice to clients

ICTWOR3231A Resolve technical enquiries using multiple information systems

ICTWOR3232A Collect and analyse technical information

Target Group

This skill set is for experienced personnel in the provision of technical help desk to customers and access network contractors.

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Suggested words for Statement of Attainment

These units of competency meet industry requirements for the provision of technical support of ICT networks.

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ICTSS00020 Wireless LAN and IP Network installation Skill Set

Modification History

Release	Comments
Release 3	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 2	New release of this skill set with *ICT10 Integrated Telecommunications Training Package Version 2.0*. ICAB4240C replaced by ICANWK417A and ICAB4235B replaced by ICANWK406A.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Description

This skill set is for experienced personnel in the installation of modern ICT networks using converging technologies of wireless and IT networks.

Pathways Information

This skill set provides credit towards ICT40210 Certificate IV in Telecommunications Network Engineering.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICANWK406A Install, configure and test network security

ICANWK417A Build an enterprise wireless network

ICTTEN3056A Install telecommunications network equipment

ICTTEN4198A Install, configure and test an internet protocol network

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ICTTEN4199A Install, configure and test a router

ICTWHS2170B Follow Occupational Health and Safety and environmental policy and procedures

Target Group

This skill set is for experienced personnel in the installation of modern ICT networks using converging technologies of wireless and IT networks.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for work in the installation of a wireless LAN with IP security and associated networking elements in the practical application of converging technologies.

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ICTSS00021 Advanced Cabler Registration Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This skill set is for open CPR registered customer premises cablers working in the telecommunications industry on specialised cabling for broadband applications in accordance with ACMA requirements.

Pathways Information

This skill set provides credit towards ICT30213 Certificate III in Telecommunications.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

ICTCBL3009B Install, terminate and certify structured cabling installation

ICTCBL3010B Install and terminate optical fibre cable on customer premises

ICTCBL3011B Install and terminate coaxial cable

ICTCBL3013A Perform cable and system test on customer premises

Target Group

This skill set is for CPR registered customer premises cablers.

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Suggested words for Statement of Attainment

These units of competency meet the Australian Communications and Media Authority requirements for registration as an open CPR cabler.

Cablers work on installation, maintenance and modification of telecommunications cabling, on customer premises.

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ICTSS00022 Basic Open Cabler Registration Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This skill set is for customer premises cablers working in the telecommunications industry in accordance with ACMA requirements.

Pathways Information

This skill set provides credit towards ICT20213 Certificate II in Telecommunications.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

ICTTEN2140B Use hand and power tools

ICTWHS2170B Follow work health and safety and environmental policies and procedures

Target Group

This skill set is for customer premises cablers working in the telecommunications industry in accordance with ACMA requirements.

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Suggested words for Statement of Attainment

These units of competency meet the Australian Communications and Media Authority requirements for registration as an ‘open’ CPR cabler.

Cablers work on installation, maintenance and modification of telecommunications cabling on customer premises.

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ICTSS00023 Basic Restricted Cabler Registration Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package version 2.0*.

Description

This skill set is for open CPR registered customer premises cablers working in the telecommunications industry on specialised cabling for broadband applications in accordance with ACMA requirements.

Pathways Information

This skill set provides credit towards ICT30213 Certificate III in Telecommunications.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule

ICTTEN2140B Use hand and power tools

ICTWHS2170B Follow work health and safety and environmental policies and procedures

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Target Group

This skill set is for customer premises cablers working in the telecommunications industry on specialised cabling for simple point to point broadband applications in accordance with ACMA requirements.

Suggested words for Statement of Attainment

These units of competency meet the Australian Communications and Media Authority requirements for registration as an open CPR cabler.

Cablers work on installation, maintenance and modification of telecommunications cabling, on customer premises.

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ICTSS00024 Civil Works - Installation of Pit and Pipe and FDH Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This skill set is for those working in NBN construction.

Pathways Information

This skill set provides credit towards the ICT20613 Certificate II in National Broadband Network Construction.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

CPCCOHS1001A Work safely in the construction industry

HLTAID001 Provide cardiopulmonary resuscitation

ICTCBL2131A Install an above ground equipment enclosure

ICTCBL2133A Construct underground telecommunications infrastructure

ICTPMG2130A Prepare site for support installation

ICTTEN2140B Use hand and power tools

ICTWHS2170B Follow work health and safety and environmental policies and procedures

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Target Group

This skill set is for those working in NBN construction.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the installation of pit and pipe and FDH cabinets.

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ICTSS00025 Designer Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This skill set is for personnel who have no experience in the Telecommunications Industry want to work designing ICT access networks.

Pathways Information

This skill set provides credit towards ICT40510 Certificate IV in Telecommunications Network Planning.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTCBL2133A Construct underground telecommunications infrastructure

ICTCBL3021A Install aerial cable

ICTNPL4108A Plan the deployment of access network architectures

ICTPMG5039A Prepare project specifications

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Target Group

This skill set is for personnel who have no experience in the Telecommunications Industry want to work designing ICT access networks.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the design of access networks.

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ICTSS00026 ICT Access Senior Designer Skill Set

Modification History

Release	Comments
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package version 2.0*.

Description

Not applicable.

Pathways Information

This skill set provides credit towards ICT50210 Diploma of Telecommunications Network Engineering.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

ICTTEN5037A Design a telecommunications project

ICTPMG6034A Prepare a detailed design brief

Target Group

This skill set is for experienced personnel who want to work designing complex ICT access networks.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the design of complex access networks.

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ICTSS00027 National Broadband Network Advanced Linesworker/Installer Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This skill set is for personnel engaged in advanced lineswork or installation of cable fibre on the National Broadband Network and includes relevant levels of safety and awareness training.

Pathways Information

This skill set provides credit towards the ICT30213 Certificate III in Telecommunications and ICT30713 Certificate III in National Broadband Network Construction.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

CPCCOHS1001A Work safely in the construction industry

ICTBWN3090B Install lead-in module and cable for fibre to the premises

ICTCBL3018A Install underground enclosures and conduit

ICTCBL3019A Install underground cable

ICTTEN3056A Install telecommunications network equipment

ICTWHS2170B Follow work health and safety and environmental policies and procedures

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Target Group

This skill set is for personnel engaged in advanced lineswork or installation of cable fibre on the National Broadband Network and includes relevant levels of safety and awareness training.

Suggested words for Statement of Attainment

These units of competency are recommended for advanced linesworkers and installers who perform work on the National Broadband Network.

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ICTSS00028 National Broadband Network Splicer Skill Set

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Units updated to current versions.
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Description

This skill set is for personnel engaged in the splicing of cable fibre on the National Broadband Network and includes relevant levels of safety and awareness training.

Pathways Information

This skill set provides credit towards ICT30213 Certificate III in Telecommunications and ICT30713 Certificate III in National Broadband Network Construction.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

CPCCOHS1001A Work safely in the construction industry

ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

ICTCBL3240B Install ribbon fibre cable in the FTTX distribution network

ICTWHS2170B Follow work health and safety and environmental policies and procedures

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Target Group

This skill set is for personnel engaged in the splicing of cable fibre on the National Broadband Network and includes relevant levels of safety and awareness training.

Suggested words for Statement of Attainment

These units of competency are recommended for splicers who perform work on the National Broadband Network.

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ICTSS00029 Plan FTTP Access Network Skill Set

Modification History

Release	Comments
Release 1	This skill set first released with *ICT10 Integrated Telecommunications Training Package version 2.0*.

Description

Not applicable.

Pathways Information

This skill set provides credit towards ICT40510 Certificate IV in Telecommunications Network Planning.

Licensing/Regulatory Information

Not applicable.

Skill Set Requirements

ICTNPL4151A Plan the telecommunications access network for an estate

ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation

ICTWOR4032A Undertake a civil site survey

Target Group

This skill set is for experienced personnel in the provision of access network civil construction services for access network contractors.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for providing access network services.

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ICTSS00030 ICT Sustainabillity Planning Skill Set

Modification History

Not applicable.

Description

Not Applicable

Pathways Information

This skill set provides credit towards ICT60110 Advanced Diploma of Optical Networks, ICT60210 Advanced Diploma of Telecommunications Network Engineering and ICT70110 Vocational Graduate Certificate in Telecommunications Network Engineering.

Licensing/Regulatory Information

Not Applicable

Skill Set Requirements

ICTSUS6233A Integrate sustainability in ICT planning and design projects

ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects

ICTSUS7235A Use ICT to improve sustainability outcomes

ICTSUS7236A Manage improvements in ICT sustainability

Target Group

This skill set is for experienced personnel who want to integrate sustainability in the planning of ICT networks.

Suggested words for Statement of Attainment

These units of competency meet industry requirements for the integration of sustainability practices in the planning of ICT networks. It prepares the participant to justify and plan practical applications of sustainability in ICT network in a competitive and innovative environment.

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BSBCUS402B Address customer needs

Modification History

Release	Comments
Release 1	This version first released with *BSB07 Business Training Package version 6.0.* Revised unit. Required skills updated to focus on learning and development practices and compliance with policy and procedures. Replaces BSBCUS402A Address customer needs

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to manage the ongoing relationship with a customer, which includes assisting the customer to articulate their needs, meeting customer needs and managing networks to ensure customer needs are addressed. The customer relationship would typically involve direct interaction a number of times over an extended period.

This unit is appropriate to workers who are expected to have detailed product knowledge in order to recommend customised solutions. They would be expected to apply organisational procedures and be aware of, and apply as appropriate, broader factors involving ethics, industry practice and relevant government policies and regulations.

Application of the Unit

This unit applies to workers required to be familiar with a product and service that varies widely and is capable of significant customisation.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Assist customer to articulate needs	1.1 Ensure ***customer*** needs are fully explored, understood and agreed 1.2 Explain and match available services and products to customer needs 1.3 Identify and communicate ***rights and responsibilities of customers*** to the customer as appropriate
2. Satisfy complex customer needs	2.1 Explain possibilities for meeting customer needs 2.2 Assist customers to evaluate service and/or product options to satisfy their needs 2.3 Determine and prioritise preferred actions 2.4 Identify potential areas of difficulty in customer service delivery and take appropriate actions in a positive manner
3. Manage networks to ensure customer needs are addressed	3.1 Establish ***effective regular communication*** with customers 3.2 Establish, maintain and expand relevant networks to ensure appropriate referral of customers to products and services from within and outside the organisation 3.3 Ensure procedures are in place to ensure that decisions about targeting of customer services are based on up-to-date information about the customer, and the ***products and services*** available 3.4 Ensure procedures are put in place to ensure that referrals are based on the matching of the assessment of customer needs and availability of products and services 3.5 Maintain records of customer interaction in accordance with

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	organisational procedures

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to relate to people from diverse backgrounds and people with diverse abilities.
- information management skills to summarise information verbally and non-verbally
- literacy and numeracy skills to:
  - interpret product and service features or sales data
  - read a variety of texts to prepare general information and papers
  - summarise information obtained from a variety of verbal and non-verbal sources
  - write formal and informal text
- numeracy skills to analyse data, and to compare time lines and promotional costs against budgets
- problem-solving skills to develop solutions unique to a customer
- self-management skills to:
  - comply with policies and procedures
  - seek learning and development opportunities.

Required knowledge

- key provisions of relevant legislation from all levels of government that may affect aspects of business operations, such as:
  - anti-discrimination legislation
  - ethical principles
  - codes of practice
  - privacy laws
  - environmental issues
  - occupational health and safety
- organisational procedures and standards for customer service relationships
- detailed product and service knowledge which may:
  - be of significant breadth so as to propose alternative products and services, or
  - of significant depth so as to propose variations within a limited product and service range.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • assisting customers to articulate their needs • documenting processes used and customer satisfaction with the products/services offered • assisting customers to address their needs.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • access to office equipment and resources • examples of products/services and promotional strategies.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • review of documentation prioritising preferred actions • analysis of responses to case studies and scenarios • demonstration of techniques • observation of presentations • assessment of written reports • evaluation of communication established with customers • review of customer interaction records.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Customers may include:	• customers with routine or specific requests • in person, computer-based and telephone customers • internal and external customers • people from a range of social, cultural or ethnic backgrounds • people who may be unwell, drug affected or emotionally distressed • people with varying physical and mental abilities • regular and new customers.
Rights and responsibilities of customers may include:	• fulfilment of external obligations • informed consent.
Effective regular communication may include:	• giving customers full attention • handling sensitive and confidential issues • maintaining eye-contact (for face-to-face interactions), except where eye-contact may be culturally inappropriate • speaking clearly and concisely • using active listening techniques • using appropriate language and tone of voice • using clearly written information/communication • using non-verbal communication e.g. body language, personal presentation (for face-to-face interactions) • using open and/or closed questions.
Products and services may include:	• either products or services • goods • ideas • infrastructure • private or public sets of benefits.
Organisational procedures may include:	• procedural manuals • quality systems, standards and guidelines.

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Unit Sector(s)

Stakeholder Relations – Customer Service

Custom Content Section

Not applicable.

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BSBPMG521A Manage project integration

Modification History

Release	Comments
Release 1	This version first released with *BSB07 Business Services Training Package Version 8.0*. Replaces BSBPMG501A Manage application of project integrative processes.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to integrate and balance the overall project management functions of scope, time, cost, quality, human resources, communications, risk and procurement across the project life cycle; and to align and track the project objectives to comply with organisational goals, strategies and objectives.

Application of the Unit

This unit applies to those responsible for managing and leading a project in an organisation, business or as a consultant.

The project manager operates within assigned authority levels, and is responsible for own performance and the performance of others.

The project manager may undertake the work in the context of an organisational program and/or portfolio of projects.

This unit has generic application for projects in a range of industries, organisations and contexts.

In the context of this unit a project is defined as involving:

- a comprehensive, detailed and integrated project management plan
- a formal communications plan
- a dedicated and project-based budget

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- formal and planned engagement with a wide range of stakeholders
- a documented risk, issues and change-management methodology
- a quality plan with assurance and control processes
- a project team-based environment.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Establish project	1.1 Identify, clarify and prepare ***project initiation documentation***
	1.2 Identify the relationship between the project and ***broader organisational strategies and goals***
	1.3 Negotiate and document project ***objectives, outcomes and benefits***
	1.4 Negotiate the ***project governance structure*** with relevant authorities and stakeholders
	1.5 Prepare and submit ***project charter*** for approval by relevant authorities

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2. Undertake project planning and design processes	2.1 Establish and implement a methodology to disaggregate project objectives into achievable ***project deliverables***
	2.2 Identify project stages and key requirements for stage completion against client requirements and project objectives
	2.3 Analyse ***project management functions*** to identify interdependencies and the impact of the ***triple constraints***
	2.4 Develop a ***project management plan*** that ***integrates*** all project-management functions with ***associated plans and baselines***
	2.5 Establish designated mechanisms to monitor and control planned activity
	2.6 Negotiate approval of project plan with relevant stakeholders and project authority
3. Execute project in work environment	3.1. Manage the project in an established ***internal work environment*** to ensure work is conducted effectively throughout the project
	3.2. Maintain established links to align project objectives with organisational objectives throughout the project life cycle
	3.3. Within authority levels, resolve conflicts that may negatively affect project objectives
4. Manage project control	4.1. Ensure project records are updated against project deliverables and plans at required intervals
	4.2. Analyse and submit ***status reports*** on project progress and identified issues with stakeholders and relevant authorities
	4.3. Analyse and submit ***impact analysis*** on change requests for approval where required
	4.4. Maintain relevant ***project logs and registers*** accurately and regularly to assist with project audit
	4.5. Ensure associated plans are updated to reflect project progress against baselines and approved changes
5. Manage project finalisation	5.1. Identify and allocate ***project finalisation activities***
	5.2. Ensure project products and ***associated documentation*** are prepared for handover to client in a timely manner
	5.3. Finalise financial, legal and contractual obligations
	5.4. Undertake ***project review assessments*** as input to future projects

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- decision-making skills between competing interests and priorities
- literacy skills to interpret and develop complex project plans and documentation
- negotiating skills to work with stakeholders and project authorities on agreed plans and processes
- numeracy skills to conduct complex forecasting
- planning and organising skills to:
  - plan, monitor and respond to project issues
  - measure progress against agreed plans
- team leadership and communication skills to liaise with other members of the project team
- technology skills to use common software and work office products for documentation and analysis
- time-management skills to ensure priorities are addressed.

Required knowledge

- project governance models
- project knowledge areas
- project life cycle stages, phases and structures relevant to industry and project context
- types of organisational documentation for strategies and goals.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • identifying and aligning project with organisational objectives • conducting project establishment processes • managing preparation of a project management plan for a project of sufficient complexity to demonstrate the full range of

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	performance requirements • ensuring project registers and logs are maintained • analysing project reports • undertaking impact analysis • preparing strategy for project finalisation.
Context of and specific resources for assessment	Assessment must ensure access to: • project documentation, which includes information about participation in life cycle and integration processes.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third-party workplace reports of on-the-job performance by the candidate • analysis of responses addressing different project scenarios • oral or written questioning to assess knowledge of project life cycle processes relevant to the industry sector and project context • assessment of management of the project life cycle processes.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Project initiation documentation may include:	• agreed project management framework • agreed project methodology • client or customer requirements • concept proposal • contract documentation • executive team instructions

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	• feasibility study • life cycle approval gateways • output from prior project.
Broader organisational strategies and goals may include:	• market focus • organisational mission statement • strategy plans • values and ethics
Objectives, outcomes and benefits may include:	• expected benefits to be achieved for organisation and business • measurable project product statement • short and long-term outcomes for the organisation.
Project governance structure may include:	• boards, committees, working groups, reference groups, advisory groups, sponsors, project managers, project team members and stakeholders • identified authority levels assigned to groups and individuals • issue-escalation procedures • project organisation chart • statements of roles for project management bodies and participants.
Project charter may include:	• approvals and sign-off • broad stakeholder identification • consolidated project initiation documentation (PID) • documented objectives • high-level product deliverables • high-level risk assessment • project assumptions and constraints • project mandate • source of project authority.
Project deliverables may include:	• definable product, service or document • discrete components of the overall project outputs • specified products of the project • time, quality and cost.
Project management functions involve all nine functions:	• communications • cost • human resources • procurement and contracting • project integration • quality • risk • scope • time.
Triple constraints	• cost

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include:	• scope and quality • time.
Project management plan may be:	• a covering document that integrates the planning requirements of the nine functions of project management • in single or multiple document format.
Integrates may include:	• decisions that: • determine comparative value • evaluate competing interests • make trade-offs • processes and activities that: • combine • coordinate • define • identify • unify
Associated plans and baselines may include:	• communications plan (stakeholders and information) • human resources plan • procurement plan • project budget • project schedule • quality-management plan • risk plan • scope-management plan.
Internal work environment may include:	• organisational policy and procedures • organisational culture and style • physical working conditions • geographic location and/or dispersion • team dynamics.
Status reports may include:	• client progress reports • internal or external • regular consolidated reports to project authority • reports under contractual obligations • specific budget and schedule reports.
Impact analysis may include:	• assessment against project quality requirements • forecasting against triple constraints (scope, time and cost) • review of project baselines against proposed change.
Project logs and registers may include:	• change log • daily log • issues log • quality log • risk register

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	• task-completion log • version-control log.
Project finalisation activities may include:	• completing financial transactions • consolidating and storing project data • documenting outstanding project issues • obtaining or providing certifications • preparing final project reports • updating organisation knowledge management.
Associated documentation may include:	• 'as built' design specifications • certificates, guarantees, indemnities and warranties • product or service specifications • user, training and installation manuals.
Project review assessments may include:	• benefits realisation review • outcomes evaluation • post-implementation review • project lessons learned.

Unit Sector(s)

Management and Leadership – Project Management

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BSBPMG522A Undertake project work

Modification History

Release	Comments
Release 1	This version first released with *BSB07 Business Services Training Package Version 8.0*. Replaces BSBPMG510A Manage projects.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to undertake a straightforward project or a section of a larger project. This unit addresses the management of projects, including developing a project plan, administering and monitoring the project, finalising the project, and reviewing the project to identify lessons learned for application to future projects.

Application of the Unit

The unit focuses on the application of project-management skills and the requirement to meet timelines, quality standards, budgetary limits and other requirements set for the project.

The unit does not apply to specialist project managers. For specialist project managers, the other units of competency in the project management field (BSBPMG) will be applicable.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Define project	1.1 Access ***project scope and other relevant documentation***
	1.2 Define project stakeholders
	1.3 Seek clarification from ***delegating authority*** of issues related to project and ***project parameters***
	1.4 Identify limits of own responsibility and reporting requirements
	1.5 Clarify relationship of project to other projects and to the organisation's objectives
	1.6 Determine and access available resources to undertake project
2. Develop project plan	2.1 Develop ***project plan*** in line with the project parameters
	2.2 Identify and access appropriate ***project-management tools***
	2.3 Formulate risk-management plan for project, including work health and safety (WHS)
	2.4 Develop and approve project budget
	2.5 Consult team members and take their views into account in planning the project
	2.6 Finalise project plan and gain necessary approvals to commence project according to documented plan
3. Administer and monitor project	3.1 Take action to ensure project team members are clear about their responsibilities and the project requirements
	3.2 Provide ***support for project team members***, especially with regard to specific needs, to ensure that the quality of the expected outcomes of the project and documented time lines are met
	3.3 Establish and maintain ***required record-keeping systems*** throughout the project
	3.4 Implement and monitor plans for managing project finances,

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	resources and quality 3.5 Complete and forward project reports as required to stakeholders 3.6 Undertake ***risk management*** as required to ensure project outcomes are met 3.7 Achieve project deliverables
4. Finalise project	4.1 Complete financial record keeping associated with project and check for accuracy 4.2 Ensure transition of staff involved in project to new roles or reassignment to previous roles 4.3 Complete project documentation and obtain ***necessary sign-offs*** for concluding project
5. Review project	5.1 Review project outcomes and processes against the project scope and plan 5.2 Involve team members in the project review 5.3 Document lessons learned from the project and report within the organisation

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication and negotiation skills to work with team members and other stakeholders to maintain project schedules
- communication skills to relate to people with diverse abilities and from diverse backgrounds in a culturally appropriate way
- literacy skills to read, write and review a range of documentation
- numeracy skills to:
  - analyse data
  - compare time lines and promotional costs against budgets
- planning and organising skills to develop, monitor and maintain implementation schedules.

Required knowledge

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- organisation's mission, goals, objectives and operations and how the project relates to them
- organisational structure, and lines of authority and communication in the organisation
- relevant legislation and codes from all levels of government that may affect aspects of business operations, including:
  - anti-discrimination legislation
  - codes of practice
  - environmental issues
  - ethical principles
  - WHS
  - privacy laws.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • developing a project plan • examples of monitoring arrangements and evaluation of the efficacy of the project plan in addressing project time lines and budget • knowledge of relevant legislation.
Context of and specific resources for assessment	Assessment must ensure: • access to workplace project documentation • demonstration of all required skills, knowledge and performance in a workplace-based project.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third-party workplace reports of on-the-job performance by the candidate • observation of presentations

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	• oral or written questioning to assess knowledge of the organisation's mission, goals, objectives and operations and how the project relates to them • review of project risk-management plan and project plan • evaluation of project reports forwarded to stakeholders • analysis of documentation reviewing project outcomes and processes against the project scope and plan • evaluation of documentation outlining lessons learned from the project.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other project management units.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Project scope and other relevant documentation may include:	• contract or other agreement
	• project brief
	• project plan or summary
	• other documents outlining:
	  • expected outcomes of the project
	  • inclusions and exclusions from project
	  • project resources
	  • quality standards for project
	  • timeframes for project.

Stakeholders may include:	• clients or customers (internal and external) • funding bodies • management, employees and relevant key personnel (internal and external) with special responsibilities • project sponsor.
Delegating authority may include:	• customer or client • funding body • manager or management representative

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	• project sponsor.
Project parameters may include:	• project finances or budget • integration of project within organisation • legislative and quality standards • physical, human and technical resources available or required for project • procurement requirements associated with project • reporting requirements • risks associated with project, including WHS • scope of project • time lines.
Project plan may include:	• details of how the project will be managed • roles and responsibilities • time lines • work breakdown structure.
Project management tools may include:	• cost schedule control system • Critical Path Method • Gantt and bar charts • life cycle cost analysis • logistics support analysis • PERT charts • project management software • risk and issues logs • spreadsheets • technical resources required for the project, for example WHS management-system tools.
Support for project team members may include:	• additional physical, human and technical resources (within allocated budget) if and as required • encouragement • feedback • learning and development • regular project team meetings • supervision, mentoring and coaching.
Required record-keeping systems may include systems for:	• correspondence • financial data, including costs, expenditure, income generated and purchases • project outcomes • quality data, including any test results • recording of time spent on project and progress in completing project • samples, prototypes and models.

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Resources may include:	• human • physical • technical.
Risk management may include:	• changing roles and responsibilities in project team • negotiating an extension of deadline, or redefining completion or quantity or quality of outcomes • outsourcing some aspects of the project • reducing costs • researching and applying more efficient methods for completing project tasks • seeking further resources to meet deadline • sharing ideas to gain improvements to work undertaken in the project.
Necessary sign-offs may be required by:	• clients • funding body • management • project sponsor.

Unit Sector(s)

Management and Leadership – Project Management

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BSBSMB405B Monitor and manage small business operations

Modification History

Release	Comments
Release 1	This version first released with *BSB07 Business Training Package version 6.0* Revised unit. Required knowledge and Range Statement changed to include environmentally sustainable practices Replaces BSBSMB405A Monitor and manage small business operations

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to operate a small business and to implement a business plan. The strategies involve monitoring, managing and reviewing operational procedures.

Specific legal requirements apply to the management of a small business.

Application of the Unit

This work is undertaken by individuals who operate a small business.

The unit is suitable for existing micro and small businesses or a department in a larger organisation.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Develop o***perational strategies and procedures***	1.1 Develop an action plan to provide a clear and coherent direction, in accordance with the ***business goals and objectives***
	1.2 Identify ***occupational health and safety (OHS) and environmental issues*** and implement strategies to minimise risk factors
	1.3 Develop a ***quality system*** for the business in line with industry standards, compliance requirements and cultural criteria
	1.4 Develop performance measures and ***operational targets*** to conform with the business plan
	1.5 Develop strategies for innovation, including the utilisation of existing, new or emerging technologies, where practicable, to optimise business performance
2. Implement operational strategies and procedures	2.1 Implement systems and key performance indicators/targets to monitor business performance and customer satisfaction
	2.2 Implement systems to control stock, expenditure/cost, wastage/shrinkage and risks to health and safety in accordance with the business plan
	2.3 Maintain staffing requirements, where applicable, within budget to maximise productivity
	2.4 Carry out the provision of goods/services in accordance with established legal, ethical cultural and ***technical standards***
	2.5 Provide goods/services in accordance with time, cost and quality specifications, and customer requirements
	2.6 Apply quality procedures to address product/service and customer requirements
3. Monitor business performance	3.1 Regularly monitor/review the achievement of operational targets to ensure optimum business performance, in accordance

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	with the business plan goals and objectives 3.2 Review systems and structures, with a view to more effectively supporting business performance 3.3 Investigate and analyse operating problems to establish causes and implement changes as required as part of the business quality system 3.4 Amend operational policies and procedures to incorporate corrective action
4. Review business operations	4.1 Review and adjust business plan, as required, to maintain business viability, in accordance with business goals and objectives 4.2 Clearly record proposed changes to aid future planning and evaluation 4.3 Undertake ongoing research into new business opportunities and adjust business goals and objectives as new business opportunities arise

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to develop criteria and targets for the business plan
- communication skills to question, clarify and report
- literacy skills to interpret legal requirements, company policies and procedures
- numeracy skills to manage performance information and to control the finances
- technology skills to use relevant business equipment.

Required knowledge

- methods for developing and maintaining networks
- methods for implementing operation and revenue control systems
- methods for monitoring performance and implementing improvements
- OHS responsibilities and procedures for managing hazards
- principles of risk management relevant to the business, including risk assessment
- quality system principles and methods
- relevant industry codes of practice
- relevant marketing, sales and financial concepts
- relevant performance measures

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- role of innovation
- systems to manage staff, stock, expenditure, services and customer service
- environmentally sustainable business practice and operation
- technical or specialist skills relevant to the business operation.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • developing strategies and procedures to successfully manage the operation of the business • making appropriate adjustments to the business operations as required • knowledge of quality system principles and methods.
Context of and specific resources for assessment	Assessment must ensure: • access to relevant documentation • candidate's individual circumstances and work in the context of running a small business, are the basis for assessment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • portfolio of evidence including operational strategies and procedures • oral or written questioning to assess knowledge of principles of risk management relevant to the business, including risk assessment • review of analysis of operating problems (establishing causes and implementing changes as required as part of the business quality system) • review of records proposing changes to the business operations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBSMB406A Manage small business finances

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	• BSBSMB407A Manage a small team.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Operational strategies and procedures may be determined by:	• business premises (size, location, layout) • financial control systems and procedures • management and administrative systems and procedures • methods/techniques/technology • physical and natural resources • plant and equipment , including OHS requirements • premises, plant and equipment, which may be new or previously owned • purchase (sole or shared ownership) or leasing • raw materials • requirements, which may be one-off requirements or recurrent requirements (such as equipment maintenance) specific to the nature of the business • technology • environmentally sustainable principles of business operation • use of existing, new and emerging technologies including e-commerce.
Business goals and objectives may include:	• customer needs/marketing projections • family or community benefits • financial projections • goals, objectives, plans, systems and processes • lifestyle issues • proposed size and scale of the business, market focus of the business • short-, medium- or long-term goals • social responsibility.
Occupational health and safety and environmental issues must include:	• controls, which may include instructions to workplace personnel concerning site hazards and controls, material safety data sheets, use of personal protective equipment,

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	vehicle access, signs and barricades, traffic control, outside contractors • establishment and maintenance of procedures for assessing and controlling risks • establishment and maintenance of procedures for identifying risks to health and safety • environmentally sustainable purchase and supply of goods and services • waste and by-products.
Quality system may include:	• manual or computer quality control systems • quality assurance/management approaches • random inspections and assessments of goods and services against predetermined standards • random inspections and assessments of processes against predetermined standards • random sampling and follow-up of customers.
Operational targets may include:	• external targets, which may relate to market share and positioning and may involve exploring new markets, building national or international trade links • internal targets, which may relate to size, quality, quantity and diversity, wages to sales, sales to area/stock levels/stock turnover/average debtor payment periods and levels • staffing level and skills mix • targets, which may be short-, medium- or long-term.
Technical standards may include:	• current and generally agreed descriptions of what the product/service is, how it should be produced/delivered and the environmental sustainability, quality, safety, efficiency or other measures to determine the activity is done effectively.

Unit Sector(s)

Management and Leadership – Small and Micro Business

Custom Content Section

Not applicable.

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BSBWHS501A Ensure a safe workplace

Modification History

Release	Comments
Release 1	This Unit first released with *BSB07 Business Training Package version 7.0*. Replaces and is equivalent to BSBOHS509A Ensure a safe workplace.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to establish, maintain and evaluate the organisation's work health and safety (WHS) policies, procedures and programs in the relevant work area according to WHS legislative requirements.

Application of the Unit

This unit applies to managers working in a range of contexts. It takes a systems approach and addresses compliance with relevant legislative requirements.

Those who have or are likely to have responsibility for WHS as part of their broader management role should undertake this unit.

The unit is relevant for people with obligations under WHS legislation, for example persons conducting a business or undertaking (PCBUs) or their officers (as defined by relevant legislation).

NOTE: The terms Occupational Health and Safety (OHS) and Work Health and Safety (WHS) are equivalent and generally either can be used in the workplace. In jurisdictions where the National Model WHS Legislation has not been implemented RTOs are advised to contextualise the unit of competency by referring to the existing State/Territory OHS legislative requirements.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

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Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Establish and maintain a WHS management system	1.1 Locate, adapt, adopt and communicate WHS policies that clearly define the organisation's commitment to complying with ***WHS legislation***
	1.2 Identify ***duty holders*** and define WHS responsibilities for all workplace personnel according to WHS legislation, policies, procedures and programs
	1.3 Identify and approve financial and human resources required by the WHS management system (WHSMS)
2. Establish and maintain effective and compliant participation arrangements for managing WHS	2.1 Work with workers and their representatives to set up and maintain participation arrangements according to relevant WHS legislation
	2.2 Appropriately resolve issues raised through participation and consultation arrangements according to relevant WHS legislation
	2.3 Promptly provide information about the outcomes of participation and consultation to workers and ensure it is easy for them to access and understand
3. Establish and maintain procedures for effectively identifying	3.1 Develop procedures for ongoing hazard identification, and assessment and ***control of associated risks***
	3.2 Include hazard identification at the planning, design and

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hazards, and assessing and controlling risks	evaluation stages of any change in the workplace to ensure that new hazards are not created by the proposed changes and existing hazards are controlled 3.3 Develop and maintain procedures for selecting and implementing risk controls according to the hierarchy of control and WHS legislative requirements 3.4 Identify inadequacies in existing risk controls according to the hierarchy of control and WHS legislative requirements, and promptly provide resources to enable implementation of new measures 3.5 Identify requirements for expert WHS advice, and request this advice as required
4. Evaluate and maintain a WHS management system	4.1 Develop and provide a WHS induction and training program for all workers as part of the organisation's training program 4.2 Use a system for ***WHS recordkeeping*** to allow identification of patterns of occupational injury and disease in the organisation, and to maintain a record of WHS decisions made, including reasons for the decision 4.3 Measure and evaluate the WHSMS in line with the organisation's quality systems framework 4.4 Develop and implement improvements to the WHSMS to achieve organisational WHS objectives 4.5 Ensure compliance with the WHS legislative framework so that, as a minimum, WHS legal requirements are achieved

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical and problem solving skills to examine relevant workplace information and data to identify hazards, and to assess and control risks
- communication skills to consult with staff and to promote a safe workplace
- information technology skills to store and retrieve relevant workplace information and data
- literacy skills to adapt and communicate WHS policies that reflect WHS legislative requirements
- problem-solving skills to deal with complex and non-routine difficulties.

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Required knowledge

- hazard identification and risk-management processes
- hierarchy of risk control
- in-house and WHS legislative reporting requirements
- relevant WHS Acts, regulations and codes of practice that apply to the business operation.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • detailed knowledge and application of all relevant WHS Acts, regulations and codes of practice • establishing and maintaining arrangements for managing WHS within the organisation's business systems and practices • identifying requirements for expert WHS advice.
Context of and specific resources for assessment	Assessment must ensure access to: • appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • analysis of responses to case studies and scenarios • assessment of written reports • demonstration of techniques • direct questioning combined with review of portfolios of evidence and third-party workplace reports of on-the-job performance by the candidate • review of WHS policies, information provided on the WHSMS, and information about the outcomes

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	of participation and consultation provided to workers • oral or written questioning to assess knowledge of WHS and WHS legislation • evaluation of WHS induction and training • review of WHS recordkeeping system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

WHS legislation may include:	• applicable commonwealth and state or territory WHS Acts, regulations and codes of practice
	• common law duties to meet general duty of care requirements
	• WHS legislative and regulatory requirements for:
	  • effectively managing hazards
	  • establishing consultation arrangements, including those for health and safety representatives and health and safety committees
	  • providing information and training, including training in safe operating procedures; procedures for workplace hazards; hazard identification, risk assessment and risk control; and emergency and evacuation procedures
	• WHS legislative, regulatory and other requirements for the maintenance and confidentiality of records of occupational injury and disease.

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Duty holders may include:	• as specified in WHS Acts:
	  • officers
	  • PCBUs or their officers
	  • workers
	  • other persons at a workplace.

Control of associated risks may include:	• administrative • as specified in WHS Acts, regulations and codes of practice • counselling/disciplinary processes, such as those associated with alcohol and other drugs • education about alcohol and other drugs work-related issues • engineering • hazard elimination • housekeeping and storage • issue resolution • personal protective equipment • purchasing of supplies and equipment • workplace inspections, including plant and equipment.

WHS recordkeeping may relate to:	• audit and inspection reports
	• consultation, such as:
	  • meetings of health and safety committees
	  • work team meeting agendas, including WHS items and actions
	• first aid/medical post records
	• hazardous chemicals registers
	• induction, instruction and training
	• manufacturer and supplier information, including dangerous goods storage lists
	• plant and equipment maintenance and testing reports
	• workers' compensation and rehabilitation records
	• workplace environmental monitoring records.

Unit Sector(s)

Regulation, Licensing and Risk – Work Health and Safety

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BSBWHS504A Manage WHS hazards and risks

Modification History

Release	Comments
Release 1	This Unit first released with *BSB07 Business Training Package version 7.0*. Replaces but is not equivalent to BSBOHS505C Manage hazards in the work environment AND BSBOHS507B Facilitate the application of principles of occupational health to control OHS risk.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to manage work health and safety (WHS) hazards and risks.

Application of the Unit

This unit applies to individuals who contribute to the management of WHS hazards and risks. This management is based on the organisation's WHS management system (WHSMS), WHS information system (WHSIS) and risk-management approach (as covered in BSBWHS503A Contribute to the systematic management of WHS risk).

The unit applies to people who work in a range of WHS roles across all industries and who apply a substantial knowledge base and well-developed skills in a wide variety of WHS contexts.

NOTE: The terms Occupational Health and Safety (OHS) and Work Health and Safety (WHS) are equivalent and generally either can be used in the workplace. In jurisdictions where the National Model WHS Legislation has not been implemented RTOs are advised to contextualise the unit of competency by referring to the existing State/Territory OHS legislative requirements.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

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Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Access information and data on WHS hazards and risks	1.1 Identify ***sources of information and data***
	1.2 Obtain information and data to determine the nature and scope of ***hazards and risks***, the range of harms they may cause, and how these harms happen
	1.3 Obtain information and data to determine techniques, tools and processes to assess risk associated with identified hazards and risk control options
2. Prepare to manage WHS hazards and risks	2.1 Apply knowledge of the organisation's WHSMS and WHSIS to identify requirements for managing WHS hazards and risks
	2.2 Apply knowledge of ***WHS legislation*** to identify ***duty holders*** and legislative requirements for managing WHS hazards and risks
3. Develop and implement WHS hazard and risk-management processes	3.1 Apply techniques, tools and processes to assess risks associated with hazards and risk control options
	3.2 Apply knowledge of hazards and risks to develop appropriate risk controls
	3.3 Develop and implement a risk control plan and evaluate risk controls
	3.4 Carry out hazard identification and risk management according to organisational and legal requirements, adopting a

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	risk-management approach

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - analyse relevant workplace information and data
  - contribute to the assessment of resources needed to manage risk and where appropriate access these resources
  - identify areas for WHS improvement
- communication skills to:
  - conduct effective formal and informal meetings and communicate effectively with personnel at all levels of the organisation
  - use language appropriate to the work team and the task
- consultation and negotiation skills to:
  - develop plans
  - implement and monitor designated actions
- information technology skills to:
  - access and download internal and external information and data on WHS
  - use a range of communication media
- literacy skills to prepare plans and reports for a range of target groups, including health and safety committees, health and safety representatives, managers, supervisors, and persons conducting businesses or undertakings (PCBUs) or their officers
- organisational skills to manage own tasks within a timeframe
- project-management skills to achieve change in WHS matters
- research skills to:
  - access relevant WHS information and data
  - identify areas for improvement
  - interpret information and data.

Required knowledge

- basic principles of incident causation and injury processes
- difference between hazard and risk

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- formal and informal communication and consultation processes, and key personnel related to communication
- how the characteristics and composition of the workforce impact on WHS risk and the management of WHS, including:
  - communication skills
  - cultural background and diversity
  - gender
  - labour market changes
  - language, literacy and numeracy levels of the workforce
  - structure and organisation of the workforce, including part time, casual and contract workers; shift rosters; and geographical location
  - workers with specific needs and limitations
  - workplace culture towards alcohol and other drug use
- internal and external sources of WHS information and data, and how to access them
- limitations of generic hazard identification and risk assessment checklists, and risk ranking processes
- methods for providing evidence of compliance with WHS legislation
- nature of workplace processes (work flow, planning and control) and hazards relevant to the workplace
- organisational culture as it impacts on the work team
- organisational WHS policies, procedures, processes and systems
- other functional areas that impact on the management of WHS
- principles and practices of a systematic approach to managing WHS
- relevant commonwealth and state or territory WHS Acts, regulations, codes of practice, standards and guidance material, and other relevant publications
- risk as the effect of uncertainty on objectives
- risk management as a duty of PCBUs or their officers under WHS legislation
- roles and responsibilities of individuals and parties under WHS legislation
- standard industry controls for a range of hazards
- techniques, tools and processes for identifying and controlling health and safety hazards and risks, including:
  - hazard and risk checklists
  - hazard hunts
  - job safety analyses
  - manifests and registers, including for dangerous goods, hazardous chemicals and plant
  - safe work method statements
  - surveys using questionnaires, interviews and other survey techniques
  - workplace inspections and walk throughs.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • complete risk assessment using a range tools and processes • outline risk factors and recommended risk controls for a hazard • action plan to implement risk controls and risk-management processes, including positive performance indicators to monitor implementation • knowledge of relevant WHS Acts, regulations, codes of practice, standards and guidance material.
Context of and specific resources for assessment	Assessment must ensure access to: • a workplace or simulated workplace • workplace documentation • office equipment and resources • relevant Acts, regulations, codes of practice, standards and guidelines relating to risks found in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • analysis of responses to case studies and scenarios • assessment of written reports on the effectiveness of hazard identification, risk assessment, and control and management actions taken • demonstration of techniques used to identify hazards, to assess associated risks, and to control, monitor and evaluate risks • direct questioning combined with review of portfolios of evidence and third-party reports of on-the-job performance by the candidate • observation of performance in role plays

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	• observation of presentations • oral or written questioning to assess knowledge • review of action plans • written reports on hazard-identification and risk-management activities.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBWHS503A Contribute to the systematic management of WHS risk • BSBWHS506A Contribute to developing, implementing and maintaining WHS management systems • BSBWHS507A Contribute to managing WHS information systems • BSBWHS508A Manage WHS hazards associated with plant.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Sources of information and data may include:	• Australian and international standards • industry bodies and groups • unions • websites, journals and newsletters • WHS Acts, regulations, codes of practice, guidelines and other information issued by WHS regulators • WHS specialists • workers' compensation insurance agents • workplace policies, procedures, processes and systems.
Hazards and risks may include:	• hazards and risks associated with particular industries and/or occupations

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	• hazards and risks determined by:
	  • needs of the workplace, local industry and regional contexts
	  • how common they are or could be
	  • how big a problem they are or could be, in terms of severity of actual or potential harm, and numbers of workers they may harm
	  • potential or actual costs, impacts on the organisation/industry, and requirements to comply with hazard and industry-specific WHS regulations and codes of practice
	• commonly occurring hazards:
	  • biological hazards, such as viruses, bacteria, hepatitis, legionnaires' disease, Q fever, brucellosis, leptospirosis, HIV and fungi
	  • electrical
	  • extreme temperature
	  • hazardous chemicals
	  • ionising and non-ionising radiation
	  • machinery and equipment
	  • manual tasks
	  • noise and vibration
	  • psychosocial hazards, such as work-related stress and fatigue, bullying and violence
	  • working at height, falling objects, falls, slips and trips.

WHS legislation may include:	• Acts • regulations • codes of practice.

Duty holders may include:	• as specified in WHS Acts:
	  • PCBUs or their officers
	  • workers
	  • other persons at a workplace.

Unit Sector(s)

Regulation, Licensing and Risk – Work Health and Safety

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HLTAID001 Provide cardiopulmonary resuscitation

Modification History

Release	Notes
Release 3	Updated mapping information. Equivalent outcome.
Release 2	Updated mapping information. Equivalent outcome.
Release 1	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria Revised evidence requirements, including volume and frequency of assessment

Application

This unit of competency describes the skills and knowledge required to perform cardiopulmonary resuscitation (CPR) in line with the Australian Resuscitation Council (ARC) Guidelines.

This unit applies to all workers who may be required to provide CPR in a range of situations, include community and workplace settings.

Specific licensing requirements relating to this competency, including requirements for refresher training should be obtained from the relevant state/territory Work Health and Safety Regulatory Authority.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
1. Respond to an emergency	1.1 Recognise an emergency situation

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ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
situation	1.2 Identify, assess and minimise immediate hazards to health and safety of self and others 1.3 Assess the casualty and recognise the need for CPR 1.4 Seek assistance from emergency response services
2. Perform CPR procedures	2.1 Perform CPR 2.2 Display respectful behaviour towards casualty 2.3 Operate automated external defibrillator (AED) according to manufacturer's instructions
3. Communicate details of the incident	3.1 Accurately convey incident details to emergency response services 3.2 Report details of incident to workplace supervisor as appropriate 3.3 Maintain confidentiality of records and information in line with statutory and/or organisational policies

Foundation Skills

The Foundation Skills described those required skills (language, literacy and numeracy) that are essential to performance.

- *Oral communication* – in order to make an accurate verbal report to supervisor and emergency response services

The remaining foundation skills essential to performance are explicit in the performance criteria of this unit.

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Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ced1390f-48d9-4ab0-bd50-b015e5485705

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Assessment Requirements for HLTAID001 Provide cardiopulmonary resuscitation

Modification History

Release	Notes
Release 1	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria. Revised evidence requirements, including volume and frequency of assessment

Performance Evidence

The candidate must show evidence of the ability to complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the job role.

There must be demonstrated evidence that the candidate has completed the following tasks at least once in line with state/territory regulations, first aid codes of practice, ARC guidelines and workplace procedures:

- conducted a hazard assessment and identified strategies to minimise risk
- demonstrated safe manual handling techniques
- assessed airway, breathing and responsiveness of casualty
- performed at least four minutes of uninterrupted CPR on both an adult and an infant resuscitation manikin placed on the floor, demonstrating the following techniques on each:
  - checking for response and normal breathing
  - recognising abnormal breathing
  - opening and clearing the airway
  - using correct hand location, compression depth rate in line with the ARC recommended ratio of compressions and ventilations
  - acting in the event of regurgitation or vomiting
  - following single rescuer procedure, including the demonstration of a rotation of operators with minimal interruptions to compressions
- followed the prompts of an Automated External Defibrillator (AED)
- provided an accurate verbal report of the incident
- responded to at least one simulated resuscitation scenario contextualised to the candidate's workplace/community setting.

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Knowledge Evidence

The candidate must be able to demonstrate essential knowledge required to effectively complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the work role. This includes knowledge of:

- state/territory regulations, first aid codes of practice and workplace procedures including:
  - ARC Guidelines relevant to the provision of CPR
  - safe work practices to minimise risks and potential hazards
  - infection control principles and procedures, including use of standard precautions
  - requirements for currency of skill and knowledge
- legal, workplace and community considerations, including:
  - need for stress-management techniques and available support following an emergency situation
  - duty of care requirements
  - respectful behaviour towards a casualty
  - own skills and limitations
  - consent
  - privacy and confidentiality requirements
  - importance of debriefing
- considerations when providing CPR, including:
  - airway obstruction due to body position
  - appropriate duration and cessation of CPR
  - appropriate use of an AED
  - chain of survival
  - standard precautions
- basic anatomy and physiology relating to:
  - absence of normal breathing
  - anatomy of the external chest
  - physiology relating to response/consciousness
  - upper airway anatomy and effect of positional change.

Assessment Conditions

Skills must be demonstrated working individually:

- in an environment that provides realistic in-depth, industry-validated scenarios and simulations to assess candidates' skills and knowledge.

In addition, assessment resources must include:

- adult and infant resuscitation manikins in line with ARC Guidelines for the purpose of assessment of CPR procedures
- equipment, including:

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- an Automated External Defibrillator (AED) training device.

Simulated assessment environments must simulate the real-life working environment where these skills and knowledge would be performed, with all the relevant equipment and resources of that working environment.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors. In addition, assessors must hold:

- a current advanced first aid certificate

OR

- at least three years' experience as a health professional, nurse or emergency services provider

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ced1390f-48d9-4ab0-bd50-b015e5485705

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HLTAID003 Provide first aid

Modification History

Release	Comments
Release 4.0	Updated mapping information. Equivalent outcome.
Release 3.0	Updated mapping information.
Release 2.0	Minor corrections to formatting to improve readability. Equivalent competency outcome.
Release 1.0	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria, changes to scope of unit. New evidence requirements for assessment. Removal of prerequisite unit

Application

This unit of competency describes the skills and knowledge required to provide a first aid response to a casualty. The unit applies to all workers who may be required to provide a first aid response in a range of situations, include community and workplace settings.

Specific licensing requirements relating to this competency, including requirements for refresher training, should be obtained from the relevant state/territory Work Health and Safety Regulatory Authority.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
1. Respond in an emergency situation	1.1 Recognise an emergency situation 1.2 Identify, assess and manage immediate hazards to health and safety of self and others 1.3 Assess the casualty and recognise the need for first

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ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
	aid response
	1.4 Assess the situation and seek assistance from emergency response services where required
2. Apply appropriate first aid procedures	2.1 Perform cardiopulmonary resuscitation (CPR)
	2.2 Provide first aid in accordance with established first aid principles
	2.3 Display respectful behaviour towards casualty
	2.4 Obtain consent from casualty where possible
	2.5 Use available resources and equipment to make the casualty as comfortable as possible
	2.6 Operate first aid equipment according to manufacturer's instructions
	2.7 Monitor the casualty's condition and respond in accordance with first aid principles
3. Communicate details of the incident	3.1 Accurately convey incident details to emergency response services
	3.2 Report details of incident to workplace supervisor as appropriate
	3.3 Maintain confidentiality of records and information in line with statutory and/or organisational policies
4. Evaluate own performance	4.1 Recognise the possible psychological impacts on self and other rescuers involved in critical incidents
	4.2 Participate in debriefing to address individual needs

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Foundation Skills

The Foundation Skills described those required skills (language, literacy and numeracy) that are essential to performance.

- Oral communication – in order to make an accurate verbal report to emergency response services and workplace supervisor

The remaining foundation skills essential to performance are explicit in the performance criteria of this unit.

Unit Mapping Information

No equivalent unit.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ced1390f-48d9-4ab0-bd50-b015e5485705

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Assessment Requirements for HLTAID003 Provide first aid

Modification History

Release	Comments
Release 1.1	Minor corrections to formatting to improve readability. Equivalent competency outcome.
Release 1.0	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria, changes to scope of unit. New evidence requirements for assessment. Removal of prerequisite unit

Performance Evidence

The candidate must show evidence of the ability to complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the job role.

There must be demonstrated evidence that the candidate has completed the following tasks at least once in line with state/territory regulations, first aid codes of practice, Australian Resuscitation Council (ARC) guidelines and workplace procedures:

- conducted a hazard assessment and identified strategies to minimise risk
- demonstrated safe manual handling techniques
- assessed airway, breathing and responsiveness of casualty
- performed at least four minutes of uninterrupted CPR on both an infant resuscitation manikin and an adult resuscitation manikin placed on the floor, demonstrating the following techniques on each:
  - checking for response and normal breathing
  - recognising abnormal breathing
  - opening and clearing the airway
  - using correct hand location, compression depth rate in line with the ARC recommended ratio of compressions and ventilations
  - acting in the event of regurgitation or vomiting
  - following single rescuer procedure, including the demonstration of a rotation of operators with minimal interruptions to compressions
- followed the prompts of an Automated External Defibrillator (AED)
- conducted a verbal secondary survey

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- applied first aid procedures for the following:
  - allergic reactions
  - anaphylaxis
  - asthma
  - basic wound care
  - severe bleeding
  - burns
  - cardiac arrest
  - choking and airway obstruction
  - convulsions
  - envenomation (using pressure immobilisation)
  - fractures, sprains and strains (using arm slings, roller bandages or other appropriate immobilisation techniques)
  - poisoning
  - respiratory distress
  - shock
- provided an accurate verbal report of the incident
- responded to at least two simulated emergency scenarios contextualised to the candidate's workplace/community setting.

Knowledge Evidence

The candidate must be able to demonstrate essential knowledge required to effectively complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the work role. This includes knowledge of:

- state/territory regulations, first aid codes of practice and workplace procedures including:
  - ARC Guidelines relevant to provision of CPR and first aid
  - safe work practices to minimise risks and potential hazards
  - infection control principles and procedures, including use of standard precautions
  - requirements for currency of skill and knowledge
- legal, workplace and community considerations including:
  - need for stress-management techniques and available support following an emergency situation
  - duty of care requirements
  - respectful behaviour towards a casualty
  - own skills and limitations
  - consent
  - privacy and confidentiality requirements
  - importance of debriefing
- considerations when providing first aid including:
  - airway obstruction due to body position

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  - appropriate duration and cessation of CPR
  - appropriate use of an AED
  - standard precautions and infection control
- principles and procedures for first aid management of the following scenarios:
  - abdominal injuries
  - allergic reactions
  - anaphylaxis
  - bleeding control
  - burns
  - cardiac conditions
  - choking and airway obstruction
  - cold and crush injuries
  - diabetes
  - dislocations
  - drowning
  - envenomation
  - environmental impact (including hypothermia, hyperthermia, dehydration and heat stroke)
  - epilepsy
  - eye and ear injuries
  - fractures
  - head, neck and spinal injuries
  - minor skin injuries
  - needle stick injuries
  - poisoning and toxic substances
  - respiratory distress, including asthma and other respiratory conditions
  - seizures
  - severe allergic and anaphylactic reactions
  - shock
  - soft tissue injuries
  - unconsciousness, abnormal breathing or not breathing
- basic anatomy and physiology relating to:
  - absence of normal breathing
  - anatomy of the external chest
  - physiology relating to response/consciousness
  - upper airway anatomy and effect of positional change
  - anatomy and physiology considerations in provision of first aid for specified conditions

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Assessment Conditions

Skills must be demonstrated working individually:

- in an environment that provides realistic in-depth, industry-validated scenarios and simulations to enable assessment of candidates' skills and knowledge.

Assessment resources must include:

- adult and infant resuscitation manikins in line with ARC Guidelines for the purpose of assessment of CPR procedures
- first aid equipment including
  - roller bandages
  - triangular bandages cloth
  - trauma dressings
  - placebo bronchodilator and spacer device
  - adrenalin auto-injector training device
  - an AED training device
  - emergency rescue blanket
  - workplace first aid kit.

Simulated assessment environments must simulate the real-life working environment where these skills and knowledge would be performed, with all the relevant equipment and resources of that working environment.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

In addition, assessors must hold:

- a current advanced first aid certificate

OR

- at least three years' experience as a health professional, nurse or emergency services provider.
-

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ced1390f-48d9-4ab0-bd50-b015e5485705

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ICAICT206A Install software applications

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to select, install or upgrade basic commercial software applications.

Application of the Unit

This unit applies to workers who require the information and communications technology (ICT) skills to select, install and upgrade basic commercial software applications within a small to large office environment. Communicating effectively and supporting software application packages are key components of any ICT business or office environment.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised*

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Element	Performance Criteria
unit of competency.	*text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Determine software or software upgrade requirements	1.1 Document ***client*** requirements and report to ***appropriate person*** 1.2 Act on instructions to meet client requirements, according to ***organisational requirements***
2. Obtain software or software upgrade	2.1 Investigate and select a ***software application program*** that best conforms to requirements and organisational policies 2.2 Obtain application program under instruction from appropriate ***person*** 2.3 Determine ***licensing requirements*** and record, according to organisational guidelines 2.4 Ensure target ***computer*** conforms to the minimum hardware and ***operating system*** requirements of the ***application program***
3. Install or upgrade software	3.1 Install new or upgraded ***software application program*** according to ***appropriate person*** or organisational instructions 3.2 Complete the installation process efficiently and effectively to minimise disruption 3.3 Carry out testing and acceptance, according to corporate guidelines, paying particular attention to possible ***effect*** on other systems 3.4 Ensure client requirements are satisfied 3.5 Refer outstanding ***client*** issues to ***appropriate person*** as necessary

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

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- communication skills to:
  - communicate with peers and supervisors
  - support software application deployment
- literacy skills to:
  - interpret user manuals and help functions
  - make decisions about licensing requirements
  - read and write basic workplace documents
  - seek assistance and expert advice
- technical skills to:
  - carry out testing
  - upload and install software
  - use computer hardware.

Required knowledge

- broad general knowledge of:
  - client business domain
  - hardware storage devices
  - input and output devices
  - licensing arrangements and responsibilities
  - operating systems supported by the organisation
  - organisational guidelines for purchasing
  - software application packages
  - software copyright responsibilities.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install software applications through operating system instructions • configure computer to accept new software or upgrade

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	• carry out testing and acceptance according to corporate guidelines.
Context of and specific resources for assessment	Assessment must ensure access to: • PC where software installation may be performed • use of application software currently used in industry • documents detailing organisational testing and acceptance policy and procedures • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's underpinning knowledge of software upgrade requirements, current industry standard application software and acceptance testing procedures • direct observation of candidate upgrading or installing new software.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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Client may include:	• employees • external organisations • individuals • internal departments.
Appropriate person may include:	• authorised business representative • client • supervisor.
Organisational requirements may include:	• budget • corporate purchasing • guidelines • licensing arrangements.
Software application program may include:	• database programs • email programs • internet browsers • spreadsheets • system browsers • word processing.
Licensing requirements may include:	• cost of licence • number of licences required • support provided • type of licence.
Computer may include:	• laptops • servers • workstations.
Operating system may include:	• Mac OS X • Linux • Windows.
Effect may relate to:	• data entry • effect on normal business • installation time • problems.

Unit Sector(s)

General ICT

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ICAICT304A Implement system software changes

Modification History

Version	Comments
ICAICT304A	This version first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to implement system software changes and to hand over the modified system to the client's operational area.

Application of the Unit

This unit applies to those working in support roles who are required to update operating systems on client computers with the latest technology fixes.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of*

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Element	Performance Criteria
	performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Determine system changes required	1.1 Determine and record required changes to ***system***
	1.2 Ensure that documentary evidence exists to support changes and evaluate changes required
	1.3 Complete ***documentation*** required according to maintenance methodologies
	1.4 Clarify and confirm the nature of the changes with the ***client***
	1.5 Obtain technical data from reliable sources and request other resources that may be required to complete the changes
2. Carry out system changes	2.1 Plan the procedure to effect intended changes
	2.2 Consult with colleagues and ***users*** involved in the proposed changes and agree a mutually acceptable timeline and method of implementation
	2.3 Copy initialisation or configuration files prior to implementation
	2.4 Create a roll-back path in the event of failure
	2.5 Ensure that changes required in ***software*** are made according to project or ***organisational guidelines***
	2.6 Test and verify that the changes have been made according to implementation guides and ***organisational standards***
3. Present changes to client	3.1 Demonstrate changes to the client and explain the impact of these changes
	3.2 Work towards making these changes acceptable to the client if changes are rejected, or making further modifications if required
	3.3 Update documentation and repositories according to standards and update modifications made to the change-management system
4. Perform handover to client	4.1 Update documentation and client procedures to reflect changes made
	4.2 Secure sign-off of acceptance documents by client
	4.3 Facilitate handover of modified system to client's operational area

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - consult with colleagues and users
  - evaluate client user requirements
- literacy skills to:
  - interpret organisational guidelines and standards
  - interpret policy and procedures
  - interpret technical manuals
  - write documentation and client procedures
- planning and organisational skills to:
  - effect intended changes
  - prioritise and organise own work
  - technical skills to install and configure system software.

Required knowledge

- business scheduling requirements
- change control procedures
- client business domain
- current industry-accepted hardware and software products
- emerging standards for data and voice communications
- system's current functionality
- features of system under modification
- organisational policy and procedures with regard to system changes
- vendor software services with regard to system changes.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

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Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate, document and implement changes to the system with minimum disruption to the system and client users.
Context of and specific resources for assessment	Assessment must ensure access to: • computer • system software currently used in industry • technical manuals and tools • appropriate learning and assessment support when required • modified equipment for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's knowledge of the system's functionality • direct observation of candidate implementing software change • evaluation of candidate's change process and updated modifications • review reports prepared by candidate, including log books and test results.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

System may include:	• application • business • computers • financial system • information system • management system • mobile equipment • network • software.
Documentation for version control may follow:	• audit trails • client training • International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and Australian Standards (AS) standards • maintaining equipment inventory • naming standards • project-management templates and report writing • satisfaction reports • version control.
Client may include:	• customer • external organisation • individual • internal department • internal employee.
Users may include:	• department within the organisation • person within a department • third party.
Implementation may include:	• formulating methods for standby operations or contingency plans • implementing the entire system.
Software may include:	• commercial software applications • in-house or customised software • organisation-specific software

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	• packaged software.
Organisational guidelines may include:	• communication methods • content of emails • dispute resolution • document procedures and templates • downloading information and accessing particular websites • financial control mechanisms • making voice or video calls • opening mail with attachments • personal use of emails and internet access • virus risk.
Organisational standards may include:	• communication with stakeholders • dispute resolution and modification procedures • formal procedures that must be adhered to, such as check points and sign-offs with documented procedures and templates • implementation of financial control mechanisms • processes for determining size and cost.

Unit Sector(s)

General ICT

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ICAICT306A Migrate to new technology

Modification History

Version	Comments
ICAICT306A	This version first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to use upgraded technology. It includes testing and evaluating new technologies to improve the organisation's performance.

Application of the Unit

This unit applies to individuals engaged in ongoing review and research in order to identify and apply new technology or techniques to improve aspects of the organisation's activities.

The unit emphasises the importance of constantly reviewing work processes, skills and techniques to ensure that the quality of the entire business process is maintained at the highest level possible through the appropriate application of new technology.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria

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Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to use new technology	1.1 Review organisation's goals and activities 1.2 Research new operational technologies that will advance the organisation's goals and activities 1.3 Prepare evaluation checklist 1.4 Evaluate and select the most appropriate technologies 1.5 Acquire selected ***technology*** 1.6 Identify and use new or upgraded ***equipment*** where appropriate, for the benefit of the organisation
2. Use technology to assist in solving organisational problems	2.1 Conduct testing of new or upgraded equipment 2.2 Use features and functions of new or upgraded equipment and ***software*** within the organisation 2.3 Access and use ***sources of information*** relating to new or upgraded equipment
3. Evaluate new or upgraded technology performance	3.1 Evaluate new or upgraded equipment for performance and usability against ***OHS standards*** and evaluation criteria 3.2 Determine ***environmental considerations*** from new or upgraded equipment 3.3 Seek ***feedback*** from users, where appropriate 3.4 Document new technology in a method consistent with organisation's guidelines

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

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Required skills

- analytical skills to evaluate features and functions of new equipment and software
- communication skills to:
  - communicate with peers and supervisors
  - seek assistance and expert advice
  - seek feedback from users
- literacy skills to interpret technical documentation, equipment manuals and specifications
- planning and organisational skills to prioritise and monitor own work
- safety awareness skills to work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- research skills to locate appropriate sources of information regarding IT and new technologies
- technical skills to:
  - assist in the decision-making process
  - identify features of new technologies
  - test and evaluate new software and equipment.

Required knowledge

- current technology trends and directions in IT:
  - hardware
  - new developments
  - new protocols
  - services
  - software
- current industry hardware and software products, with broad knowledge of general features and capabilities
- information-gathering techniques
- vendor product directions relating to specified technology.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and	Evidence of the ability to:

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evidence required to demonstrate competency in this unit	• identify new and emerging technology in IT • conduct testing and evaluate new equipment for the benefit of the organisation • use features and functions of new technologies, including software and equipment.
Context of and specific resources for assessment	Assessment must ensure access to: • site where new technology may be used • new equipment and software currently used in industry • documents detailing OHS standards, environmental guidelines and organisational requirements • appropriate learning and assessment support when required • modified equipment for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's knowledge of features and functions of new technology • direct observation of candidate using new technology • review of evaluation prepared by candidate evaluating upgraded technology performance • evaluation of currency of appropriate technology.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Technology may include:	• communications equipment • hardware • networks • personal computers (PCs) • storage.
Equipment may include:	• hard drives • hubs • tablet • modems and other connectivity devices, such as digital subscriber line (DSL) modems • monitors • other peripheral devices • PCs • personal digital assistant (PDA) • printers • switches • workstations.

Software may include:	• commercial software packages
	• customer relationship management
	• enterprise systems (corporate systems)
	• integrated services:
	  • banking
	  • financial services
	• user-based software for new business processes.

Sources of information may include:	• appliance software and technical connections guidance and other outputs supplied by vendors and manufacturers • documents • test pages • web pages.
OHS standards may relate to:	• correct lifting methods • correct posture • length of time in front of computer

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	• light position
	• lighting
	• physical safety considerations:
	  • general electrical safety and cabling
	  • power supply and leads applying to computer and peripheral installations
	• repetitive strain injury prevention
	• style of chair
	• type of desk
	• type of monitor
	• typing position
	• ventilation.

Environmental considerations may include:	• correct disposal by an authorised body of redundant hardware:
	  • circuit boards
	  • hard drives
	  • motherboards
	• recycling
	• safe disposal of packaging:
	  • cardboard
	  • paper
	  • plastic
	  • polystyrene.

Feedback may include:	• interviews • meetings • questionnaires • surveys.

Unit Sector(s)

General ICT

Custom Content Section

Not applicable.

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ICAICT401A Determine and confirm client business requirements

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to determine client business requirements and verify the accuracy of the information gathered.

Application of the Unit

This unit applies to information technology (IT) personnel who are required to gather information to determine business system requirements to meet client expectations and needs.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills*

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Element	Performance Criteria
unit of competency.	*and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Determine context of business need or problem	1.1 Establish the business ***problem*** to be investigated, including determining ***system*** boundaries, scope and the development methodology to be used 1.2 Choose ***information-gathering method*** and develop questions appropriate to business problem 1.3 Develop objectives and identify expected outcomes to be achieved 1.4 Document the business problem 1.5 Submit ***documentation*** to ***appropriate person*** for substantiation
2. Gather information	2.1 Use chosen information-gathering method to identify ***clients*** of the system and problems they encounter 2.2 Record client responses 2.3 Analyse gathered information to identify new ***system requirements*** and establish problem specifications 2.4 Document system requirements and problems 2.5 Analyse physical requirements and identify changes required to implement new systems
3. Confirm system specifications	3.1 Check documentation to ensure it meets client business needs 3.2 Submit documentation to the client for verification of accuracy and approval 3.3 Make changes to the documentation as necessary and indicated by the client 3.4 Submit documentation to client for final approval or sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

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Required skills

- communication skills to:
  - collect and present information
  - liaise and negotiate with internal and external personnel
  - participate in teams
- initiative and enterprise skills to identify, analyse and evaluate information from a variety of sources
- literacy skills to:
  - gather, analyse and evaluate information
  - prepare documentation
- problem-solving skills to:
  - participate in the development of strategic initiatives and contribute to solutions
  - troubleshoot common system problems
- research skills to specify, analyse and evaluate broad features of a particular business domain
- technical skills to provide current advice on systems and data-gathering products.

Required knowledge

- data-gathering techniques
- detailed knowledge in areas related to client business
- functional organisational charts and their interpretation
- physical requirements of the client's business, taking into account current system functionality, geography, environment, client user and cost constraints
- products related to data capture
- role of stakeholders and the degree of stakeholder involvement.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • use investigative techniques to interview and document • produce a clear statement of business expectations and needs,

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competency in this unit	including critical business requirements.
Context of and specific resources for assessment	Assessment must ensure access to: • current business needs • a client expectations brief • business objectives • systems, data gathering and appropriate software products • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of candidate documenting a business problem • verbal or written questioning to assess candidate's knowledge of techniques for gathering, analysing and documenting information • review of documented system specifications developed by candidate for approval by client.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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Problem may refer to:	• application • business • network • system.
System may include:	• application • business • cabling infrastructure • computers • financial information • management • network equipment • software.
Information-gathering method may include:	• focus groups or observation • interviews • physical-site surveys • questionnaires • surveys • vendor offerings.

Documentation may include:	• audit trails
	• standards:
	  • Australian Standards (AS)
	  • Institute of Electrical and Electronics Engineers (IEEE)
	  • International Electrotechnical Commission (IEC)
	  • International Organization for Standardization (ISO)
	  • Internet Engineering Task Force (IETF)
	  • naming
	• project management templates
	• report writing principles
	• version control.

Appropriate person may include:	• authorised business representative • client • supervisor.
Clients may include:	• customers • employees • external organisations • individuals • internal departments.
System requirements may include:	• client user • cost constraints

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	• environment • geography • system functionality.

Unit Sector(s)

General ICT

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ICAICT405A Develop detailed technical design

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to assist in the development of a detailed technical design.

Application of the Unit

This unit applies to individuals performing systems design tasks who are required to review and update technical design documents.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of*

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Element	Performance Criteria
	performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Assist in selecting technical design features	1.1 Select and revise design model based on iteration and design changes 1.2 Incorporate outstanding design points according to ***acceptance criteria*** 1.3 Distribute reports identifying changes and implications to ***appropriate person*** for review
2. Contribute to design review	2.1 Compare design against ***requirements*** and fix as necessary 2.2 Confirm design with appropriate person 2.3 Use ***feedback mechanisms*** to gather information on design changes from ***client*** 2.4 Incorporate design changes where required
3. Contribute to development of program specifications	3.1 Implement modules by incremental development techniques 3.2 Identify user authority for each module 3.3 Prepare detailed specifications of module implementation for each module that will not be incrementally built 3.4 Prepare documentation according to requirements of the ***project***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with client when:
  - transferring and collecting information
  - presenting information and gaining consensus on concepts
- literacy skills to prepare technical documentation
- problem-solving skills to:

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  - develop algorithms
  - participate in the development of strategic initiatives
  - revise the design model
- technical skills to incorporate required changes to model.

Required knowledge

- client business domain and client's critical business functions and processes
- current various life cycle options
- design fundamentals and refinement
- design quality metrics.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• design and prepare a clear and best-fit technical design for a set project, incorporating:
	  • changes to design model based on user requirements
	  • detailed specification of modules
	  • updated documentation to reflect changes.

Context of and specific resources for assessment	Assessment must ensure access to: • requirements model • business requirements • project deliverables • acceptance criteria • current information technology (IT) blueprint • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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	• verbal or written questioning to assess candidate's knowledge of the principles of technical designs • review of project documentation, particularly including design model and module specifications • review of client-feedback mechanisms.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Acceptance criteria may include:	• cost implications • logistical considerations • technical • timeframe.
Appropriate person may include:	• authorised business representative • client • supervisor.
Requirements may relate to:	• application • business • network • people in the organisation • system.
Feedback mechanisms	• interviews • meetings

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may include:	• questionnaires • surveys.
Client may include:	• clubs • external organisations • individuals • internal departments • internal employees.
Project may include:	• business improvement process • business involved in a total organisational change • ebusiness solution involving the total organisation or part of the organisation • systems-only change.

Unit Sector(s)

General ICT

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ICAICT508A Evaluate vendor products and equipment

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to evaluate and test a range of vendor products and equipment against a client's business requirements.

Application of the Unit

This unit applies to individuals in a range of information and communications technology (ICT) areas who are required to assess hardware and software products.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of*

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Element	Performance Criteria
	performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Establish business requirements	1.1 Identify and prioritise ***business requirements*** 1.2 Identify conflicting or overlapping business requirements 1.3 Specify budget and available resources 1.4 Validate business requirements, budget and resource needs with ***client***
2. Identify vendor products and equipment	2.1 Investigate a representative range of vendor products and equipment 2.2 Identify and document interdependencies 2.3 Specify and document technical alternatives available to the business 2.4 Determine and document availability of products and equipment 2.5 Ensure vendor products and equipment meet Australian or other ***standards***
3. Test vendor products and services	3.1 Develop valid and reliable test regime with appropriate measurements 3.2 Establish test environment, including calibrated measuring equipment 3.3 Undertake testing of products or equipment and document results 3.4 Undertake revised testing where initial tests are inconclusive or where alternative product configuration may meet business requirements
4. Evaluate vendor products, services and equipment	4.1 ***Rate*** vendor products for quality, performance and support 4.2 Rate vendor products for fit with client needs 4.3 Establish product limitations, performance, integration capabilities and costs and compare with established business requirements 4.4 Prepare cost-benefit analysis
5. Prepare evaluation	5.1 Document product information in order of preference

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report	5.2 Recommend preferred product, including the reasoning behind recommendations 5.3 Prepare a report containing ***solution*** details 5.4 Submit report to client for approval

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to compare and contrast similar products from different vendors
- communication skills to effectively communicate with vendors
- literacy skills to identify key sources of product information, summarise and document technical information
- numeracy skills to compare prices on different products.

Required knowledge

- broad knowledge of:
  - Australian Computer Society Code of Ethics
  - client business domain
  - copyright and intellectual property
  - current industry-accepted hardware and software products, including their general features and capabilities
- detailed knowledge of current and future technical systems
- features and function of relevant hardware components and software products and the interaction between these
- vendor product and international standards.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

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Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate a range of vendor products and equipment against a client's functional requirements • choose the most appropriate products • document the selected items and selection rationale.
Context of and specific resources for assessment	Assessment must ensure access to: • client functional requirements • hardware and software specifications from vendors • test procedures and activities. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's knowledge of client business domain and appropriate selection criteria • review of reports prepared by candidate showing selected items and selection rationale.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Business requirements may relate to:	• application • business • network • people in the organisation • system.
Client may include:	• employees • external organisations • individuals • internal departments.
Standards may include:	• Australian Standards (AS) • Institute of Electrical and Electronics Engineers (IEEE) • International Electrotechnical Commission (IEC) • International Organization for Standardization (ISO) • International Telecommunications Union (ITU) • Internet Engineering Task Force (IETF) • organisational • project.

Rate process may include:	• evaluation of:
	  • customer testimonies
	  • support documents.

Solution may include:	• hardware upgrades • implementing a new system • new hardware • new software • software upgrades • user training.

Unit Sector(s)

General ICT

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ICANWK410A Install hardware to a network

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to plan, manage and install new hardware components in a network.

Application of the Unit

This unit applies to those employed in technical information technology (IT) support roles, such as network administrators, who are required to install and support network hardware in a peer-to-peer or client-server networked environment.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the*

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Element	Performance Criteria
	required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Determine network hardware requirements	1.1 Assess client ***network hardware*** and cabling requirements, considering compatibility with existing ***application software*** and ***operating system***
	1.2 Analyse requirements against local area network (LAN), wide area network (WAN), wireless networks, and mobile equipment access design limitations and ***organisational guidelines***
	1.3 Evaluate ***client*** requirements according to organisational guidelines, corporate purchasing procedures, licensing arrangements and budget
2. Obtain network hardware	2.1 Contact vendors and obtain technical specifications
	2.2 Evaluate or test hardware according to client requirements and organisational guidelines
	2.3 Document recommendations and provide copies to ***appropriate person***
	2.4 Determine and document licensing requirements and security issues
	2.5 Acquire hardware according to recommendations and organisational procedures
	2.6 Organise cabling infrastructure where required
3. Install network hardware	3.1 Conduct installation with minimal disruption to clients
	3.2 Install hardware according to appropriate installation procedures
	3.3 Configure and test the installation to ensure that it meets client needs
4. Provide instruction and support for installed products	4.1 Determine and document client instructions and needs
	4.2 Provide one-to-one or group instruction to client and users, as required
	4.3 Obtain client evaluation and feedback, to ensure that

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	client requirements have been met

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to assess current client hardware and future requirements
- communication skills to:
  - discuss client requirements and specifications
  - interpret client budget requirements
  - interpret technical and hardware installation manuals
  - provide client instruction
- literacy skills to write technical notes and reports
- numeracy skills to plan, prioritise and organise work
- planning and organisational skills to maintain the continuity of network operations and business functions during network installation tasks
- research skills to document licensing requirements and security issues
- technical skills to:
  - evaluate client equipment for requirements
  - use application and diagnostic software.

Required knowledge

- overview knowledge of:
  - current industry, data and voice networking, security products, devices and procedures
  - current industry-accepted network protocols
  - organisational contracting procedures and responsibilities
  - system diagnostic software
- current industry-accepted network hardware and software products
- hardware and software installation procedures
- LAN capabilities and characteristics, such as network type, IP addressing, switch or hub operation
- network connections, including types of cables and cabling distance limitations and wireless connections
- operating systems sufficient to enable basic installation
- set-up and configuration procedures

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- software packages supported by the organisation.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate client user requirements and hardware installation • install a range of network hardware by planning, managing and supporting the installation of new components in a network, according to organisational policies and procedures.
Context of and specific resources for assessment	Assessment must ensure access to: • vendor hardware and software components • application software and operating system • hardware maintenance tools • live network • networked computers • organisational guidelines • technical documentation and installation manuals • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's underpinning knowledge • direct observation of candidate installing network devices • review of instructional guides for client or group presentation prepared by candidate • evaluation of performance test results prepared by candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level,

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	language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Network hardware may include:	• access points • firewalls • gateways • hubs • IP cameras • mobile phones • modems • network bridges • network interface cards • network printers • network scanners or multifunction devices • network-attached storage (NAS) • personal digital assistants (PDAs) • print servers • routers • switches.
Application software may include:	• database programs to handle data and voice functionality • email programs • internet browsers • spreadsheets • system browsers • word processing.
Operating system may	• Linux • Mac

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include:	• Windows.
Organisational guidelines may include:	• communication methods • content of emails • dispute resolution • document procedures and templates • downloading information and accessing particular websites • financial control mechanisms • opening mail with attachments • personal use of emails and internet access • virus risk.
Client may include:	• clubs • external organisations • individuals • internal departments • internal employees.
Appropriate person may include:	• authorised business representative • client • supervisor.

Unit Sector(s)

Networking

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ICANWK411A Deploy software to networked computers

Modification History

Version	Comments
ICANWK411A	This version first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to plan, manage and support the installation of new or upgraded software to networked computers according to vendor and organisation specifications.

Application of the Unit

This unit applies to those involved in installing, configuring, maintaining and supporting software, such as network administrators and network support staff.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold*

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Element	Performance Criteria
unit of competency.	*italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Determine operating system and software and hardware requirements	1.1 Assess ***client*** software and licensing requirements, considering compatibility with existing application software and operating system 1.2 Assess ***hardware*** requirements 1.3 Analyse requirements against local area network (LAN), wide area network (WAN), and wireless networks within organisational guidelines 1.4 Evaluate client requirements according to organisational guidelines, corporate purchasing procedures and budget
2. Obtain deployment software to automate deployment	2.1 Evaluate ***deployment software*** according to client requirements and organisational guidelines 2.2 Contact ***vendors*** and obtain technical specifications, including support arrangements and licensing 2.3 Acquire software and licences, according to organisational procedures 2.4 Store software licences and manuals, according to organisational guidelines
3. Automate installation of operating system via network	3.1 Plan and deploy ***operating system*** according to appropriate vendor installation procedures with minimal disruption to network and clients 3.2 Configure and test installation to ensure that it meets client needs and vendor specifications 3.3 Install updates and patches
4. Automate installation of software packages via network	4.1 Plan and deploy ***software packages*** according to appropriate vendor installation procedures with minimal disruption to network and clients 4.2 Configure and test installation to ensure that it meets client needs and vendor specifications

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	4.3 Install updates and patches
5. Test and sign off	5.1 Test installed operating system and software for error-free performance, identifying and resolving problems 5.2 Determine and document security and licensing issues 5.3 Obtain client evaluation and feedback, to ensure that client requirements have been met

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with a client to determine functional requirements of network
- literacy skills to document client requirements
- problem-solving skills to troubleshoot and debug:
  - deployment issues
  - configuration issues
- research skills to determine most suitable solution for client
- technical skills to:
  - implement LANs
  - implement various software deployment solutions.

Required knowledge

- overview knowledge of:
  - network protocols and operating systems
  - organisational contracting procedures and responsibilities
  - software licensing requirements and documentation
  - transmission control protocols or internet protocols (TCPs/IPs) and applications
- detailed knowledge of:
  - current industry standards related to software deployment
  - deployment software configuration
  - configuration of automated deployment processes
  - operating system deployment
  - software package deployment
  - troubleshooting deployment processes.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify client software requirements • plan and deploy automatic installation of operating system and software • configure and test installation, ensuring client needs are met.
Context of and specific resources for assessment	Assessment must ensure access to: • site or prototype where deployment processes may be implemented • live network • software tools to support implementation of deployment processes • technical documentation and installation manuals • organisational guidelines • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's knowledge of underpinning knowledge and skills • direct observation of candidate performing the tasks required to successfully implement automated deployment processes • documentation produced in a small project environment that reflects the understanding of client and technical skills required.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally

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	appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Client may include:	• external organisations • individuals • internal departments • internal employees.
Hardware may include:	• networks • network interface card (NIC) • personal computers • servers • workstations.
Deployment software may include:	• Acronis • Altiris • Ghost • remote installation services (RIS) and wireless distribution system (WDS) • Windows Server tools.
Vendors may include:	• Adobe • Apple • Citrix • Linux or Unix • Microsoft • Novell • open source.

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Operating system may include:	• Linux • Mac • Unix • Windows.
Software packages may include:	• office applications • utilities.

Unit Sector(s)

Networking

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ICANWK416A Build security into virtual private networks

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to build security into a virtual private network (VPN).

Application of the Unit

This unit applies to networking staff who are required to ensure that VPNs contain required security.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement.*

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Element	Performance Criteria
	Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Configure router to provide for network security monitoring and management	1.1 Create and apply audit rules consistent with ***policies, standards, protocols and management systems***
	1.2 Configure router to provide appropriate level of asset security and monitoring of security consistent with ***commercial and business requirements***
	1.3 Monitor and manage system to assess the level of security and attempts to breach security of ***framework components***
	1.4 Employ appropriate ***hardware*** and ***software*** to monitor and address security issues and provide VPN solutions
2. Secure a site-to-site VPN	2.1 Configure internet key exchange (IKE) and internet protocol security (IPSec)
	2.2 Configure site-to-site IPSec VPN using pre-shared keys
	2.3 Configure site-to-site IPSec VPN using digital certificates
3. Secure a remote access VPN	3.1 Configure a VPN server
	3.2 Install and administer a router-management console
	3.3 Develop documentation on current ***system*** settings and framework components and file securely for future reference

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to undertake a network security risk assessment
- initiative and enterprise skills to develop enterprise policies, strategies and procedures
- literacy skills to:
  - interpret audit rules
  - produce security documentation

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- numeracy skills to undertake a cost-benefit comparison
- technical skills to:
  - implement LAN, WLAN, VPN and WAN solutions
  - implement security strategies and configure network security software and hardware.

Required knowledge

- characteristics of:
  - auditing and penetration testing techniques
  - configuration of routers and switches
  - security protocols, standards and data encryption
- detailed knowledge of:
  - authentication issues
  - network protocols and operating systems
  - processes and techniques related to security perimeters and their functions
  - security threats, including eavesdropping, data interception, data corruption and data falsification
  - transmission control protocol or internet protocol (TCP/IP) protocols and applications
  - VPNs features, issues and functions
- overview knowledge of:
  - audit and intrusion detection systems
  - LAN, WLAN and WAN
  - organisational issues surrounding security cryptography
  - screened subnets
  - virus detection software.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop basic security functionality for either VPN, LANs, WANs or WLANs • implement such security • maintain such security

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	• document the security implemented and its maintenance.
Context of and specific resources for assessment	Assessment must ensure access to: • network technical requirements • network infrastructure, including servers and security hardware and software • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess candidate's knowledge of:
	  • VPNs
	  • WANs
	  • security protocols
	• review of candidate's documentation of installed security and its maintenance
	• evaluation of candidate's security implementation on a VPN.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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Policies may include:	• audit systems • incident response procedures • network intrusion detection systems.

Standards, protocols and management systems may include:	• AAA security
	• access control lists, context-based control lists
	• data over cable service interface specification
	• domain name system security extensions
	• generic routing encapsulation
	• IEEE 802.11 Protocol standard for secure wireless local area network products
	• internet group management protocol
	• IP security protocol
	• network port addresses translation (NAT or PAT)
	• point-to-point network tunnelling protocol
	• secure:
	  • electronic transactions
	  • multi-purpose internet mail extensions
	  • shell
	  • socket layer and transport layer security.

Commercial and business requirements may include:	• availability • backup • confidentiality • firewalls • hacking prevention • integrity • password logons.
Framework components may include:	• deployment of public key infrastructure (PKI), CA and key management services • firewall technologies • multi-platform directory services supporting relevant standards • operating system capable of providing access control, audit services • support for generalised security services interfaces, personnel security • trusted hardware and operating system at selective desktops, servers, network points and mainframes.
Hardware may include:	• desktop and laptop computers, networked and stand-alone • firewall devices • network-monitoring appliances • routers • switches

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	• wired and wireless networks.
Software may include:	• audit • encryption modules • operating system • packaged software but can be supplied from many varying vendors and can include security • virus checking.
System may include:	• applications • databases • external service providers, such as internet service providers (ISPs) and digital certification suppliers • gateways • operating system • servers.

Unit Sector(s)

Networking

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ICANWK502A Implement secure encryption technologies

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to ensure secure encryption is selected, implemented and monitored in an information and communications technology (ICT) network, either locally or both.

Application of the Unit

This unit applies to information technology (IT) professionals who may select, implement and monitor a secure encryption environment in any size enterprise. The encryption system may include local file encryption and encryption across computer networks.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised*

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Element	Performance Criteria
unit of competency.	*text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Determine encryption methods	1.1 Analyse enterprise data ***security*** requirements 1.2 Create a new or review an existing ***security plan*** to determine appropriate ***encryption*** methods 1.3 Review a range of ***encryption technologies*** and rank the most appropriate options 1.4 Assess the costs associated with each encryption option 1.5 Document encryption options and costs and forward to ***appropriate person*** for decision
2. Implement encryption	2.1 Apply encryption technologies to the enterprise system 2.2 Analyse effect of encryption technologies on ***user*** roles and responsibilities 2.3 Inform user of new encryption technologies and effect it has on their responsibilities
3. Monitor encryption	3.1 Analyse implementation of the encryption technologies, confirming function and performance 3.2 Review help-desk records for problems concerning implementation and take appropriate action 3.3 Review system logs for encryption issues and compromises 3.4 Document encryption issues and compromises, notifying appropriate person

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

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- analytical skills to:
  - analyse enterprise data security requirements and help-desk records
  - monitor and assess encryption systems
  - review a range of encryption software and tools
  - review security plan and conduct a detailed survey, including effect on user
  - review system security logs for breaches
- communication skills to:
  - convey and clarify complex information
  - liaise with users and clients
- literacy skills to:
  - create and interpret a data security analysis report
  - interpret an enterprise security plan
  - interpret and prepare technical documentation that includes encryption options and costs
- numeracy skills to make estimates and comparison of costs (cost-benefit analysis)
- planning and organisational skills to analyse effect on user and plan for organisational change
- problem-solving skills to troubleshoot, debug and correct connectivity and security issues
- research skills to:
  - assess and compare encryption options
  - determine data security threats, risks and countermeasures
- technical skills to:
  - develop enterprise policy and procedures
  - implement best practice encryption systems
  - implement local area network (LAN) or wireless local area network (WLAN), virtual private network (VPN) or wide area network (WAN) solutions
  - monitor encryption system for issues and compromises
  - test and prove function of chosen encryption system
  - undertake a network security risk assessment.

Required knowledge

- certificate-related infrastructure (certificate authorities, registration authorities, repository services)
- common asymmetric key algorithms and their usage
- common symmetric key algorithms and their usage, such as:
  - advanced encryption standard (AES)
  - data encryption standard (DES)
  - triple data encryption algorithm (triple DES)
  - Blowfish

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- encryption strength
- encryption types (public key, secret key, hash key)
- functions and features of:
  - access control permissions
  - digital signatures
  - symmetric encryption, asymmetric encryption and one-way encryption
  - timestamps
- one-way message digests, such as message digest algorithm 5 (MD5) and secure hash algorithm (SHA)
- public key infrastructure (PKI), pretty good privacy (PGP) and GNU Privacy Guard (GnuPG)
- replay security
- sources of security threats, including eavesdropping, data interception, data corruption, data falsification and authentication issues
- transmission control protocol or internet protocol (TCP/IP) protocols and applications
- security problems and challenges that arise from organisational issues
- wired equivalent privacy (WEP), wi-fi protected access (WPA) and wi-fi protected access 2 (WPA2).

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse enterprise data security requirements • create new or review existing security plan to determine the appropriate encryption methods • rank and document appropriate encryption methods • implement encryption systems informing users of any affects • monitor and document encryption issues and compromises notifying appropriate person.
Context of and specific resources for assessment	Assessment must ensure access to: • site where encryption installation may be conducted • live network • servers • encryption software • encryption tools

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	• appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of security analysis and planning report that outlines enterprise security requirements and security plan, including challenges faced and how these were addressed • evaluation of documentation demonstrating review of suitable encryption systems, ranking the most appropriate • verbal or written questioning to assess candidate's knowledge of encryption types, algorithms, functions and features • direct observation of candidate performing tasks required to successfully implement and monitor a chosen encryption system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Security may include:	• access policies

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	• data protection requirements:
	  • encryption
	  • permissions
	  • secure remote access
	  • tamper identification
	  • user authentication and control
	• information rights management
	• roles and site permissions.

Security plan may include:	• enterprise processes • enterprise requirements • enterprise security policies • enterprise work practices and procedures • security analysis report.
Encryption may include:	• asymmetric public-key ciphers • digital signatures • PGP • PKI • PKZIP • Rivest, Shamir and Adelman (RSA) • secure shell (SSH) • secure socket layer (SSL) • symmetric ciphers.
Encryption technologies may include:	• Blowfish Advanced CS • Cryptainer LE • GnuPG • inbuilt operating system file encryption systems • new PKI • open VPN • PGP.
Appropriate person may include:	• authorised business representative • client • supervisor.
User may include:	• department within the enterprise • person within an enterprise department • third party.

Unit Sector(s)

Networking

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ICANWK503A Install and maintain valid authentication processes

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to design, develop, install and maintain authentication processes. Security of information and personnel is of increasing importance to organisations. Authentication is a control or protective measure put into place by an organisation to reduce the vulnerability of the system.

Authentication controls include passwords, personal identification numbers (PINs), smart cards, biometric devices and other Authentication protocols.

Application of the Unit

This unit applies to middle managers, such as information security managers, network engineers or security analysts, responsible for implementing and monitoring the organisational security management system.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Determine authentication requirements	1.1 Determine user and enterprise security requirements with reference to enterprise security plan 1.2 Identify and analyse authentication options according to user and enterprise requirements 1.3 Select the most appropriate authentication and authorisation processes
2. Configure authentication software or tools	2.1 Create an authentication realm and reuse as required to protect different areas of ***server*** 2.2 Add ***users*** and authorisation rules to new realm according to business needs 2.3 Describe user attributes and user attribute set-up 2.4 Set up an authentication filter and authorisation parameters on the appropriate server according to business requirements
3. Apply authentication methods	3.1 Develop or obtain authentication ***protocols*** as required 3.2 Develop and distribute related ***methods*** to users according to business need 3.3 Brief user on authentication system and their responsibilities according to enterprise security plan 3.4 Apply authentication system to ***network*** and user according to system product requirements 3.5 Record and store permission and configuration information in a secure central location
4. Monitor authentication system	4.1 Review the authentication system according to user and enterprise security and quality of service requirements 4.2 Ensure ongoing security monitoring using incident

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	management and reporting processes, according to enterprise security plan 4.3 Adjust authentication system if required

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - analyse network information
  - plan approaches to technical problems or management requirements
- communication skills to:
  - convey and clarify complex information
  - liaise with clients
- literacy skills to interpret and prepare technical documentation, including recording authentication events related to network security design and incident response
- planning skills to plan control methods for managing authentication processes
- problem-solving skills to:
  - apply solutions in complex networks, including systems processes
  - instigate rapid deployment of solutions to problems involving authentication failure and security incidents
- technical skills to apply best practice to systems authentication methodologies and technologies.

Required knowledge

- overview knowledge of:
  - problems and challenges dealing with organisational authentication issues
  - resource accounting through authentication
  - common virtual private network (VPN) issues, including quality of service (QoS) considerations, bandwidth, dynamic security environment
  - function and operation of VPN concepts
- authentication adaptors
- biometric authentication adaptors
- digital certificates, such as VeriSign, X.509, and SSL
- function and operation of authentication

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- network authentication services, such as Kerberos and NT LAN Manager (NTLM)
- features of common password protocols, such as:
  - challenge handshake authentication protocol (CHAP)
  - challenge phrases
  - password authentication protocol (PAP)
  - remote authentication dial-in user service (RADIUS) authentication
- token cards.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • design and deploy authentications solutions to the business technology environment and business needs • configure authentication software or tools • monitor and test authentication process after implementation • ensure authentication solutions are current.
Context of and specific resources for assessment	Assessment must ensure access to: • site or prototype where network authentication may be implemented and managed • network support tools currently used in industry • organisational security policies related to authentication, manufacturer recommendations and current authentication standards, including biometric authentication adaptors • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess candidate's knowledge of:
	  • current and emerging authentication processes
	  • features and limitations in vendor solutions, operating systems and software
	• direct observation of candidate demonstrating management of

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	authentication processes in a range of complex systems • review of documentation prepared by candidate to manage authentication processes.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Server may include:	• application or web • building environmental assessment (BEA) Weblogic • Certificate authority • email • file and print • firewall • file transfer protocol (FTP) • IAS - RADIUS • IBM VisualAge and WebSphere • Microsoft domain controllers • Novell Directory Services (NDS) • proxy or cache • routing and remote access, e.g. using virtual private network (RRAS-VPN).
Users may include:	• external client • intranet

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	• remote.
Protocols may include:	• CHAP and PAP • Kerberos • lightweight directory access protocol (LDAP) • network level authentication • NTLM • open LDAP • simple and protected GSSAPI negotiation mechanism (SPNEGO) • security support provider interface (SSPI).
Methods may include:	• certificates • challenge response • face, voice and unique bio-electric signals • fingerprint • ID card • other biometric identifier • pass phrase • password • PIN • retinal pattern • security token • signature • software token.
Network may include:	• data • internet • large and small local area networks (LANs) • national wide area networks (WANs) • private lines • use of the public switched telephone network (PSTN) for dial-up modems only • voice • VPNs.

Unit Sector(s)

Networking

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ICANWK509A Design and implement a security perimeter for ICT networks

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to build a high performance, high security, failure resistant security perimeter for an enterprise information and communications technology (ICT) network.

Application of the Unit

This unit applies to middle managers, such as information security managers, network engineers, network technicians or security analysts, responsible for implementing and managing the organisational network security.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the	*Performance criteria describe the performance needed to*

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Element	**Performance Criteria**
essential outcomes of a unit of competency.	*demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Plan and design firewall solution	1.1 Determine level and nature of security needed to meet enterprise requirements 1.2 Identify security threats 1.3 Research available perimeter security options 1.4 Design security perimeter to meet identified enterprise requirements
2. Configure perimeter to secure network	2.1 Deploy perimeter devices according to design 2.2 Configure ***perimeter topology*** 2.3 Configure ***basic functionality*** of ***devices*** to allow access 2.4 Configure ***advanced functions***
3. Plan, design and configure network devices to provide secure fallover and redundancy	3.1 Back up device configuration 3.2 Design and configure perimeter to enable continuity of service during upgrade of devices 3.3 Design and configure perimeter to enable continuity of service in the event of device failure
4. Plan, design and configure a VPN solution	4.1 Configure perimeter for site to site virtual private networks (VPNs) 4.2 Configure perimeter as a remote access VPN server 4.3 Configure perimeter to allow ***VPN tunnel*** forwarding 4.4 Diagnose and resolve VPN connectivity issues
5. Test and verify design performance	5.1 Test functionality of basic features 5.2 Test functionality of advanced features 5.3 Perform penetration testing to verify perimeter meets security requirements 5.4 Monitor perimeter device performance

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	5.5 Monitor security breaches 5.6 Document test results and report to appropriate person

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to analyse network information and plan approaches to technical problems or management requirements
- communication skills to:
  - convey and clarify complex information
  - liaise with clients
- literacy skills to interpret and prepare technical documentation, including recording security incidents and developing security policies
- planning skills to plan deployment of the perimeter solution
- problem-solving skills to:
  - design perimeter solution to meet security requirements
  - resolve technical problems
- technical skills to:
  - configure firewalls
  - configure routers
  - deploy perimeter devices to a network
  - test performance of security perimeter to current industry standards.

Required knowledge

- overview knowledge of:
  - emerging security issues
  - emerging security policies
- detailed knowledge of:
  - auditing and penetration testing techniques
  - capabilities of software and hardware perimeter solutions
  - logging analysis techniques
  - organisational network infrastructure
  - security technologies, according to perimeter design

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- weaknesses of installed perimeter design.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify threats to perimeter security • develop design for a secure perimeter • deploy perimeter to meet security requirements • design and configure advanced features of perimeter devices to provide additional services • design and configure an integrated VPN solution • conduct exhaustive testing of perimeter.
Context of and specific resources for assessment	Assessment must ensure access to: • site or prototype where perimeter security may be implemented and managed • perimeter devices • organisational security requirements • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's knowledge of emerging security issues, security features of hardware and software, limitations in vendor solutions, operating systems and software • direct observation of candidate demonstrating deployment and configuration of a security perimeter • direct observation of candidate conducting testing of secure perimeter • evaluation of report that outlines testing procedures, test results and changes made as a result of testing • evaluation of design and implementation of system in terms of performance and suitability for business needs.

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Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Perimeter topology may include:	• 3 legged • back-to-back private • back-to-back public.
Basic functionality may include:	• access control lists (ACLs) • dynamic host configuration protocol (DHCP) • routing • secure network address translation (NAT).
Devices may include:	• Cisco PIX • Cisco router ACLs • ClearOS • Linux iptables • Microsoft ISA Firewall • SmoothWall • Untangle.
Advanced functions may include:	• automated web-client configuration • content filtering • demilitarised zone (DMZ) hosting • firewall policies

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	• forward and reverse caching • load balancing • port forward rules • quality of service (QOS) • server publishing • stateful packet inspection.
VPN tunnel may include:	• IPSec • layer 2 tunnelling protocol (L2TP) • point-to-point tunnelling protocol (PPTP) • secure socket tunnelling protocol (SSTP).

Unit Sector(s)

Networking

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ICANWK516A Determine best-fit topology for a local network

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to determine the most appropriate way of networking computers to meet user needs and business requirements.

Network topologies include large and small local area networks (LANs), wide area networks (WANs), virtual private networks (VPNs), virtual local area networks (VLANs) and wireless local area networks (WLANs).

Application of the Unit

This unit applies to individuals in senior roles in the networking area who are required to plan the most appropriate topology for a proposed network.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria

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Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Determine user needs	1.1 Identify the different segments of the proposed ***network*** based on business ***requirements***
	1.2 Determine segment needs, using network functional analysis
	1.3 Estimate ***traffic*** content and volumes based on business requirements
	1.4 Develop a prioritised organisational network functional matrix
2. Develop local area network specification	2.1 Determine the resource requirements for each network segment on the basis of functional analysis
	2.2 Analyse features of the physical environment for the effect on network design
	2.3 Conduct a costing process for possible topology options
	2.4 Consider topology options with reference to available resources and network functional matrix
	2.5 Select and document appropriate network topology based on business requirements and functional analysis

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to determine features of the physical environment for the effect on network design

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- literacy skills to produce network recommendations
- numeracy skills to conduct a costing process
- technical skills to:
  - conduct basic traffic analysis
  - connect networks and keep cables tidy
  - use LAN functional matrices
  - use network protocols
  - use traffic simulation tools.

Required knowledge

- detailed knowledge of:
  - adaptor cards
  - bridges
  - constraints, including costs and queuing
  - ethernet
  - gateways
  - growth projections and capacity planning
  - high and low-speed links
  - hubs
  - protocols
  - redundancy paths
  - response time and reliability requirements
  - routers
  - scope of operation
  - security
  - transmission control protocol or internet protocol (TCP/IP)
  - traffic flow patterns
  - traffic load
  - users applications requirements
- overview knowledge of:
  - cabling, particularly unshielded twisted pair (UTP), shielded twisted pair (STP) or optic fibre
  - characteristics and relative strengths and weaknesses of LAN network topologies
  - features and capabilities of current industry-accepted hardware and software products
  - features of line sharing protocols.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse business or organisational needs • identify the most appropriate LAN, VPN or WLAN topology • document the recommendation.
Context of and specific resources for assessment	Assessment must ensure access to: • business requirements • equipment specifications • organisational and industry costing • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess knowledge of:
	  • network segments
	  • network traffic
	  • different topologies
	• review of candidate's network functional matrix
	• evaluation of candidate's documented topology recommendation.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Network may include:	• data • large and small LANs • private lines • public switched telephone network (PSTN) for dial-up modems only • VLANs • VPNs • voice • WANs • WLANs.
Requirements may be in reference to:	• application • business • network • people in the organisation • system.
Traffic may include:	• data • video • voice.

Unit Sector(s)

Networking

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ICANWK517A Determine best-fit topology for a wide area network

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to identify the best way computers and local area networks (LANs) can be connected to make a wide area network (WAN).

Application of the Unit

This unit applies to individuals in networking areas who are required to research and recommend the most appropriate topology for a wide area network.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised*

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Element	Performance Criteria
unit of competency.	*text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Identify WAN needs	1.1 Identify the different LAN, or wireless local area network (WLAN) or virtual private network (VPN) segments of the proposed WAN 1.2 Determine segment needs using functional analysis 1.3 Estimate ***traffic*** content and volumes according to expected organisational usage, by examining ***telecommunications infrastructure*** 1.4 Develop an organisational WAN functional matrix
2. Create WAN specification	2.1 Determine ***resource requirements*** for each LAN or WLAN or VPN segment on the basis of functional analysis 2.2 Consider and report how features of the physical environment affect WAN design 2.3 Choose a ***WAN service*** appropriate to the amount and type of traffic expected to access the WAN 2.4 Include redundant links in the proposed WAN connectivity for link backup purposes, in case the main link is disrupted 2.5 Document appropriate WAN service

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to identify WAN needs
- literacy skills to compile reports
- numeracy skills to estimate traffic needs and compare costs
- technical skills to use:

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- functional matrices
- LAN functional matrices
- network protocols
- traffic simulation tools.

Required knowledge

- detailed knowledge of:
  - concepts and types of modems
  - internet protocol (IP) addressing
  - packet switching
  - routed or routable protocols, including IP, IPX and AppleTalk
  - router operations, including DDR
  - routing protocols, including RIP, EIGRP and OSPF
  - transmission control protocols or internet protocols (TCPs/IPs)
  - relationship of asynchronous and synchronous communication
  - use of microwave and satellite communication in networking
- overview knowledge of:
  - constraints and costs
  - features of telecommunications infrastructure, including the difference between digital and analog networks
  - growth projections and capacity planning
  - high or low-speed links
  - protocols
  - redundancy paths
  - response time and reliability requirements
  - scope of operation
  - security
  - traffic flow patterns
  - traffic load
  - users and the applications expected.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

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Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • consider budget constraints and business needs • identify the configuration for connecting a LAN or WLAN or VPN into a WAN • document the configuration.
Context of and specific resources for assessment	Assessment must ensure access to: • design documents relating to LANs to be incorporated into the WAN • equipment specifications • costings • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess candidate's knowledge of:
	  • network segments
	  • telecommunications infrastructure
	• review of candidate's WAN functional matrix
	• evaluation of documented recommendation.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Traffic may include:	• data • video • voice.
Telecommunications infrastructure may include:	• asymmetrical digital subscriber line (ADSL) • high speed digital subscriber line (HDSL) • integrated services digital network (ISDN) • leased lines • switched circuits (permanent virtual circuits (PVCs) and switched virtual circuits (SVCs) • symmetrical digital subscriber line (SDSL) • T-carriers, synchronous optical network (SONET) technologies.
Resource requirements may include:	• average transaction and file transfer size • nature of WAN traffic (i.e. constant, steady, flows or communication in bursts) • number of users • telecommunications links • type of applications using the link.
WAN service may include:	• bandwidth • cost structure • reliability.

Unit Sector(s)

Networking

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ICANWK518A Design an enterprise wireless local area network

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to conduct an internal and outdoor site survey and design a complex wireless local area network (LAN).

Application of the Unit

This unit applies to individuals in the networking area who are required to evaluate client requirements and design an appropriate wireless local area network.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement.*

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Element	Performance Criteria
	Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Document current network configuration	1.1 Obtain details of current ***network*** layout and parameters 1.2 Hold consultations with key stakeholders 1.3 Document the current network configuration, ***network topology*** and links to carrier
2. Research client needs	2.1 Identify the ***client's*** current needs 2.2 Determine future needs 2.3 ***Document*** current and future needs according to ***organisational requirements***
3. Implement site survey	3.1 Select the appropriate diagnostic ***tools*** and measurement processes 3.2 Select test equipment and ensure calibration 3.3 Undertake ***site survey*** with minimum disruption to client and ensure safe working environment for ***users*** and survey personnel 3.4 Record physical infrastructure, building use, aesthetics and other issues that will impact on future network performance and client acceptance 3.5 Record radio frequency interference issues, sources and possible resolution 3.6 Document results of site survey
4. Develop specifications for upgrade of wireless network	4.1 Document the current network performance equipment and capacity for the expanded network 4.2 Assess interference issues relating to existing radio frequency, topographic barriers, climate, obstacles, transmission distances and construction materials 4.3 Assess optimum location and position of access points, repeaters, routers and other equipment 4.4 Develop ***cabling*** plans and repeater links, including power requirements 4.5 Determine frequency to be used based on client and user

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	requirements
5. Model network	5.1 Determine appropriate test and modelling routines 5.2 Determine estimated network traffic and planned growth 5.3 Test planned network using modelling tools and techniques 5.4 Document outcome of tests and revise design where required
6. Determine components for network	6.1 Select and test vendor products and equipment where appropriate 6.2 Consult others, including emerging industry bodies, for sustainable compatibility and economic running costs and user connectivity access 6.3 Finalise components list for suitability and vendor claims 6.4 Prepare ***implementation plans***
7. Present design to client	7.1 Present the design in a clear and logical fashion 7.2 Provide advice to client on reasons for design choice 7.3 Inform the client of design limitations, performance expectations and possible unanticipated outcomes, including ***security*** threats 7.4 Obtain feedback from client 7.5 Undertake modifications to design if required 7.6 Complete final design documentation and seek client endorsement

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with stakeholders, users and industry bodies
- literacy skills to write technical documentation and record user requirements
- numeracy skills to undertake a cost-benefit comparison
- technical skills to:
  - analyse wireless network performance
  - design, develop and implement various wireless network solutions

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- implement wireless networking strategies and configure wireless network software and hardware
- implement WLAN and WMAN
- produce wireless network designs.

Required knowledge

- detailed knowledge of:
  - audit and intrusion detection systems
  - auditing and penetration testing techniques
  - bandwidth and quality of service
  - factors affecting signal quality
  - features of antenna design
  - layer 2 and layer 3 design issues
  - radio frequency theory and practice
  - small office home office (SOHO) and enterprise LANs
  - transmission control protocols or internet protocols (TCP/IP) and applications
  - problems associated with topography and obstacles in radio transmission path
  - wireless security strategies
  - wireless topologies
  - WLAN and WMAN solutions
- overview knowledge of:
  - network protocols and operating systems
  - security protocols, standards and data encryption
  - security threats.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • assess wireless network performance • produce wireless network designs appropriate to client requirements • document design.

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Context of and specific resources for assessment	Assessment must ensure access to: • network infrastructure, including wireless hardware and software • network technical requirements • real or simulated wireless networks • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess candidate's knowledge of:
	  • wireless networks
	  • wireless security
	• review of candidate's completed design documentation
	• evaluation of candidate's implementation plan
	• direct observation of candidate briefing client and obtaining feedback.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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Networks may include:	• domestic • large enterprise WLANs • medium • small.
Network topology may include:	• cabled connected single zone • carrier links • Free Space Optics • indoor and outdoor installations • LMDS • MMDS • multiple zone • satellite connections • stand-alone multi-zone wireless networks.
Client may include:	• communities • external organisations • individuals • internal departments • internal employees.
Document may follow:	• audit trails • client training • International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and Australian Standards (AS) standards • maintaining equipment inventory • naming standards • project management templates and report writing • satisfaction reports • version control.
Organisational requirements may include:	• how and what the organisation wants in regard to work environment • preventative maintenance and diagnostic policy • problem solution processes • roles and technical responsibilities in network management • vendor and product service level support agreements.
Tools may include:	• cable testing • carrier connection tests • data and voice integration measurements • equipment testing • frequency and spectrum analysers • modelling tools for network performance software • power meters

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	• radiation meter.
Site survey may include:	• building plans • GPS measurements • indoor propagation analysis • path loss measurements • physical inspection • satellite mapping.
Users may include:	• department within the organisation • person within a department • third party.
Cabling may include:	• category 5e, 6 and 7 cable • coaxial cable • fibre optic cable.
Implementation plans may include:	• cabling • construction requirements • cut-over arrangements • service suppliers.
Security may include:	• authentication, authorisation and accounting (AAA) • diameter • IP security (IPSec) • lightweight eXtensible authentication protocol (LEAP) • privacy key management (PKM) • secure sockets layer (SSL) • smart cards • tokens • wi-fi protected access (WPA) • wired equivalent privacy (WEP).

Unit Sector(s)

Networking

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ICANWK520A Design IT system security controls

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to design the security controls that ensure an IT system is secure, both physically and legally. It involves developing the organisational policy and procedures for information security, process security, internet technology security, communications security, wireless security and overall physical security.

Application of the Unit

This unit applies to individuals in a range of information and communications technology (ICT) areas who are required to guarantee the security of IT systems.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the	*Performance criteria describe the performance needed to*

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Element	**Performance Criteria**
essential outcomes of a unit of competency.	*demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Review organisational security policy and procedures	1.1 Review business environment to identify existing ***requirements***
	1.2 Determine organisational goals for legal and security requirements
	1.3 Verify security needs in a policy document
	1.4 Determine legislative impact on business domain
	1.5 Gather and document objective evidence on current ***security threats***
	1.6 Identify options for using internal and external expertise
	1.7 Establish and document a standard methodology for performing security tests
2. Develop security plan	2.1 Investigate theoretical attacks and threats on the business
	2.2 Evaluate risks and threats associated with the investigation
	2.3 Prioritise assessment results and write ***security policy***
	2.4 Document information related to attacks, threats, risks and controls in a ***security plan***
	2.5 Review the ***security strategy*** with security-approved key ***stakeholders***
	2.6 Integrate approved changes into business plan and ensure compliance with statutory requirements
3. Design controls to be incorporated into system	3.1 Implement controls in a procedurally organised manner to ensure minimum risk of security breach in line with ***organisational guidelines***
	3.2 Monitor each phase of the implementation to determine the impact on the business
	3.3 Take corrective action on system implementation breakdown

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	3.4 Record implementation process 3.5 Evaluate corrective actions for risk 3.6 Plan ***risk assessment*** review process 3.7 Take action to ensure confidentiality throughout all phases of design

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to undertake risk assessment of data-gathering techniques
- communication skills to manage group facilitation and presentation related to transferring and collecting information
- literacy skills to produce business reports
- planning and organisational skills to provide accurate and concise insights to possible security threats for all levels of staff, both technical and managerial
- problem-solving skills to identify and remedy evolving and complex security threat scenarios.

Required knowledge

- detailed knowledge of:
  - communications security, including human organisational interactions
  - how to conduct an information security risk assessment
  - internet technology security, including firewalls
  - physical security
  - security testing methods for performing security tests
  - wireless security
- overview knowledge of:
  - current industry-accepted security processes, including general features and capabilities of software and hardware solutions
  - ethics in IT
  - general features of specific security technology
  - privacy issues and legislation
  - process security for policy and procedures.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • confirm sufficient knowledge of security products and organisational security policy • establish realistic ground rules for security product procedures • design security controls for a system • incorporate these into a security strategy.
Context of and specific resources for assessment	Assessment must ensure access to: • IT security assurance specifications • probability, frequency and severity of direct and indirect harm, loss or misuse of the IT system • risk analysis tools and methodologies • risks to the mission or business resulting from IT-related risks • security environment, which also includes the threats to security that are, or are held to be, present in the environment • security environment relating to laws and legislation, existing organisational security policies and organisational expertise • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess knowledge of:
	  • layered security
	  • risk management
	  • security issues
	  • statutory requirements
	• review of documented security, including:
	  • policy
	  • plan
	  • strategy.

Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Requirements may relate to:	• application • business • network • people in the organisation • system.
Security threats may include:	• by-pass actions • data tampering and manipulation • eavesdropping • impersonation • keyboard logging • local applications or local area network (LAN) connections • penetration • weaknesses in internet networks.

Security policy may relate to:	• audits and alerts
	• privacy
	• standards, including:
	  • archival
	  • backup
	  • network

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	• theft • viruses.
Security plan may include:	• logical controls • physical controls • social controls.

Security strategy:	• may include:
	  • authentication
	  • authorisation and integrity
	  • privacy
	• usually forms part of the overall objectives of the organisation.

Stakeholders may include:	• development team • project team • sponsor • user.
Organisational guidelines may include:	• communication methods • content of emails • dispute resolution • document procedures • downloading information and accessing particular websites • financial control mechanisms • opening mail with attachments • personal use of emails and internet access • templates • virus risk.
Risk assessment may include:	• developing risk plans • developing scenarios • evaluating threats • following up • gathering information • identifying counter measures • identifying threats • ranking risk • reporting.

Unit Sector(s)

Networking

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ICASAS203A Connect hardware peripherals

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to connect hardware peripherals according to instructions.

Application of the Unit

This unit applies to workers who require the information and communications technology (ICT) skills to connect a variety of hardware peripherals to different configurations and types of ICT equipment. Communicating effectively, and simplifying and solving technical incompatibility conflicts and problems are key components of this ICT support role.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text*

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Element	Performance Criteria
unit of competency.	*is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Confirm client requirements	1.1 Identify and confirm ***peripheral*** requirements of ***client*** according to ***organisational standards***
	1.2 Document client requirements and peripherals needed and report findings to the appropriate person according to organisational standards
	1.3 Verify client requirements with ***appropriate person*** according to organisational standards and reporting procedures
	1.4 Take action to ensure client support expectations are covered by vendor warranty and support services
2. Obtain required peripherals	2.1 Obtain peripherals under instruction from appropriate person
	2.2 Enter details of peripherals into ***equipment inventory*** according to organisational standards
	2.3 Validate that contents of delivered components and physical contents match the packing list and resolve discrepancies if necessary
	2.4 ***Store*** peripherals according to vendors guidelines
3. Connect hardware peripherals	3.1 Verify timeframe for installation schedule with client
	3.2 Remove old peripherals with minimal disruption to clients if they are to be replaced, taking into account ***environmental considerations*** and ***OHS standards***
	3.3 Connect new peripherals with minimum disruption to clients, taking into account ***operating system*** procedures
	3.4 Configure computer to accept new peripherals
	3.5 Test hardware peripherals and confirm client satisfaction, paying particular attention to possible effect on other systems and making adjustments as required

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- customer service and conflict-resolution skills to:
  - ensure proposed actions are consistent with client's expectations
  - transfer and collect information
- literacy skills to:
  - document client requirements
  - follow vendor guidelines
  - present information
  - update equipment inventory
- negotiation skills to interact with other team members and clients
- problem-solving skills to resolve routine installation and configuration issues
- technical skills and decision-making skills to:
  - ensure compatibility of peripherals with operating system
  - remove and install peripherals
  - undertake maintenance procedures.

Required knowledge

- broad general knowledge of:
  - computer operating systems
  - help desk and maintenance practices
  - peripheral devices
  - OHS procedures for electrical equipment
  - interconnectivity of technical system components
- current industry-accepted hardware and software products
- detailed knowledge of inventory procedures
- organisational guidelines relating to external suppliers and vendors.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • safely connect several different types of hardware peripherals to the system according to vendor instructions with a minimum of downtime using known routines and procedures • locate, interpret and use vendor documentation related to connection and storage of hardware peripherals • test operation of newly installed hardware peripherals and confirm client satisfaction • adhere to OHS regulations when working with electrical equipment.
Context of and specific resources for assessment	Assessment must ensure access to: • sites with a representative range of workstations, hardware peripherals, internet connections, cabling, and software to be installed, interconnected and configured • hardware and software currently used in industry • technical documentation, including organisational hardware blueprint • vendor support • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of candidate installing, connecting and configuring hardware peripheral devices • review of reports that document client requirements and peripherals completed for different scenarios and situations • verbal or written questioning to assess candidate's ability to locate, use and interpret vendor documentation • direct observation of candidate testing hardware peripherals added to a system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking

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	background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Peripheral may include:	• Bluetooth device • firewire (IEEE 1394) device • hard drive • keyboard • laptop • mobile phone • modem • mouse • multimedia kit • pen • personal digital assistant (PDA), such as palmtop • printer • scanner • speaker • tape cartridge • touch pad • universal serial bus (USB) device • wireless fidelity (wi-fi) router.
Client may include:	• external organisations • individuals • internal departments.
Organisational standards may include:	• communication methods • content of emails • dispute resolution • document procedures and templates • downloading information and accessing particular websites • financial control mechanisms

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	• opening mail with attachments • personal use of emails and internet access • virus risk.
Appropriate person may include:	• authorised business representative • client • help-desk person • subject matter expert • supervisor • system administrator.
Equipment inventory may include detailed lists of peripherals, including:	• hard drives • hubs • modems or other connectivity devices • monitors • other peripheral devices • personal computers • PDA • printers • switches.
Store may include:	• anti-static packaging • controlled humidity • controlled temperature • secure storage area • shock and vibration minimisation • silica gel desiccant • stacking limits.

Environmental considerations may include:	• recycling of packaging:
	  • cardboard
	  • paper
	  • polystyrene
	• recycling or disposal of ewaste:
	  • cathode ray tube (CRT) monitors
	  • printed circuit boards
	  • redundant hardware.

OHS standards may include:	• electrical safety • safe lifting methods • ventilation.
Operating system may include:	• GNUs Not Unix (GNU) • Linux • Mac OS X • Microsoft Windows

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	• Unix-like operating systems:
	  • HP-UX
	  • IBM AIX
	  • Silicon Graphics IRIX
	  • Sun Solaris.

Unit Sector(s)

Systems administration and support

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ICASAS303A Care for computer hardware

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to manage the maintenance and location of hardware.

Application of the Unit

This unit applies to frontline technical support personnel who are required to manage organisational hardware assets, maintaining both them and their records.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement.*

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Element	Performance Criteria
	Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Establish safe work practices	1.1 Determine, record and apply relevant legal requirements and ***OHS standards*** to the installation and maintenance of computer ***hardware***
	1.2 Determine, record and apply requirements specified by hardware manufacturers
	1.3 Determine, record and apply ***safe work practices***, taking into account legal and manufacturer requirements
2. Establish location requirements for hardware and peripherals	2.1 Determine and apply suitable ***environmental conditions*** for hardware and peripherals
	2.2 Determine and apply ***system protection devices*** where appropriate
	2.3 Determine and apply requirements when moving hardware
	2.4 Determine and apply suitable storage principles for hardware and associated ***peripherals*** and media
3. Establish maintenance practices	3.1 Determine maintenance requirements specified by the ***equipment*** manufacturer
	3.2 Produce ***maintenance*** schedules
	3.3 Perform diagnostic functions, including replacing suspect ***components*** with other serviceable components and reloading associated ***software***
	3.4 Determine whether unserviceable components are replaceable through warranty, replacement or upgrade
	3.5 Perform diagnostic functions using the ***operating system*** (OS) and third-party diagnostic tools
4. Determine appropriate hardware quality standards	4.1 Consider and apply ***business requirements*** in respect of hardware matters
	4.2 Determine and apply quality standards to the selection of appropriate hardware and associated peripherals

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to provide advice and guidance to others
- literacy skills to:
  - comprehend basic workplace documents and technical information
  - determine whether unserviceable components are replaceable through warranty, replacement or upgrade
  - interpret user manuals and help functions
- problem-solving skills to address common operational problems with computer hardware
- safety-awareness skills to work safely in regard to the specific hardware
- technical skills to:
  - diagnose hardware problems
  - reload software
  - replace suspect components
  - reload associated software
  - select appropriate hardware for a given situation
  - set up and maintain hardware
  - undertake diagnostic procedures using OS and third-party diagnostic tools.

Required knowledge

- range of quality levels in current common hardware
- importance of maintenance
- OHS principles specific to mains-powered equipment
- potential environmental effects of common types of hardware
- security issues:
  - viruses
  - worms
- software related to hardware operations
- system hardware and associated peripherals' functions.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • perform diagnostic functions by replacing components, reloading software and by using operating system and other diagnostic tools • establish siting requirements for system hardware and associated peripheral devices • implement safe work practices • determine maintenance requirements and establish maintenance schedule • apply appropriate quality standards to computer hardware and peripherals.
Context of and specific resources for assessment	Assessment must ensure access to: • computer hardware • software and diagnostic tools • warranty records and reports, maintenance schedules, vendor documentation and safe work practices • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• direct observation of candidate performing a range of diagnostic tasks
	• review of maintenance schedule documentation completed by candidate
	• verbal or written questioning to assess candidate's knowledge of:
	  • quality standards applied to computer hardware and peripherals
	  • safe work practices.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking

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	background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

OHS standards may include:	• electrical safety
	• ergonomics in the workplace:
	  • correct posture
	  • style and adjustments of chair
	  • type of desk
	  • type of monitor
	  • working position
	• length of time in front of computer
	• lighting level
	• placement of light fittings
	• repetitive strain injury (RSI) prevention
	• safe lifting methods
	• ventilation.

Hardware may include:	• communications equipment:
	  • modems or other connectivity devices, including digital subscriber line (DSL) modems
	  • wireless access points
	• network equipment:
	  • cables
	  • hubs
	  • racks
	  • routers
	  • servers
	  • switches
	• personal computers (PCs)

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	• remote sites • servers • workstations.
Safe work practices may include:	• codes of practice • hazards and hazardous material • manual handling • physical separation of data cables and mains cables • reporting and following OHS procedures • testing and tagging electrical mains cables.
Environmental conditions may include:	• air circulation • dust • extreme cold • heat • moisture • temperature stability.
System protection devices may include:	• line conditioning • surge protection • uninterruptible power supplies (UPS).
Peripherals may include:	• Bluetooth device • Firewire (IEEE 1394) device • keyboard • laptop • mobile phone • modem • mouse • multimedia kit • pen • personal digital assistant (PDA), such as palmtop • printer • scanner • speaker • tape cartridge • touch pad • universal serial bus (USB) device • wi-fi router.
Equipment may include:	• DSL modems • hard drives • hubs • modems or other connectivity devices • monitors • other peripheral devices

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	• PCs • PDA • printers • switches • workstations.

Maintenance may include:	• faulty components returned to depot
	• on-site response
	• planned maintenance:
	  • dust and grease removal from filters and components
	  • lubrication of fan and blower bearings
	• remote diagnostics.

Components may include:	• CD and DVD drives • central processing unit (CPU) • complementary metal oxide semiconductor (CMOS) battery • fax or modem cards • interface cards • motherboards • power supply • random access memory (RAM).

Software may include:	• application:
	  • database
	  • internet browser
	  • spreadsheet
	  • word-processing
	• commercial
	• customised
	• in-house
	• programming:
	  • assembler
	  • compiler
	  • development tools
	• system:
	  • computer security software
	  • device drivers
	  • OS.

Operating systems may include:	• GNU and Linux • Mac OS X • Microsoft Windows • Unix-like operating systems: • HP-UX

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	• IBM AIX • Silicon Graphics IRIX • Sun Solaris.

Business requirements may include:	• capability for further system upgrades
	• cost and quality
	• existing facilities
	• industry standard components
	• installation:
	  • ease
	  • lead time
	  • licensing issues
	• reliability
	• robustness
	• service level agreements (SLAs)
	• technical support required:
	  • in-house
	  • vendor.

Unit Sector(s)

Systems administration and support

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ICASAS304A Provide basic system administration

Modification History

Version	Comments
ICASAS304A	This version first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to implement components of systems backup, restore, security and licensing in a stand-alone or client server environment.

Application of the Unit

Frontline technical support personnel apply the skills and knowledge in this unit, and generally work under limited supervision with experienced IT support staff.

Support personnel at this level use known routines and procedures where some discretion and judgement are required, and provide technical advice and some leadership in resolution of specified problems. More complex or non-routine activities involving individual responsibility may be performed as part of a group or team and the role may involve some responsibility for others.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Record security access	1.1 Obtain ***client*** access requirements and clearance levels according to ***organisational requirements*** 1.2 Issue computer or network user account and password details to client 1.3 Provide security ***documentation*** and access to client 1.4 Record user account and security access details to maintain system integrity and assist later auditing
2. Record software licences	2.1 Determine what licensed ***software*** is used within the organisation 2.2 Maintain ***records*** of licence number and location 2.3 Check personal computers and network for illegal software 2.3 Report illegal software to ***appropriate person***
3. Carry out system backup	3.1 Create or review organisational backup schedule 3.2 Complete file backups according to schedule 3.3 Label and store backups according to organisational requirements 3.4 Maintain record of backups
4. Restore system backup	4.1 Determine and test restore procedures according to ***organisational guidelines*** 4.2 Complete a restore under supervision of an appropriate person 4.3 Record completed restore according to organisational guidelines
5. Apply security access	5.1 Document security access as per clearance guidelines set by

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controls	management 5.2 Maintain a security access register in line with organisational guidelines to record which client or groups have access to which resources 5.3 Identify the security controls on the file system provided by the ***operating system*** 5.4 Apply effective access control on files and directories

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- literacy skills to:
  - interpret user manuals, technical documentation and help functions
  - maintain inventory records
  - record software licence records
- communication skills to:
  - communicate with peers and supervisors
  - present and explain information
  - seek assistance and expert advice
- planning and organisational skills to plan and develop a backup and restore strategy
- technical skills to:
  - configure user account and security access details
  - identify unlicensed software
  - record user account and security access details.

Required knowledge

- backup procedures
- operating systems used by the organisation
- organisational security procedures
- organisational standards to:
  - carry out backup and restore operations
  - label and store backups
- selection, functions and features of appropriate diagnostic tools
- software copyright responsibilities
- system's current functionality.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • perform systems backup, restore and maintain correct usage according to licensing agreements in a stand-alone or client server environment • maintain software licence records and check for copyright compliance within the system • maintain security access details in a register and apply access controls on (network) resources.
Context of and specific resources for assessment	Assessment must ensure access to: • sites with a representative range of stand-alone and networked client-server environments and operating systems • software licence records • technical records and documentation • organisational backup and restore procedures • organisational security guidelines • appropriate learning and assessment support when required • modified equipment for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of candidate undertaking file backup and restoration • review of records on backup results and backup schedules • review of software licence records • review of the event viewer • verbal or written questioning to assess candidate's knowledge of software copyright compliance.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally

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	appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Client may include:	• employee • external organisation • individual • internal department.
Organisational requirements may include:	• availability of system to be optimised • client-support documentation • complexity of technical manuals • information and communications technology (ICT) policy and procedures relating to service levels and installation • in-house or vendor ICT purchasing arrangements • register of licences • security procedures • storage of ICT documentation • system administration and backup procedures • type of product licences.
Documentation may follow:	• audit trails • client training • International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and Australian Standards (AS) standards • maintaining equipment inventory • naming standards

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	• project-management templates and report writing • satisfaction reports • version control.

Software may include:	• application:
	  • database
	  • internet browser
	  • spreadsheet
	  • word-processing
	• commercial applications
	• customised
	• in-house
	• programming:
	  • assembler
	  • Java, VB, C++, Visual Fox Pro
	  • compiler
	  • development tools
	• system:
	  • computer security
	  • operating system.

Records may include:	• databases • spreadsheets • vendor tools to create, modify and document user accounts • access to computer or network resources.
Appropriate person may include:	• authorised business representative • client • supervisor • system administrator.
Organisational guidelines may include:	• communication methods • content of emails • dispute resolution • document procedures and templates • downloading information and accessing particular websites • financial control mechanisms • opening mail with attachments • personal use of emails and internet access • virus risk.
Operating systems may include:	• GNU and Linux • Mac OS X • Microsoft Windows

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	• Unix-like operating systems:
	  • HP-UX
	  • IBM AIX
	  • Silicon Graphics IRIX
	  • Sun Solaris.

Unit Sector(s)

Systems administration and support

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ICASAS409A Manage risks involving ICT systems and technology

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to implement procedures that identify, analyse, evaluate and monitor risks involving information and communications technology (ICT) systems and technology. This includes the development and management of contingency plans.

Application of the Unit

This unit applies to individuals in senior roles in various ICT areas who are required to manage risk in ICT systems.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the	*Performance criteria describe the performance needed to*

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Element	**Performance Criteria**
essential outcomes of a unit of competency.	*demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Establish risk context	1.1 Review and document organisational and technical environment 1.2 Establish and document risk boundaries according to the business operating and strategic environment
2. Identify risk factors	2.1 Develop or acquire a measurement scale for project risk which includes importance, complexity, time and resources required 2.2 Identify project risks based on the measurement scale developed and document according to ***business requirements*** 2.3 Identify the business impact of changes and document according to current and future business directions
3. Implement contingency plans	3.1 Classify each risk and create ***contingency plans*** that address how the risk will be monitored and overcome, if possible 3.2 Identify measurable benchmarks to track the treatment of risks to the new ***system*** 3.3 Identify risk-management intervention points according to benchmarked performance tolerances 3.4 Demonstrate use of phased implementation and piloting to reduce risk factors
4. Monitor, update and report risk profile	4.1 Conduct regular risk updates to add new risks and remove old risks 4.2 Update contingency plans when appropriate to incorporate new information 4.3 Conduct risk reviews at major project milestones and document outcomes 4.4 Establish feedback processes to provide warning of potential new risks according to business requirements

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to analyse the risk associated with ICT systems and technologies
- communication skills to work with project teams on risk reviews
- literacy skills to:
  - disseminate and document technical specifications
  - write policy
- numeracy skills to scale risks
- planning and organisational skills to:
  - manage risk
  - plan for contingencies.

Required knowledge

- detailed knowledge of risk management
- overview knowledge of:
  - Australian Computer Society Code of Ethics
  - business process design
  - how business sites fit into corporate strategy
  - copyright and intellectual property in relation to IT systems and technology
  - privacy legislation relating to IT systems and technology
  - technology updating guidelines
  - business supply chain
  - user analysis and the CRM.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to	Evidence of the ability to: • identify where risk occurs

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demonstrate competency in this unit	• highlight the measures that will mitigate or obviate risk • set up procedures for regular risk reviews.
Context of and specific resources for assessment	Assessment must ensure access to: • analysis software • business website • networks • requirements documentation • risk management plan • site server • site server software • software applications • updated or new technology • user analysis • web servers • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess candidate's knowledge of:
	  • risk management
	  • business process design
	• review of candidate's documented outcomes of risk assessment process
	• evaluation of candidate's documented contingency plans
	• direct observation of candidate conducting risk reviews at project milestones.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Business requirements may relate to:	• application • business • network • people in the organisation • system.
Contingency plans may include:	• identifying weaknesses and providing for the implementation of a disaster prevention program • minimising disruption to business operations • providing a coordinated approach to the disaster recovery process.
System may include:	• application service provider • applications • databases • gateways • internet service provider (ISP) • operating systems • servers.

Unit Sector(s)

Systems administration and support

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ICASAS505A Review and update disaster recovery and contingency plans

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to analyse the impact of the system on the organisation and carry out risk analysis, disaster recovery and contingency planning.

Application of the Unit

This unit applies to information technology (IT) professionals who are required to prepare contingency plans in case of disaster.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text*

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Element	Performance Criteria
unit of competency.	*is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Evaluate impact of system on business continuity	1.1 Identify ***business critical functions*** and the security environment from ***documentation*** and from discussion with business area and ***project team***
	1.2 Identify critical data and ***software*** from documentation
	1.3 Assess potential impact of business risk and ***threats*** on IT ***systems***
	1.4 Identify and evaluate ***statutory requirements, commercial requirements*** and contingency possibilities according to specifications and cost ***constraints***
2. Evaluate threats to system	2.1 Identify threats to the system, considering security analysis and internal and external business environment
	2.2 Evaluate risk minimisation alternatives against ***specifications*** and cost constraints
3. Formulate prevention and recovery strategy	3.1 Evaluate prevention and recovery options to support critical business functions against business specifications and cost constraints
	3.2 Review current operational procedures to ensure that adequate risk safeguards and ***contingency plans*** are in place
	3.3 Submit disaster recovery and prevention strategy to ***appropriate person*** for approval
4. Develop disaster recovery plan to support strategy	4.1 Identify and document resources required for disaster recovery according to specifications and cost constraints
	4.2 Identify and document processes required for disaster strategy according to project ***standards***
	4.3 Identify ***cut-over criteria*** before initiating disaster plan
	4.4 Document disaster recovery plan and submit to appropriate person for review and sign-off

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - gain consensus on concepts when disaster recovery plan is submitted to higher authorities for review and sign-off
  - negotiate with client business area and project team when business critical functions are identified from project documentation
- literacy skills to interpret statutory requirements
- planning and organisational skills to:
  - manage logistics for resources and procedures required for disaster recovery
  - scope project, and plan time, cost, and quality
  - scope communications, risk analysis and management
- research skills to:
  - follow best practice in system development
  - specify, analyse and evaluate broad features of a particular business domain.

Required knowledge

- backup methodologies
- business planning process relevant to the development of IT business solutions
- client business domain
- disaster recovery plan strategies and components, including:
  - physical security
  - system failure, accident or sabotage (hackers)
  - denial of service
  - virus attack
  - cyber attack
  - telecommunications failure
- OHS
- legislative and organisational requirements
- system's current functionality
- systems engineering.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • specify contingencies that minimise down time for business critical functions • clearly specify directions on how to handle serious down time • coordinate, plan and articulate flexible logistics requirements.
Context of and specific resources for assessment	Assessment must ensure access to: • appropriate learning and assessment support when required • modified equipment for people with special needs • vulnerability assessment and general definition of requirements • acceptance test plan • business impact analysis • information technology security assurance specifications • relevant statutory documentation.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• verbal or written questioning to assess candidate's knowledge of the disaster recovery or contingency plan to ensure the following is covered:
	  • defined recovery requirements from the perspective of business functions
	  • impact of an extended loss on operations and key business functions
	  • contingency plan is understandable, and easy to use and maintain
	  • contingency planning considerations may be integrated into ongoing business planning and system development processes
	  • disaster recovery plan is not a one-off activity, but rather an ongoing process
	• review of disaster recovery plan developed by the candidate.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate.

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	Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Business critical functions may include:	• customer service functions • financial systems • payroll.
Documentation may relate to:	• audit trails • client training • International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and Australian Standards (AS) standards • maintaining equipment inventory • naming standards • project management templates and report writing • satisfaction reports • version control.
Project team may include:	• different businesses working in partnership • individual business analysts • solution developers and business clients working together • third-party solution developers working together.
Software may include:	• commercial • in-house • packaged or customised software.
Threats may include:	• accident • cyber attack

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	• denial of service • espionage • information technology failure • sabotage • security • telecommunications network failure • virus attack • weather, such as storms and earthquake.
Systems may include:	• application service provider • applications • databases • gateways • internet service provider (ISP) • operating systems • servers.
Statutory requirements may include:	• industry imposed controls and standards • legislation, such as Privacy Act • laws regarding confidentiality and reporting of data in organisations, such as health and banking.
Commercial requirements may include:	• access to internal network • availability • backup • confidentiality • encryption • firewalls • hacking • integrity • passwords and logons • storage and data recovery.
Constraints may include:	• budget • hardware • legal constraints • policy • resource • software • time.
Specifications may include:	• current system functionality • technical requirements • user-problem statement.
Contingency plans will typically:	• identify weaknesses and provide for the implementation of a disaster prevention program

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	• minimise disruption to business operations • provide a coordinated approach to the disaster recovery process • vary in format and content detail.
Appropriate person may include:	• authorised business representative • client • supervisor.
Standards may include:	• ISO, IEC and AS standards • organisational standards • project standards.
Cut-over criteria may include:	• actual system down time • authorisations to cut-over • estimate of business impact, including • time before system is operational • cut-over plan refresher.

Unit Sector(s)

Systems administration and support

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ICTBWN3082B Perform tests on optical communication system and components

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to test optical communication systems and components in the field using portable test instruments.

It covers testing of point-to-point networks as well as next generation optical fibre networks which use passive optical network (PON) technologies in fibre to the home (FTTH) deployment.

Application of the Unit

Installation contractors, technical staff and field officers from telecommunications service providers or other private and public organisations or regulatory authorities apply the skills and knowledge in this unit.

They combine technical skills with organisational and administrative skills to perform tests on broadband passive optical networks (PON), fibre to the x (FTTx) networks, hybrid fibre coaxial (HFC) networks and dense wavelength division multiplexing (DWDM) systems during installation, maintenance, commissioning and troubleshooting phases.

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Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority.

If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to use optical measuring instruments	1.1 Obtain ***relevant legislation, codes, regulations and standards*** and prepare for the given work 1.2 Notify ***customer*** for site access, security arrangements and location details of ***optical system*** and test purpose 1.3 Identify site ***hazards*** and notify appropriate personnel to make site safe 1.4 Devise and implement risk control measures of hazards with handling optical fibres and lasers in consultation with appropriate personnel

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	1.5 Prepare a ***testing plan*** indicating the ***type of measurement*** at the nominated ***wavelength*** and seek approval from customer 1.6 Select the appropriate ***tools*** and ***test instruments*** according to the required measurement and enterprise practice
2. Conduct optical measurements	2.1 Set up test instrument according to manufacturer's instructions according to occupational health and safety ***(OHS) and environmental requirements*** 2.2 Perform measurement using knowledge of appropriate testing techniques and in a safe manner to assess the performance of optical system and component 2.3 Record test results and compare with standard test specifications from manufacturer and enterprise guidelines 2.4 Evaluate the test results and report on the functionality of the optical component or equipment and the performance of the optical system
3. Document measurement results	3.1 Document test results for future reference and make recommendations on optimising component and system performance 3.2 Clean work site and make safe according to the enterprise requirements and to customer satisfaction 3.3 Notify appropriate personnel of job completion for sign off and present test documentations

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers and enterprise staff
- literacy skills to read and interpret work instructions and document work
- numeracy skills to gather and record data from measurements
- planning and organisational skills to plan, prioritise and manage own work
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards

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    - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
    - clean an optical connector to an acceptable industry standard
    - safely inspect an optical connector for contamination and determine if cleaning is necessary
    - safely operate:
        - optical loss test set (OLTS)
        - optical time domain reflectometer (OTDR)
        - PON power meter.
        -

Required knowledge

- consequences of mating contaminated optical connectors
- downstream and upstream signals
- DWDM metro and long haul system architecture
- HFC architecture (optical section)
- logarithmic power levels (decibels, dBm)
- optical connector types
- optical fibre safety, practices, handling and theory
- optical spectrum limits, wavelengths used in various applications and International Telecommunications Union (ITU) grid
- optical transmitters and receivers
- PON architecture
- safe handling procedures with optical fibres
- transmission system line rates:
    - optical Ethernet
    - synchronous digital hierarchy (SDH)
- wavelength division multiplexing (WDM), coarse wavelength division multiplexing (CWDM) and DWDM principles and optical multiplexers.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for	Evidence of the ability to:

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assessment and evidence required to demonstrate competency in this unit	• measure optical power level • measure insertion loss of a passive device • measure end-to-end fibre loss (bi-directional) • measure splice loss • measure distance to fault, event, end of fibre using OTDR • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites on which optical measurements can be conducted • tools and equipment required for measurements • manufacturer's documentation for test instruments and equipment under test.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing optical measurements • review of a written reports and test results completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation • ICTBWN3205B Use optical and radio frequency measuring instruments. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill

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	level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• Australian Construction Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts

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	• OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Customer may be:	• asset manager • installation manager • maintenance manager • nominated customer representative • outage manager • project manager.
Optical system may contain:	• add-drop multiplexer • DWDM system • fibre hub • HFC network • optical line termination (OLT) • optical network termination (ONT) • optical amplifier • optical splitter.
Hazards may include:	• building debris • earth potential rise • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage • vermin.
Testing plan may include:	• correct test set-up • recording and evaluation of measurements • test layout • test procedures • test purpose • test sites and location • type of measurements • use of appropriate test equipment.
Type of measurement may include:	• end-to-end continuity using visual fault locator • fibre loss (bi-directional) • insertion loss: • coupler

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	• filter • optical splitter • WDM • optical power level at: • drop terminal • OLT • ONT • optical transmitter • patch panel • optical return loss (ORL) • splice loss • total end-to-end loss, including splices and connectors.
Wavelengths may include:	• 850 nm • 1310 nm • 1490 nm • 1550 nm.
Tools may include:	• alcohol swabs • dry type cleaning cassette for optical connectors • hand tools • lint-free dry wipes • microscope for examining optical connector with: • integral safety infra-red filter • video microscope display • optical connector adaptors • FC to LC • FC to SC • FC to ST • SC to ST • optical reference cable • optical termination.
Test instruments may include:	• bi-directional automated optical loss test set • hand-held optical power meter • hand-held optical source • launch cable for OTDR • OFI-FTTx active ONT detector • OLTS • ORL test set • OTDR multimode • OTDR single mode • PON – OTDR

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	• PON meter • visual fault locator (VFL).

OHS and environmental requirements may include:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Unit Sector(s)

Telecommunications - Broadband and wireless networks

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ICTBWN3088B Install optical fibre splitters in fibre distribution hubs

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor editorial change to performance criterion. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install optical fibre splitters in fibre distribution hubs (FDH) as part of a fibre to the premises (FTTP) network.

Optical networks and FTTP are part of the strategies by service providers using wave division multiplexing (WDM) to deliver very high speed broadband capacity through the access network for the National Broadband Network (NBN) initiative.

Assessment by a TITAB-registered assessor is recommended.

Application of the Unit

Technicians and cable installers who install and maintain optical network cables and equipment in access networks apply the skills and knowledge in this unit to provide services in Next Generation Networks (NGN) using emerging technologies.

NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV, mesh networks and cloud computing.

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Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Set up and prepare for installation	1.1 Review preparation to ensure work complies with requirements of ***relevant legislation, codes, regulations and standards***
	1.2 Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements
	1.3 Notify appropriate personnel of identified ***safety hazards*** at the work site
	1.4 Determine type of ***FDH enclosure*** and ***optical splitter module*** from project plan and identify splitter installation requirements using work instructions
	1.5 Obtain ***tools and safety equipment*** and material to perform tasks safely and efficiently
	1.6 Select and use required protective equipment and make site safe and secure for installation work

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	1.7 Obtain splitter module and visually inspect for ***splitter module damage*** and replace if necessary
2. Install splitter module in FDH	2.1 Follow occupational health and safety ***(OHS) and environmental requirements*** for the given work and identify and avoid ***other services***
	2.2 Open the enclosure and assess the suitability of the FDH according to the project plan
	2.3 Locate next available slot in splitter module area of FDH for installation
	2.4 Insert splitter module and secure according to manufacturer specifications
	2.5 Inspect installed splitter module and surrounding area for completeness of job
3. Prepare and connect splitter input fibres to feeder cable	3.1 Locate feeder port to be connected and remove protective cover in preparation
	3.2 Use an optical power meter to verify feeder port is not active
	3.3 Clean the adapter according to manufacturer specifications and route splitter input fibre to correct feeder port
	3.4 Remove dust cap and clean end face according to manufacturer specifications to prevent possible damage from mating ***contaminated connectors***
	3.5 Connect input fibre to feeder port and record connection according to organisational policy
4. Connect output fibres and test splitter	4.1 Determine output fibre to be connected and required adapter in distribution field
	4.2 Clean adapter and fibre end-face according to manufacturer specifications
	4.3 Route output fibre and connect with adapter in distribution field
	4.4 Test operation of optical splitter for optical power levels at the operating ***WDM optical wavelengths***
	4.5 Record connections, test results and park unused fibre leads for safety reasons according to organisational policy
5. Clean up work site	5.1 Seal any internal enclosures and close FDH
	5.2 Remove installation waste and debris from work site and dispose of according to environmental requirements
	5.3 Notify appropriate personnel of job completion and obtain

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	sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to work effectively within a group
- literacy skills to interpret work instructions
- numeracy skills to gather and record data from measurements
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - clean optical end face
  - connect optical fibre to feeder port
  - operate WDM test equipment and optical power meter
  - recognise optical devices in a communication system
  -

Required knowledge

- organisational policy and procedures
- personal safety issues
- propagation of light in optical communication systems
- role of transmitters and receivers in optical communication systems
- site engineering
- specific OHS requirements relating to the handling of optical fibre and the use of laser light sources
- WDM applications
- workplace and industry environment.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use optical power test equipment • measure optical signals at three WDM wavelengths • install splitter in the enclosure • connect input and out optical fibres to the splitter • test optical splitter • complete connection recording • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • a telecommunications operations site where installation of optical fibre splitters in FDH may be conducted • a fibre distribution hub and relevant optical splitter • use of tools, equipment and personal protective equipment currently used in industry • relevant regulatory and equipment documentation that impacts on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of candidate installing optical fibre splitters in FDH • direct observation of candidate applying all related OHS requirements and work practices • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, e.g.

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	• ICTBWN3090B Install lead-in module and cable for fibre to the premises • ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003

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	• AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environment Protection Acts • ISO Draft 11801 (International) • OHS Acts and relevant codes and standards • regulated or industry codes of practice, including appropriate Australian Communications and Media Authority (ACMA) standards • relevant Institute of Electrical and Electronics Engineers (IEEE) standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Appropriate personnel may be:	• consultant • project engineer • project supervisor • site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• active lasers with no safety labels
	• active optical fibres
	• contact with remote power feed
	• electrical supply that require mandatory separation from communications cable
	• exposed fibres
	• unsafe support structures
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

FDH enclosure may include:	• external cabinet • internal cabinet.
Optical splitter module may include:	• 4 port • 8 port

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	• 16 port • 32 port.

Tools and safety equipment may include:	• personal protective equipment
	• safety equipment
	• test equipment:
	  • passive optical network (PON) meter
	  • optical time domain reflectometer (OTDR)
	• tools:
	  • fibre cleaning kit
	  • fibre splicer
	  • labeller
	  • screw drivers
	  • spanners
	  • tagging tool.

Splitter module damage may include:	• broken connector • kinks in fibre leads • no end caps on connectors • physical damage to module body.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe work practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats

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	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Other services may include:	• alarms • electrical services • fire sprinkler systems • gas and water mains • high voltage (HV) power • other service provider networks.
Contaminated connectors may include:	• chips • dry residue • dust • liquids • scratches.
WDM optical wavelengths are set at:	• 1310 nm • 1490 nm • 1550 nm.

Unit Sector(s)

Telecommunications - Broadband and wireless networks

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ICTBWN3090B Install lead-in module and cable for fibre to the premises

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install a lead-in module and its associated cable for a fibre to the premises (FTTP) installation.

Optical networks and FTTP are part of the strategies by service providers using wave division multiplexing (WDM) to deliver very high speed broadband capacity through the Access Network for the National Broadband Network (NBN) initiative.

FTTP services can be underground or aerial and may include hybrid fibre coaxial (HFC) installations.

Assessment by a TITAB registered assessor is recommended.

Application of the Unit

Technicians and cable installers who install and maintain optical network cables and equipment in Access Networks apply the skills and knowledge in this unit to provide services in Next Generation Networks (NGN) using emerging technologies.

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NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV, mesh networks and cloud computing.

Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority.

If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Set up and prepare for installation	1.1 Obtain ***relevant legislation, codes, regulations and standards*** for compliance when conducting work 1.2 Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements 1.3 Notify appropriate personnel of identified ***safety hazards*** at the work site

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	1.4 Determine type of ***lead-in module*** and cable from project plan and identify ***installation requirements*** using work instructions 1.5 Obtain ***tools and safety equipment*** and material to perform tasks safely and efficiently 1.6 Select and use required protective equipment and make site safe and secure for installation work 1.7 Obtain lead-in module and visually inspect for ***lead-in module damage*** and replace if necessary
2. Install lead-in module in enclosure	2.1 Follow occupational health and safety ***(OHS) and environmental requirements*** for the given work and identify and avoid ***other services*** 2.2 Identify position in ***enclosure*** to secure module and install mounting bracket according to manufacturer's specifications 2.3 Splice lead-in module tail to distribution joint 2.4 Attach lead-in module to mounting bracket and secure in position
3. Install optical fibre lead-in cable to premises	3.1 Unpack and prepare lead-in cable according to manufacturer's specifications 3.2 Haul optical fibre lead-in cable to premises observing ***maximum strain*** on cable for underground installation 3.3 Coil excess cable length within enclosure 3.4 Install aerial lead-in using catenary and bearer wire to meet relevant height and minimum sag requirements
4. Terminate the lead-in cable at the premises	4.1 Access the optical network terminating (ONT) unit to expose lead-in cable to retrieve fibre and connector 4.2 ***Clean ONT adapter and connector*** according to manufacturer's specifications 4.3 Mate fibre connector with ONT adapter ensuring free of ***contaminants*** 4.4 Route fibre cable within ONT and secure in position 4.5 Test operation of lead-in at the ONT for optical power levels at the designated operating ***WDM optical wavelength*** 4.6 Record connections, test results and park unused fibre leads for safety reasons according to organisational policy
5. Clean up work site	5.1 Seal ONT and enclosure 5.2 Remove installation waste and debris from worksite and

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	dispose of according to environmental requirements 5.3 Notify appropriate personnel of job completion and obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to work effectively within a group
- literacy skills to interpret work instructions
- numeracy skills to gather and record data from measurements
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - clean optical end face
  - connect optical fibre to feeder port
  - operate WDM test equipment and optical power meter
  - recognise optical devices in a communication system
  - splice optical fibre lead in tail to distribution joint.
  -

Required knowledge

- licence requirements for working at heights
- organisational policy and procedures
- personal safety issues
- propagation of light in optical communication systems
- role of transmitters and receivers in optical communication systems
- site engineering
- specific OHS requirements relating to the handling of optical fibre and the use of laser light sources
- WDM applications

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- workplace and industry environment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use optical power test equipment • measure optical signals at three WDM wavelengths • install lead-in module in the enclosure for both an aerial and underground installation • demonstrate successful completion of the procedures • complete connection recording • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • access to a telecommunications operations site where installation of lead-in module and cable for FTTP may be conducted • a fibre lead-in module, distribution pit, premises conduit and relevant ONT • use of tools, equipment and personal protective equipment currently used in industry • relevant regulatory and equipment documentation that impacts on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing lead-in module and cable for FTTP applying all related OHS requirements and work practices • direct observation of the candidate measuring optical signals at three WDM wavelengths

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	• oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTBWN3088B Install optical fibre splitters in fibre distribution hubs • ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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Relevant legislation, codes, regulations and standards may include:	• appropriate licences:
	  • winch
	  • crane
	  • forklift
	  • EWP
	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts
	• OHS
	• road and traffic control legislation and codes
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Appropriate personnel may be:	• consultant • project engineer • project supervisor • site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• active lasers with no safety labels
	• active optical fibres
	• contact with remote power feed
	• electrical supply that require mandatory separation from communications cable
	• exposed fibres
	• unsafe support structures
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold

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	• thunderstorms.
Lead-in module may include:	• 1310 nm • 1490 nm • 1550 nm.
Installation requirements may refer to:	• aerial • underground • combination of underground and aerial.

Tools and safety equipment may include:	• personal protective equipment
	• safety equipment
	• test equipment:
	  • passive optical network (PON) meter
	  • optical time domain reflectometer (OTDR)
	  • local area network (LAN) Cat tester
	  • network analyser
	• tools:
	  • fibre cleaning kit
	  • fibre splicer
	  • labeller
	  • screw drivers
	  • spanners
	  • tagging tool.

Lead-in module damage may include:	• cuts in fibre sheathing • end caps on connectors • kinks in fibre leads • physical damage to module body.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • chemicals

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	• materials • tools and equipment • safety equipment: • flashing lights • safety barriers • warning signs and tapes • witches hats • special access requirements • environmental considerations: • clean-up protection • stormwater protection • waste management.
Other services may include:	• alarms • electrical services • fire sprinkler systems • gas and water mains • high voltage (HV) power • other service provider networks.
Enclosure may include:	• cabinet • FTTP cabinet • HFC housing • housing • pit.
Maximum strain may relate to:	• typically 600 nm • verify with manufacturer's for specific value.
Clean ONT adapter and connector may use:	• dry clean • lint-free swabs • lint-free wipes • wet clean.
Contaminants may include:	• chips • dry residue • dust • liquids • scratches.
WDM Optical wavelength is one of:	• 1310 nm • 1490 nm • 1550 nm.

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Unit Sector(s)

Telecommunications - Broadband and wireless networks

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ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to work safely on a live optical fibre installation to test and commission a wave division multiplexing (WDM) system or connect a splitter for fibre to the x (FTTx) deployment.

Optical networks and FTTx are part of the strategies by service providers using WDM to deliver very high speed broadband capacity through the access network for the National Broadband Network (NBN) initiative.

Application of the Unit

Technicians and cable installers who install and maintain optical network cables and equipment in Access Networks apply the skills and knowledge in this unit to provide services in Next Generation Networks (NGN) using emerging technologies.

NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV, mesh networks and cloud computing.

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Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

ICTWHS2170B Follow work health and safety and environmental policy and procedures

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Set up and prepare for working with live fibre	1.1 Obtain ***relevant legislation, codes, regulations and standards*** for compliance when conducting work 1.2 Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements 1.3 Notify appropriate personnel of identified ***safety hazards*** at the worksite 1.4 Determine type of ***FTTx equipment, components of optical distribution network (ODN)*** and ***WDM components*** from project plan for testing and commissioning 1.5 Obtain ***tools and safety equipment*** and materials to perform tasks safely and efficiently 1.6 Select and use required protective equipment and make site safe and secure for commissioning work 1.7 Create a safe working environment by following ***safe work***

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	practices and identifying ***optical fibre hazards*** that could cause ***possible injuries*** when handling optical fibres and laser-based equipment
2. Connect a splitter input fibre to the feeder cable	2.1 Follow occupational health and safety ***(OHS) and environmental requirements*** for the given work and identify and avoid ***other services***
	2.2 Locate the feeder fibre port to be connected
	2.3 Determine the state (live or not) of the fibre port to be connected and notify transmitter to ensure that power is turned off at the source if the fibre port is live
	2.4 Connect up connectorised splitter input fibres as instructed by the manufacturer
	2.5 Arrange for power to be turned back on to the newly connected feeder port
3. Perform live WDM commission testing of a ODN installation used in FTTx network	3.1 Locate the appropriate test points in the ODN from manufacturer's instructions for WDM testing
	3.2 Test live wavelengths for the WDM tests following safety precautions
	3.3 Test the optical signal strengths for the ***operating wavelengths*** incoming into the optical network termination (ONT) and determine if signal strengths are within the ***range of acceptable power levels***
	3.4 Test the losses between the WDM outputs and the individual LM for each wavelength and determine if within ***maximum and minimum power losses***
	3.5 Conduct all ***acceptance tests*** as specified by manufacturer
	3.6 Record and tabulate all tests results for commissioning requirements
4. Clean up work site	4.1 Seal and secure any enclosures and cabinets
	4.2 Remove waste and debris from worksite and dispose of according to environmental requirements
	4.3 Notify appropriate personnel of job completion and obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

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Required skills

- communication skills to work effectively within a group
- literacy skills to interpret work instructions
- numeracy skills to gather and record data from measurements
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - clean optical end face
  - connecting optical fibre to feeder port
  - operate WDM test equipment and optical power meter
  - recognise optical devices in a communication system.
  -

Required knowledge

- organisational policy and procedures
- personal safety issues
- propagation of light in optical communication systems
- role of transmitters and receivers in optical communication systems
- site engineering
- specific OHS requirements relating to the handling of optical fibre and the use of laser light sources
- WDM applications
- workplace and industry environment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and	Evidence of the ability to:

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evidence required to demonstrate competency in this unit	• use optical power test equipment • evaluate tests results • connect input and output optical fibres to the splitter • conduct live tests measuring optical signals at three WDM wavelengths on optical devices • conduct acceptance tests for commissioning • demonstrate successful completion of the procedures • complete connection recording • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • a telecommunications operations site where an FTTP installation may be tested and commissioned • access to a WDM system and relevant optical splitter • use of tools, equipment and personal protective equipment currently used in industry • relevant regulatory and equipment documentation that impacts on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate using optical power test equipment applying all related OHS requirements and work practices • direct observation of the candidate conducting live tests measuring optical signals at three WDM wavelengths • direct observation of the candidate conducting acceptance tests for commissioning • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTBWN3082B Perform tests on optical communication system and components • ICTBWN3088B Install optical fibre splitters in fibre distribution hubs • ICTBWN3090B Install lead-in module and cable for fibre to the premises.

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	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006

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	• AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • ISO Draft 11801 (International) • OHS • regulated or industry codes of practice including appropriate Australian Communications and Media Authority (ACMA) standards • relevant Institute of Electrical and Electronics Engineers (IEEE) standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Appropriate personnel may be:	• consultant • project engineer • project supervisor • site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• active lasers with no safety labels
	• active optical fibres
	• contact with remote power feed
	• electrical supply that require mandatory separation from communications cable
	• exposed fibres
	• unsafe support structures
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

FTTx equipment may include:	• add-drop multiplexer • Bragg grating device • lead-in fibre cable • optical amplifier • optical filter • optical splitter.
Components of the optical distribution	• distribution fibre • distribution joint acting as and feeding LMs (DLM)

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network (ODN) may include:	• fibre access point (FAP) • fibre distribution hub (FDH) • FDH tail cable • lead-in joint with multiple lead-in ports (LM) • main fibre cable • multi-dwelling unit (MDU) • network termination device (NTD) • optical network termination (ONT) • passive optical network (PON) • power supply unit (PSU) • single dwelling unit (SDU).
WDM components may include:	• dispersion compensation module • optical add/drop multiplexer • optical amplifier • optical de-multiplexer • optical multiplexer • transponder • variable optical attenuator.

Tools and safety equipment may include:	• personal protective equipment
	• safety equipment
	• test equipment:
	  • PON meter
	  • optical time domain reflectometer (OTDR)
	• tools:
	  • fibre cleaning kit
	  • fibre splicer
	  • labeller
	  • screw drivers
	  • spanners
	• tagging tool.

Safe work practices may relate to:	• applying relevant Australian standards of required health and safety precautions when working with visible and infra-red lasers • avoiding contact with chemicals, breathing in fumes and vapours, and digesting such materials • clearing fibre particles, hazardous solvents or chemicals from site at the completion of the work • ensuring all solvent residues are disposed of according to environmental policy when using a wet cleaning process • gently releasing stored energy in coiled fibre cable • installing dust caps on unplugged fibre connectors

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	• knowing action and treatment of potential accidents • knowing the colour codes used to identify the various types of fibre and what sort of signals these cables would normally carry • labelling active equipment to warn other people of possible hazards • leaving caps at the end of unconnected fibres and unused laser outputs • never unplugging patch leads without first turning off the active equipment • not damaging or obscuring manufacturer warnings or instruction labels of the laser product during installation • not looking directly into the end of a fibre as it may be carrying laser light • not looking into transmitter ports as they may be of active • not using magnifiers in the presence of laser radiation • restraining cable ends to prevent damage to eyes or body • using only built-in or another form of safe light source when examining connectors with a microscope for contamination, chips or fractures • using protective eyewear designed specifically for laser work • using sharps container to dispose of fibre off-cuts.
Optical fibre hazards may relate to:	• cleaning alcohol, epoxy resins and other solvents and chemicals may be carcinogenic, cause allergies or be dangerous to health in other ways • cleaning fluids, solvents and other chemicals may be highly inflammable • fibre off-cut damage to eyes and skin • inhalation of fibre off-cuts and particles from vacuum cleaning of worksite • laser damage to eyes • causing personal injury by activating equipment without notifying other staff who may be working remotely on the network.
Possible injuries may include:	• damage to lungs from inhalation of fibre off-cuts or particles • damage to retina in eyes • damage to skin from fibre off-cuts • personal injury from cable end whipping when releasing coiled cable.
OHS and environmental requirements may	• identifying other services, including power and gas • personal protective equipment: • earmuffs

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include:	• gloves:
	  • leather
	  • plastic
	  • rubber
	• head protection
	• masks
	• protective suits
	• safety boots
	• safety glasses
	• safe working practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Other services may include:	• alarms • electrical services • fire sprinkler systems • gas and water mains • high voltage power • other service provider networks.
Operating wavelengths may include:	• 1310 nm • 1490 nm • 1550 nm.
Range of acceptable power levels may include:	• -2 to + 2 dBm @ 1310 nm • -26 to -6 dBm @ 1490 nm • -11.5 to +5 dBm @ 1550 nm.
Maximum and minimum power losses may include:	• 23.3 dB to 15.0 dB @1310 nm • 21.6 dB to 8.0 dB @1490 nm • 20.9 dB to 9.5 dB @1550 nm.
Acceptance tests may	• delay

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include:	• dispersion • optical attenuation and loss measurements • optical power levels • phase.

Unit Sector(s)

Telecommunications - Broadband and wireless networks

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ICTBWN3205B Use optical and radio frequency measuring instruments

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to set up and use hand-held optical and radio frequency (RF) communications instruments in order to perform installations, upgrades and fault-finding on optical and RF equipment.

The complexity of the measurements performed is suitable for entry-level practitioners.

Application of the Unit

Installation contractors, technical staff and field officers from telecommunications carriers, other private and public organisations and regulatory authorities apply the skills and knowledge in this unit. They combine technical skills with organisational and administrative skills.

Field officers may be responsible for small projects such as forming routine field measurements on optical fibres in broadband optical networks, RF cables and equipment in broadband cable networks and satellite and terrestrial television systems.

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Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to use measuring instruments	1.1 Obtain approval for site access with customer or site owner prior to site entry 1.2 Identify the purpose of the test and the ***type of measurement*** required 1.3 Select the appropriate ***tools*** and ***instruments*** according to the required measurement 1.4 Check tools and instruments and calibrate to ensure accuracy 1.5 Obtain resources required 1.6 Devise and implement risk control measures in consultation with appropriate personnel and document safety hazards
2. Conduct measurements	2.1 Follow site-specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures 2.2 Set up test equipment according to manufacturer’s

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	instructions and safe industry practice 2.3 Perform measurement using knowledge of appropriate testing techniques to assess the overall system performance 2.4 Record and interpret test results and compare with standard test specifications 2.5 Clean work area and make safe according to established procedures
3. Document measurement results	3.1 Document test results and make recommendations to achieve optimum performance 3.2 Notify customer of work completion

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to interpret technical documentation such as manufacturer's instructions
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - clean an optical connector to an acceptable industry standard
  - inspect an optical connector for contamination and determine if cleaning is necessary
  - operate a digital signal level meter (SLM) to measure RF signals on a broadband network or on a satellite or terrestrial television installation

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- operate a passive optical network (PON) power meter to measure PON signals of various wavelengths on fibre to the home (FTTH) and fibre to the premises (FTTP) network
- operate optical loss test set (OLTS) to measure loss of a fibre.
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Required knowledge

- consequences of mating contaminated optical connectors
- decibels, dBm and dBmV
- optical and RF connector types
- RF awareness and RF safety
- RF spectrum and optical spectrum limits and allocations
- safe handling procedures with optical fibres.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • check and calibrate tools and instruments • perform optical measurements using hand-held instrument • perform RF measurements using hand-held instrument • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites on which optical and RF measurements installations can be conducted • tools and equipment, currently used in industry, required for measurements.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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	• direct observation of the candidate performing an optical measurement using a hand-held instrument • direct observation of the candidate performing an RF measurement using a hand-held instrument • review of an oral and written report with completed documentation.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation • ICTBWN3082B Perform tests on optical communication system and components • ICTRFN3055A Install a radio communications antenna and feedline • ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Type of measurement may include:	• optical measurement:
	  • detecting the presence of an active optical network terminal (ONT)
	  • determining absolute optical power (in dBm)
	  • determining insertion loss (in dB)
	  • determining relative optical power level (in dB)
	• RF measurement:
	  • determining absolute RF power (in dBm)
	  • determining relative RF power level (in dB)
	  • determining relative RF voltage (in dBmV).

Tools may include:	• alcohol swabs
	• dry type cleaning cassette for optical connectors
	• electrical attenuators with suitable connectors
	• lint free dry wipes
	• metallic test leads and RF cables
	• microscope for examining optical connector face
	• optical connector adaptors:
	  • FC to LC
	  • FC to SC
	  • FC to ST
	  • SC to ST
	• optical launch cable
	• optical reference cable
	• optical termination
	• resistive termination
	• RF connector adaptors:
	  • BNC to F type
	  • N type to BNC
	  • N type to SMA
	  • test leads.

Instruments may include:	• hand-held optical power meter • hand-held optical source

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	• OFI-FTTx active ONT detector • OLTS • PON meter • signal level meter (SLM).

Unit Sector(s)

Telecommunications - Broadband and wireless networks

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ICTCBL2005B Install customer cable support systems

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install support systems for cable infrastructure. It involves planning cable routes and selecting and installing a support structure.

The activity may be for a new cable installation, upgrade of cable capacity for an existing network or subsystem, or cabling infrastructure for convergence to Next Generation Networks (NGN).

Assessment by a TITAB registered assessor is recommended.

The six unit competency set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B. that meets the Australian Communications and Media Authority's (ACMA) requirements for Cabling Provider Registration (CPR), is generally used as part of a more specialised customer cabling qualification. This set is usually regarded as more suitable for new entrants where limited industry experience has been obtained and forms the major part of specialised qualifications, such as ICT203103 Certificate II in Telecommunications Cabling. When these six units are undertaken as a set within state and territory funding approved programs, the two benchmark CPR units (ICTCBL2136B and ICTCBL2137B) are not required.

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All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Technical staff who install and provide cabling infrastructure for customer premises and equipment apply the skills and knowledge in this unit.

They may be required to do new installations, upgrades or maintain existing networks in domestic, commercial and industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

This unit applies to indoor and outdoor cable and systems within customer premises.

Licensing/Regulatory Information

Refer to unit descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

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Elements and Performance Criteria

1. Prepare cable support installation	1.1 Arrange access to the site according to required procedure and comply with ***site security arrangements*** and ***relevant legislation, codes, regulations and standards***
	1.2 Confirm site capacities for storage and location of cable feeders or establish alternative methods
	1.3 Determine customer specifications, manufacturer's and enterprise requirements for cable support
	1.4 Notify appropriate personnel of identified ***safety hazards*** at the cabling worksite
	1.5 Plan cable route identifying and avoiding ***other services*** and remote power feeding services operating at above telecommunications network voltage (TNV) on site in commercial buildings
	1.6 Select ***tools*** and materials for installation of support system from work specifications and schedules
2. Determine cable routes	2.1 Review relevant ***plans*** and verify cable locations
	2.2 Select ***cable routes*** appropriate to the location of building services providing access to all outlets and enabling ***cable*** to be supported to the outlet point
	2.3 Plan safe and efficient installation by accurate identification of structural building requirements and identified site constraints
	2.4 Identify cable and services segregation clearances to ensure cable route complies with manufacturers, enterprise, legislative and industry codes of practice
3. Determine support method	3.1 Select an appropriate ***support system*** for the planned cable route and identified site constraints
	3.2 Prepare the support system for capability to meet the planned concentration of cable in any location to facilitate ready access for maintenance and to allow for future expansion
4. Mark out and install fixings and support structure	4.1 Mark out and install fixings and structures securely in a ***safe manner*** to manufacturer's specifications ensuring cable weight can be supported in all operating conditions
	4.2 Align support structure correctly to enable cable to be installed evenly, in order and without damage
	4.3 Install protective earthing to industry standards
	4.4 Conduct work with minimal disruption to ongoing customer activity

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5. Complete support installation	5.1 Check and adjust installed supports to ensure cable will not be exposed to damage during installation and operation 5.2 Remove installation waste and debris from worksite and dispose of according to environmental requirements to maintain safe worksite conditions 5.3 Complete ***documentation***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - arrange site access
  - interpret and apply relevant regulations and standards
  - organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment

technical skills to:

- read and interpret drawings related to:
  - cable coding system
  - cable layouts
  - frame locations
  - identifiers
  - outlet locations
- use correct methods of running and fastening cables in commercial buildings
- use hand and power tools.

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Required knowledge

- building construction of commercial buildings
- cable and services segregation clearances to ensure cable route complies with manufacturer's, enterprise, legislative and industry codes of practice
- features and operating requirements of equipment
- information required to operate appropriate equipment according to specifications
- installation methods and performance requirements
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• plan a cable route and cable support system
	• interpret related floor plans, building plans, reflected ceiling plans and schematic drawings
	• install three different support structures:
	  • catenary wire
	  • ducts and or trays
	  • frame back-mounts
	• complete support installation applying relevant regulations and standards
	• comply with all related OHS requirements and work practices.

Context of, and specific resources for assessment	Assessment must ensure: • sites where customer cable support systems may be installed • use of equipment currently used in industry

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	• relevant regulatory and equipment documentation that impact on cable installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation • direct observation of the candidate installing a cable support system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3009B Install, terminate and certify structured cabling installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Site security arrangements may include:	• access times and methods • approval to enter site • approved entry requirements • electronic surveillance • security clearance.
Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • confined spaces regulations • Environmental Protection Acts • fire regulations • mining legislation • noise abatement and heritage legislation • OHS • regulated or industry codes of practice • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed

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	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable • hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage (HV) power.
Tools may include:	• cutters • drills • explosive power tools • hammers • hand or power (electrical or air) tools • power leads.
Plans may include:	• building plans • floor plans • reflected ceiling plans • schematic drawings.
Cable routes may include:	• ducting systems • false or suspended ceilings • raised floors • subfloor ducting • wall cavities.
Cable may include:	• cable compliant with appropriate ACMA technical standard requirements • structured: • Category 5, 6, 6A, 7 or 7A • shielded twisted pairs (STP) or unshielded twisted pairs (UTP) • underground or aerial.

Support system may refer to:	• back-mount frames for distributors formally main distribution frame (MDF), intermediate distribution frame (IDF), final distribution point (FDP))
	• cable trays:
	  • cable ladder
	  • galvanised steel
	  • low or high sided
	  • perforated
	  • PVC
	  • single or multiple channel

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	• catenary wire
	• ducts:
	  • closed
	  • metal
	  • open
	  • PVC
	  • single or multiple channel
	• line poles
	• systems:
	  • between buildings or poles
	  • exposed areas
	  • in building risers designed for services installation
	  • installed in ceilings
	  • on external building walls
	  • under floors
	• suspension.

Safe manner may include:	• safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	  • ladders
	  • scaffold
	  • scissor lifts or cherry pickers
	• use of protective clothing:
	  • earmuffs
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses.

Documentation may include:	• inventory of material used on project • record of installation procedures • update of cable plan and route.

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Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2006B Place and secure customer cable

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install customer cable infrastructure. It involves selecting cable route, setting up cable dispensers and placing and securing cable.

The activity may be for a new cable installation, upgrade of cable capacity for an existing network or subsystem, or cabling infrastructure for convergence to Next Generation Networks (NGN).

Assessment by a TITAB registered assessor is recommended.

The six unit competency set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B, that meets the Australian Communications and Media Authority's (ACMA) requirements for Cabling Provider Registration (CPR), is generally used as part of a more specialised customer cabling qualification. This set is usually regarded as more suitable for new entrants where limited industry experience has been obtained and forms the major part of specialised qualifications, such as ICT20313 Certificate II in Telecommunications Cabling. When these six units are undertaken as a set within state and territory funding approved programs, the two benchmark CPR units (ICTCBL2136B and ICTCBL2137B) are not required.

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All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Technical staff who install and provide cabling infrastructure for customer premises and equipment apply the skills and knowledge in this unit.

They may be required to do new installations, upgrades or maintain existing networks in domestic, commercial and industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

This unit applies to indoor and outdoor cable and systems within customer premises.

Licensing/Regulatory Information

Refer to the Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

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Elements and Performance Criteria

1. Prepare for task and identify cable route	1.1 Arrange access to the site according to required procedure and comply with ***site security arrangements*** and ***relevant legislation, codes, regulations and standards***
	1.2 Notify appropriate personnel of identified ***safety hazards*** at the cabling work site
	1.3 Plan cable route identifying and avoiding ***other services*** and remote power feeding services operating at above telecommunications network voltage (TNV) on site in commercial buildings
	1.4 Select cable route to maintain required clearances and segregations according to cable plan and complying with relevant industry standards
	1.5 Confirm ***cable route*** and requirements with customer
	1.6 Select ***tools***, equipment and ***cables*** for installation of support system from ***work specifications*** and schedules
2. Set up cable dispensers	2.1 Determine feeder locations to minimise wastage of cable and efficiency
	2.2 Set up ***feeders*** in locations to provide ease of access during hauling of cable
	2.3 Secure feeder locations to minimise safety risks during installation
	2.4 Label hauling end of the cable with unique identifier prior to placement
3. Place and secure cable	3.1 ***Haul and place cable*** in a ***safe manner*** within clearances required by industry standards, manufacturer's and work specifications
	3.2 Place cable in a neat, orderly and methodical manner, allowing sufficient excess at cable ends to facilitate termination
	3.3 Inspect cable to maintain separations to comply with regulations
	3.4 Install barriers to achieve ***separations*** where sufficient spatial separation cannot be met with other services
	3.5 Install and trim ***securing anchors*** promptly to restrain cable movement to manufacturer's specifications
4. Complete cable installation	4.1 Update ***records and cable plans*** promptly and accurately
	4.2 Store records and plans according to customer and company requirements

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	4.3 Remove installation waste and debris from worksite and dispose of according to environmental requirements to maintain safe worksite conditions

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - arrange site access
  - interpret and apply relevant regulations and standards
  - organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - read and interpret drawings related to:
    - cable coding system
    - cable layouts
    - frame locations
    - identifiers
    - outlet locations
  - use correct methods of running and fastening cables in commercial buildings
  - use hand and power tools.
  -

Required knowledge

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- building construction of commercial buildings
- cable and services segregation clearances to ensure cable route complies with manufacturer's, enterprise, legislative and industry codes of practice
- features and operating requirements of equipment
- information required to operate appropriate equipment according to specifications
- installation methods and performance requirements
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • place and secure cables on support structures and building faces for both internal and external locations avoiding cable damage • plan cable placement and set up cable dispensers for structured, aerial and underground cabling • haul and install cables on support structures and building faces for both internal and external locations applying relevant regulations and standards • install securing methods for above locations • complete records and TCA forms • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where placing and securing customer cable may be conducted • use of equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable installation activities.

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Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation • direct observation of the candidate placing and securing cable for three different situations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2005B Install customer cable support systems. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Site security arrangements may include:	• access times and methods • approval to enter site • approved entry requirements • electronic surveillance • security clearance.
Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australia Building Codes and Regulations • cabling security codes and regulations • confined spaces regulations • Environmental Protection Acts • fire regulations • mining legislation • noise abatement and heritage legislation • OHS • regulated or industry codes of practice • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Safety hazards may refer to:	• access points that may contain
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed

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	• electrical supply and areas of earth potential rise that require mandatory separation from communications cable • hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage (HV) power.
Cable route may include:	• ducting systems • false or suspended ceilings • raised floor • sub-floor ducting • wall cavities.
Tools may include:	• cutters • drills • explosive power tools • hammers • hand or power (electrical or air) tools • hauling rope • power leads • pulling sock.

Cables may include:	• cable compliant with appropriate ACMA technical standard requirements
	• structured:
	  • Category 5, 6, 6A, 7 or 7A
	  • shielded twisted pairs (STP) or unshielded twisted pairs (UTP)
	  • underground or aerial.

Work specifications may include:	• ACMA standards
	• cable plans and designs
	• consideration of access to sites:
	  • door and lift access
	  • floor loadings
	  • loading limits
	  • storage areas
	• contract documents
	• enterprise or local environmental hazard requirements
	• manufacturer’s specifications
	• site requirements:
	  • access and egress points

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	• noise control • presentation • relationships with other customer activities • specification schedules • use of over voltage protection.
Feeders may include:	• draw unit • feeding guides • manufacturer's coils • pulley system.
Haul and place cable may refer to:	• cable placed: • in ceilings • on external face of buildings • on external poles • on support structures • through modular furniture ducts • under floors • vertically • within cavities • minimising cable damage: • burning • crushing • cutting • kinking • nicking • sheath twist • stretching.
Safe manner may include:	• safe use and handling of: • chemicals • materials • tools and equipment • work platforms: • ladders • scaffold • scissor lifts or cherry pickers • testing of external poles prior to access • use of protective clothing: • earmuffs • gloves • head protection

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	• kneepads • masks • protective suits • safety boots • safety glasses • working in close proximity to exposed electrical conductors.
Separations may include:	• wiring rules standard AS/ACIF S009:2006 • distance between communications cable and other cable required by regulations where no barrier is installed • distances between communications cable and other services: • high voltage (HV) • single core • HV multi-core • low voltage (LV) • open terminations • physical barriers installed when there is not enough space to achieve spatial separations • requirements defined in ACMA regulations and other relevant Australian standards.
Securing anchors may include:	• brackets • clips • fasteners • ties.
Records and cable plans may relate to:	• electronic databases and computer assisted designs (CAD) • information on: • cable coding system and identifiers • cable layout • frame location • outlet location • inventory of material used on project • record of installation procedures • telecommunications cabling advice (TCA) forms: • TCA1 • TCA2 • updating cable plan and route.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2008B Terminate metallic conductor customer cable

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to terminate metallic conductor cable for indoor and outdoor installations within customer premises. It also applies to joining cable in a terminating block.

The activity may be a new cable installation or upgrade of cable capacity for an existing network or subsystem, or cabling infrastructure for convergence to Next Generation Networks (NGN).

Assessment by a TITAB registered assessor is recommended.

The six unit competency set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B, that meets the Australian Communications and Media Authority's (ACMA) requirements for Cabling Provider Registration (CPR), is generally used as part of a more specialised customer cabling qualification. This set is usually regarded as more suitable for new entrants where limited industry experience has been obtained and forms the major part of specialised qualifications, such as ICT20313 Certificate II in Telecommunications Cabling. When these six units are undertaken as a set within state and territory funding approved programs, the two benchmark CPR units (ICTCBL2136B and ICTCBL2137B) are not required.

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All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Technical staff who terminate metallic conductor cable apply the skills and knowledge in this unit.

This unit applies to all communications applications, digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia. It may be applied to domestic, commercial or industrial installations.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare cable termination	1.1 Arrange access to the site according to required procedure 1.2 Prepare for ***cable terminating work*** within the ***regulatory environment, cabling environment, cable type, cable***

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	identification, termination systems, earthing and protection, records and ***relevant legislation, codes, regulations and standards*** 1.3 Select correct ***termination*** for installation according to ***strategies to manage infrastructure*** and relevant legislation, codes, regulations and standards 1.4 Notify appropriate personnel of identified ***safety hazards*** at cabling worksite 1.5 Identify remote power feeding services which operate at above telecommunications network voltage (TNV) inside customer premises and risks posed by contact with remote power feed 1.6 Remove all ***contaminants*** from worksite that may adversely affect termination and prepare worksite to ensure adequate visibility to minimise errors and reduce eye strain 1.7 Design ***cable and block*** location within frame with capacity for expansion where possible 1.8 Segregate incoming and outgoing cables for ease of access and to minimise overlaying and backtracking of cable
2. Terminate cable	2.1 Remove cable sheath to allow for conductor length and installation requirements 2.2 Layer out cable to manufacturer's ***coding system*** to ensure correct terminating sequence and unique identification where appropriate 2.3 Install over-voltage protection devices to all cables with metallic component where required 2.4 Install terminating modules to frame according to manufacturer's specifications 2.5 Fan cable pairs neatly to termination equipment to facilitate accurate termination 2.6 Terminate cable following occupational health and safety ***(OHS) and environmental requirements*** to manufacturer's specifications using correct tool 2.7 Earth cable shield to manufacturer's specifications and industry standards
3. Test termination	3.1 Conduct a visual inspection to confirm that the termination colour code sequence has been followed 3.2 Test termination to satisfy performance specifications and record results
4. Complete records	4.1 Label cable pairs clearly to provide an accurate

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and clean up site	identification according to manufacturer's, industry and client standards 4.2 Update records and plans with ***cabling details*** to provide an accurate record according to industry codes of practice and AS/ACIF S009:2006 4.3 Complete telecommunications cabling advice (TCA) forms and notify customer 4.4 Remove installation waste and debris from worksite and dispose of according to environmental requirements to maintain safe worksite conditions

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with work associates, supervisors, team members and clients
- literacy skills to interpret:
  - technical documentation, such as equipment manuals, specifications and requirements for metallic cable termination
  - related regulations and industry codes
  - review relevant plans to identify and verify cable terminations
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - check environmental conditions are suitable for termination
  - identify remote power feeding services in a range of commonly encountered circumstances
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to:
  - work systematically with required attention to detail and adherence to all safety requirements

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  - confirm an inventory of tools and materials necessary to terminate cable according to work specifications and schedules
- technical skills to:
  - perform fault clearance
  - read and interpret drawings related to:
    - cable coding system and identifiers
    - cable locations
    - frame locations
    - layouts and terminations
    - outlet location
  - use diagnostic equipment
  - use hand and power tools.
  -

Required knowledge

- features and operating requirements of testing equipment
- information required to operate appropriate terminating and testing equipment according to specifications
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- termination methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • terminate systems at both distributor and outlet locations • terminate one jumperable distributor (campus distributor or building distributor) with a capacity of 100 pair or greater and one non-jumperable distributor (local distributor) and a patch panel • terminate at least one 50 pair, one 4 pair, and one Ethernet

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	cables; including accurate completion of installation records, drawing alterations and compliance forms • use correct methods to terminate a range of cables • conduct and interpret cable test results and a minimum of three different lead-in fault remediation • interpret and apply relevant legislation, codes, regulations and standards • update records and plans to show pair locations • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where metallic conductor cable may be terminated • use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable terminating activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral or written report with completed documentation • direct observation of the candidate terminating at least one 50 pair, one 4 pair, and one Ethernet cables.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2006B Place and secure customer cable. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and

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	the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Cable terminating work refers to:	• cabling work:
	  • aerial and underground
	  • performed only in relation to a customer's premises
	• customer metallic cabling that terminates on a socket or network termination device or patch panel.

Regulatory environment refers to:	• accredited registrars and registration • ACMA • Certified Components List • Communications Alliance • labelling requirements • Telecommunications Act 1997.

Cabling environment may refer to:	• indoor environments, including concealed locations:
	  • ceilings and false ceilings
	  • internal wall space
	  • modular workstations
	  • under floor
	• outdoor environments ,including cable installations:
	  • aerial telecommunications cabling for restricted cabling work but does not include installations on poles shared

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	with low voltage (LV) or high voltage (HV) electrical power cables or terminations • external walls • underground cabling in an exclusive trench or shared trench with electrical LV cables and other utilities.
Cable type may include:	• aerial or underground • coaxial cable • copper twisted pair • indoor or external • structured data cable: • Category 5, 6, 6A, 7 or 7A
Cable identification refers to:	• cable conductor identification codes: • banded • colour coded • lettered • numbered.
Termination systems may include:	• distribution frames • Krone block • patch panel • socket • termination strip.
Earthing and protection must include:	• earthing for protection • surge suppression.
Records may include:	• building, cabling and equipment location plans • cable plans • labelling of: • distributor pairs • distributor verticals • equipment closets • network termination device (NTD) record cards • patch panels • rooms • telecommunication outlets • record books and cards: • campus distributors (CD) • building distributors (BD) • floor distributors (FD) • local distributors (LD) • TCA conforming with AS/ACIFS009:2006:

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	• cable drawings • record books • record cards • TCA1 sign off form • TCA2 form.
Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian Standard: AS/ACIF S008:2006 and Australian Standard: AS/ACIF S009:2006 • cabling security codes and regulations • communications cabling manual (restricted) • ISO Draft 11801 (International) • regulated or industry codes of practice and appropriate ACMA technical standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Termination may include:	• cable termination at a frame or outlet location • cable termination usually done individually • termination systems that may be manufacturer's proprietary systems.
Strategies to manage infrastructure may refer to:	• appropriate separations, fastening techniques and correct use of cable trays and support systems • back-mount or outlet layout conforms to manufacturer's specifications • layout allows for adequate workspace to ensure ease of access for installation and service purposes • terminating equipment layout systematically and following relevant industry codes of practice, standards and customer requirements where appropriate.
Safety hazards may refer to:	• access points that may contain: • hazardous light (non-visible laser)

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	• radio frequency (RF) emission • electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable • hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service.
Contaminants may include:	• asbestos • building debris • dust • paint • water.
Cable and block include:	• cable support bock • mounting bracket • terminating block • ropes and anchors.
Coding system may be:	• banded • colour coded • lettered • numbered.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety harness
	  • safety line
	• safe working practices, such as the safe use and handling of:
	  • tools and equipment
	  • materials
	  • chemicals
	  • work platforms

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	• asbestos
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Cabling details may include:	• cable location and type • cable infrastructure pair locations • interconnections • pair numbering and labelling.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2012B Install functional and protective telecommunications earthing system

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install telecommunications earthing system to metallic frames.

Assessment by a TITAB registered assessor is recommended.

Licensing, legislative, regulatory and certification requirements apply to telecommunications earthing systems.

The six unit competency set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B. that meets the Australian Communications and Media Authority's (ACMA) requirements for Cabling Provider Registration (CPR), is generally used as part of a more specialised customer cabling qualification. This set is usually regarded as more suitable for new entrants where limited industry experience has been obtained and forms the major part of specialised qualifications such as ICT20313 Certificate II in Telecommunications Cabling. When these six units are undertaken as a set within state and territory funding approved programs, the two benchmark CPR units (ICTCBL2136B and ICTCBL2137B) are not required.

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All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Telecommunications technicians and field officers who install earthing systems apply the skills and knowledge in this unit.

This unit may be applied to domestic, small office home office (SOHO), commercial or industrial installations and covers multi-storey and multi-site locations. It applies to indoor and outdoor installation of cabling and equipment within customer premises.

Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, LANs and WANs and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

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Elements and Performance Criteria

1. Prepare to install telecommunications earthing system	1.1 Prepare for given work according to ***relevant legislation, codes, regulations and standards***
	1.2 Arrange access to the site according to required procedure
	1.3 Calculate ***earthing requirements*** using relevant cable characteristics
	1.4 Calculate the upper and lower limits of resistance for cable system earths
	1.5 Establish ***location*** of ***earthing applications***, minimising the risks posed by contact with remote power feeding services
	1.6 Select route to minimise interference to system performance and according to safe working practices
	1.7 Select earthing materials to comply with relevant industry standards
2. Install and secure earth cable	2.1 Maintain cable separations to meet performance requirements of application environment
	2.2 Check earth cable insulation is undamaged to ensure integrity of earth provided
	2.3 Isolate protective and ***functional earths*** at all times to ensure operation according to industry standards
	2.4 Install and secure cable following occupational health and safety ***(OHS) and environmental requirements*** meeting manufacturer's specifications and industry standards
3. Terminate and test earth cable installation	3.1 Terminate earth with connectors recommended by manufacturer and according to industry standards
	3.2 Maintain earth continuity at all times to ensure safe and reliable system operation
	3.3 Maintain correct interface requirements with electrical systems according to industry standards
	3.4 Test the earthing system according to manufacturer's specifications in a safe manner
	3.5 Rectify earth system faults, where required, prior to re-testing
4. Complete task and documentation	4.1 Label earthing systems according to industry regulations
	4.2 Complete documentation, including test records
	4.3 Clean up and restore worksite
	4.4 Notify customer and obtain sign off

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications, competency requirements for telecommunications earthing systems
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to work systematically with required attention to detail
- technical skills to use hand and power tools, diagnostic equipment and perform fault clearance.
-

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000, legislation, codes of practice and other formal agreements that impact on the work activity
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- manufacturer‘s requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate earthing needs for cable systems on customer premises and apply related OHS requirements • determine potential earthing locations • determine earth route and support system • install functional earth installations including equi-potential bonding • test and label earth installation • manage remote power feed services.
Context of, and specific resources for assessment	Assessment must ensure: • sites where installation of functional and protective telecommunications earthing system may be conducted • use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, such as test results, updated cable plans and records • direct observation of the candidate installing a functional and protective telecommunications earthing system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCMP2022B Organise and monitor cabling to ensure

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	compliance with regulatory and industry standards. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS 3260:1993

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	• AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • Environmental Protection Acts • fire regulations • National Association of Testing Authorities (NATA) requirements • OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Earthing requirements refers to:	• provision of safe operation of the installation and includes:
	  • lightning conductor
	  • link to multiple earth neutral (MEN)
	  • over voltage
	  • screening
	  • surges and spikes.

Location refers to:	• cable routes • cable trays • communications earthing terminal (CET) • cross connects • data cabinets • final distribution point (FDP) • intermediate distribution frame (IDF) • main distribution frame (MDF) • telecommunications closures • telecommunications reference conductor (TRC).
Earthing applications may include:	• barriers • data rack • distributor (MDF) bonding • equipment earthing • exposed metal work • screen earth • TRC • telex earth (single function earth).
Functional earths refer to:	• earth systems with functionality to: • eliminate interference from electromagnetic, radio frequency (RF) and power sources

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	• reduce interference from electromagneticRF and power sources.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment
	  • witches hats
	  • flashing lights
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • gas and other hazard detection equipment
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2016A Joint metallic conductor cable on customer premises

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to joint metallic conductor cable on customer premises in underground situations, pits, jointing enclosures or above ground. Assessment by a TITAB registered assessor is recommended. All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Application of the unit	Technical staff apply the knowledge and skills for jointing of metallic cable. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia. They may make use of formal documentation, such as accurate completion of a telecommunications cabling advice (TCA) form (TCA1 form), test routines and databases.

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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for jointing	1.1. Arrange access to the site according to required procedures 1.2. Inform appropriate personnel of identified ***hazards*** on worksite 1.3. Organise tools, equipment and materials for given work

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Review ***site plans and documentation***
	1.5. Select ***cable type*** and requirements for ***cable joint***
2. Joint cable and test joint	2.1. Joint metallic cable following occupational health and safety (***OHS***) ***and environmental requirements*** and complying with manufacturer's requirements and relevant ***industry standards***
	2.2. Perform relevant cable tests to ensure joint complies with site specifications, ***manufacturer's specifications*** and ***relevant legislation***, ***codes***, ***regulations and standards***
	2.3. Rectify any cable faults
	2.4. Make a visual inspection of the joint to confirm soundness and completeness
3. Complete records and clean up site	3.1. Complete required records and notify customer
	3.2. Remove installation waste and debris from worksite and dispose of according to environmental requirements to maintain safe worksite conditions
	3.3. Reinstate site according to customer and company requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications for jointing metallic conductor cable
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards

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REQUIRED SKILLS AND KNOWLEDGE

• work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• task management skills to work systematically with required attention to detail and adherence to all safety requirements
• technical skills to:
  • perform fault clearance
  • use diagnostic equipment
  • use hand and power tools

Required knowledge
• ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000, legislation, codes of practice and other formal agreements that impact on the work activity • features and operating requirements of test equipment • information required to operate equipment according to a test specification • manufacturer's requirements for safe operation of equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • joint at least one 20 pair (or greater) cable • test joint • interpret test results • rectify cable faults • comply with all related OHS requirements and work practices.
Context of, and specific resources	Assessment must ensure:

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EVIDENCE GUIDE	
for assessment	• sites where jointing metallic conductor cable may be conducted • use of joint testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable jointing and testing activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of hands-on project completed by the candidate • review of oral and written report with test results • direct observation of the candidate jointing cable and testing joint.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3015A Locate and identify cable system faults. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Hazards may include:	• building debris • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Site plans and documentation may include:	• access location • cable coding system and identifiers • cable plan.

Cable type may include:	• copper:
	  • 20 pair
	  • 50 pair
	  • 100 pair
	  • Category 5
	  • Category 6
	• metallic.

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RANGE STATEMENT	

Cable joint may involve:	• additional service points for connection
	• jointing enclosures
	• joints due to:
	  • access points requirements
	  • cable damage
	  • fault rectification
	  • long cable runs
	• stub joints
	• underground pits.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes

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RANGE STATEMENT	

	• witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Industry standards refer to:	• regulated or industry codes of practice and include appropriate ACMA technical standards
	• joints are waterproof and vermin proof
	• jointed cable supported for effective curing and alignment
	• requirement to be compliant with appropriate ACMA technical standard requirements:
	  • aerial
	  • Category 5, 6, 6A, 7 or 7A
	  • Unshielded twisted pair (UTP)
	  • underground
	• requirement for all cabling products to be ACMA-approved.

Manufacturer's specifications may include:	• diagnostic procedures • installation instructions • maintenance schedule • warranty conditions.
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS

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RANGE STATEMENT	
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL2017B Alter services to existing cable system

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor changes to range statement to reflect changed terminology. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to alter services to an existing voice or data cable system within customer premises.

Assessment by a TITAB-registered assessor is recommended.

The six unit competency set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B, that meets the Australian Communications and Media Authority's (ACMA) requirements for Cabling Provider Registration (CPR), is generally used as part of a more specialised customer cabling qualification. This set is usually regarded as more suitable for new entrants where limited industry experience has been obtained and forms the major part of specialised qualifications, such as ICT20313 Certificate II in Telecommunications Cabling. When these six units are undertaken as a set within state and territory funding approved programs, the two benchmark Cabling Provider Rules units (ICTCBL2136B and ICTCBL2137B) are not required.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

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Application of the Unit

Technical staff who alter services to existing cable systems apply the skills and knowledge in this unit.

This unit applies to indoor and outdoor installation within a customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

They may make use of formal documentation, such as accurate completion of a telecommunications cabling advice form (TCA1 form), test routines and databases.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to alter services to existing cable system	1.1 Survey the site to determine ***system alteration*** requirements to ***existing cable system***
	1.2 Inform appropriate personnel of identified ***hazards*** on work

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	site 1.3 Organise equipment and materials to meet required industry standards and ensure compatibility with existing system 1.4 Arrange ***access to site*** according to required procedures
2. Alter cable system	2.1 Follow ***occupational health and safety (OHS) and environmental requirements*** for the given work and according to industry standards 2.2 Alter system so that it conforms to ***client system specifications*** according to requirements of ***relevant legislation, codes, regulations and standards***
3. Restore and test cable system	3.1 Confirm compatibility of alterations with existing systems 3.2 Test new work in isolation and when integrated with existing systems 3.3 Rectify any faults
4. Complete records and clean up site	4.1 Update plans and documents to show revised systems accurately and clearly, or create new plans as appropriate 4.2 Remove installation waste and debris from work site and dispose of according to environmental requirements to maintain safe work site conditions 4.3 Reinstate site according to customer and company requirements 4.4 Complete TCA1 form and sign off with customer to record satisfaction

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals, specifications and service orders
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems

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- task-management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use hand and power tools
  -

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- legislation, codes of practice and other formal agreements that impact on the work activity
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- manufacturer requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • estimate requirements and document specifications and cable plan for alteration • alter, restore and test cable system according to industry standards • rectify faults • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessments must ensure: • sites on which alterations to existing cable system may be conducted

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	• use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impacts on alteration activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, such as TCA1 form • direct observation of the candidate altering services to an existing cable system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2005B Install customer cable support systems • ICTCBL2006B Place and secure customer cable • ICTCBL2008B Terminate metallic conductor customer cable • ICTCBL2012B Install functional and protective telecommunications earthing system • ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

System alteration may include:	• additions • new extensions to services • removals • systems or application upgrades.
Existing cable system may include:	• all metallic conductor cable types • Category 5, 6, 6A, 7 or 7A installations • terrestrial or satellite coaxial systems.
Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build-up • needle stick injury • optical fibre cable that contains hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services that operate at above telecommunications network voltage (TNV) • vermin.
Access to site may involve:	• activities of tenants and other facility users • egress points • electronic surveillance • hours of access • noise control • presentation • registered entry requirements

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	• relationships with other customer activities • security requirements • type of client activity.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating work site and lines before beginning work
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety harness
	  • safety line
	• safe work practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Client system	• contract documents

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specifications may relate to:	• cable plans and designs • specification schedules.

Relevant legislation, codes, regulations and standards include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• ACMA technical standard requirements for cabling:
	  • underground
	  • aerial
	  • Category 5 6, 6A, 7 or 7A
	  • unshielded twisted pair (UTP)
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• Australian building codes and regulations
	• cabling security codes and regulations
	• Environment Protection Acts
	• fire regulations
	• industry standards
	• manufacturer specifications
	• noise abatement regulations
	• OHS Acts and relevant codes and standards
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006
	• use of ACMA-approved cabling products.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2064A Haul underground cable

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to haul underground cable. It involves installation and recovery of cables, including multi-pair, coaxial and optical fibre. All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Application of the unit	Technical staff who haul underground cable for telecommunications cabling projects apply the skills and knowledge in this unit. They may provide cabling in access networks or customer premises. They may also carry out cable maintenance, new installations or upgrades. This unit may be applied to domestic, commercial or industrial installations.

Licensing/Regulatory Information

Not Applicable

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for safe underground cable hauling	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Arrange access to the site according to required procedure
	1.3. Inform appropriate personnel of identified ***hazards*** on worksite
	1.4. Confirm hauling location of proposed ***cable*** according to the appropriate ***plan specifications*** obtained from ***authorised personnel***
	1.5. Obtain information on proposed locations of other services from ***relevant authorities***
	1.6. Set up ***tools and equipment*** required for safe work

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ELEMENT	PERFORMANCE CRITERIA
	practice according to enterprise guidelines 1.7. Verify air pressure in drum cables before hauling to ensure integrity of the cable 1.8. Check for ***dangerous gases*** and place ***guards*** around open manholes following occupational health and safety (***OHS***) ***and environmental requirements***
2. Haul cable	2.1. Handle existing cables in a manner that avoids ***cable damage*** 2.2. Use ***roping techniques*** to prove that conduit is clear for hauling 2.3. Attach cable to rope and haul cable into and out of pits and manholes ensuring no sheath damage 2.4. Lubricate cable and haul at correct tension maintaining smooth passage between dispenser and hauler 2.5. Maintain cable and services separations in parallel runs and crossovers to meet manufacturer's and regulation requirements 2.6. Maintain sufficient cable length allowance for jointing and ensure cable is laid up and bent within bending radius tolerance for cable materials in underground enclosure 2.7. Seal and pressurise cables according to enterprise requirements to ensure no sheath damage 2.8. Tag cable for future identification
3. Complete works on site	3.1. Record any approved alteration to the original design using correct symbols and return to appropriate personnel 3.2. Complete and sign reports, where required, according to enterprise policy 3.3. Reinstate the site to customer's satisfaction and dispose of wastes in an environmentally safe manner 3.4. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters and work in teams
- literacy skills to interpret technical documentation, such as cable plans, equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - diagnostic equipment
  - perform fault clearance
  - use hand and power tools

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's recommendations for correct hauling optical fibre cables
- safety precautions when working with laser based systems
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • haul cable applying related OHS requirements and work practices, including those related to dangerous gases and air pressures in existing and new cable • use cable dispensing equipment • use specialised hand or power tools and equipment for hauling cable safely • read and interpret drawings • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites where installation of underground cable may be conducted • use of installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, including updated cable plans and records • direct observation of the candidate hauling underground cable.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2133A Construct underground telecommunications infrastructure.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • ARPANSA electromagnetic radiation (EMR) standard • Australian building codes and regulations • Australian standards • enterprise standards

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RANGE STATEMENT	
	• environmental protection • equipment standards, intrinsically safe lightning protection, site engineering standard • fire regulations • heritage legislation • international standards • local government • OHS • Radcoms Act • Telecoms Act • WI's, CI's, Business Operating Procedures (BOP), Radiocommunications Assignment and Licensing Instruction (RALI), assignment guidelines, spectrum planning reports.

Hazards may include:	• earth potential rise (EPR)
	• optical cable:
	  • bare fibres
	  • hazardous laser light
	• remote power feeding
	• radio frequency (RF) emission.

Cable may include:	• coaxial (CATV) • grease filled or air cored copper cable • optical fibre.
Plan specifications may include:	• building plans • cable existing in pipes • cable size • conductor size • conduit size • construction plans • distance to be hauled • site layout drawings • site plans • street plans.
Authorised personnel may include:	• construction manager • project manager • site manager • site supervisor.
Relevant authorities may include:	• cable location services (Dial Before you Dig) • environment protection • local government

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RANGE STATEMENT	

	• private owners
	• utility providers such as:
	  • electricity
	  • fire services
	  • gas
	  • other telecommunications providers
	  • water.

Tools and equipment may include:	• crane • forklift • hand • hauling eye • jinker • mandrill • mechanical • mesh stockings • power • pressure gauge • roly winch • winch truck.
Dangerous gases may be:	• asphyxiating gas • carbon dioxide • carbon monoxide • combustible • natural gas • noxious gas.
Guards may be:	• barricades • plates • temporary fencing.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need to decommission and isolate worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection

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RANGE STATEMENT	
	• kneepads • masks • protective suits • safety boots • safety glasses • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • suitable light and ventilation • special access requirements • environmental considerations: • clean-up protection • stormwater protection • waste management.
Cable damage may be reduced using:	• cable dispensing methods: • 2 pair cable multi-dispenser • jinker or cable trailer • spinner • end sealing methods: • lead wipe • thermo-shrink end caps.
Roping techniques may include using:	• blower-sucker • compressed air fibreglass rods • PVC rods • Thomas duct rodder.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Addition to application. Minor changes to knowledge requirements and range statement to reflect changed terminology. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to splice and terminate optical fibre cable within an optical telecommunications transmission environment.

This work is essential in provisioning of National Broadband Network (NBN) infrastructure for high speed and high bandwidth transmissions.

Assessment by a TITAB-registered assessor is recommended.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Technical staff who splice and terminate optical fibre cable for telecommunications projects apply the skills and knowledge in this unit.

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They may carry out new installations, upgrade an optical backbone or access network provisioning for greater bandwidth and capacity required by emerging technology convergence for Next Generation Networks (NGN).

This unit may be applied to commercial or industrial fibre to the premises (FTTP) installations.

This unit does not include consideration of mechanical splicing. For mechanical splicing, refer to ICTCBL3010B Install and terminate optical fibre cable on customer premises.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for splicing	1.1 Select safety equipment to protect self and public according to enterprise guidelines and ***occupational health and safety (OHS) practices***
	1.2 Confirm layout of job using installation according to ***physical conditions*** at site and requirements of ***relevant legislation, codes, regulations and standards***

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	1.3 Inform appropriate personnel of identified ***hazards*** on work site 1.4 Locate other services from ***relevant authorities*** according to enterprise guidelines and safe practices 1.5 Test for ***dangerous gases*** and place ***guards*** around open manholes following ***OHS and environmental requirements*** 1.6 Obtain approval for alterations to the design according to enterprise guidelines
2. Check existing optical fibre cable	2.1 Verify that cable was installed according to the installation plan and visually inspect ***cable*** for signs of sheath damage 2.2 Maintain minimum bend ratios according to manufacturer specifications to prevent cable damage and signal degradation 2.3 Secure cable according to safe industry practice to avoid cable and sheath damage
3. Splice optical fibre cable	3.1 Verify fibre is not live using ***appropriate equipment*** to maintain safe work practices, and ensure correct fibre has been identified 3.2 Prepare cable end to expose ***optical fibres*** according to splicing method and manufacturer specifications 3.3 Prepare and ***splice fibres*** using safe industry practice according to enterprise specifications 3.4 Test splice joint to manufacturer and design requirements
4. Terminate optical fibre cable	4.1 Select connector unit to suit terminating frame according to design specifications 4.2 Terminate the cable using ***type of termination*** specified in the plan and according to manufacturer specifications 4.3 Test termination for transmission loss and strength and re-terminate if transmission loss exceeds the manufacturer specifications 4.4 Install protection devices on connectors and fibres to protect from exposure and contaminants 4.5 Label and lay up cables in enclosure according to manufacturer’s instructions and enterprise guidelines
5. Finish job and report	5.1 Remove waste and reinstate site according to enterprise guidelines 5.2 Prepare reports, including test results and alterations to plans, according to enterprise policy 5.3 Notify client of work completion and obtain sign-off

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to interpret technical documentation, such as equipment manuals, specifications and requirements for optical fibre cable installation
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - apply work site OHS
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work safely with optical fibre and lasers
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - install customer access network (CAN) cable
  - operate test equipment to perform measurements on optical fibre
  - perform fault clearance
  - use diagnostic equipment
  - use optical fibre jointing techniques
  - use specialised tools and test equipment
  - use hand and power tools
  -

Required knowledge

- causes of signal strength loss in optical fibre
- colour coding of fibres
- detailed knowledge of AS/NZS 2211:2006 Safety of laser products (parts 1 and 2)
- features and operating requirements of test equipment for optical fibre cable

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- industry and organisational policy and procedures when splicing optical fibre cable
- information required to operate equipment according to a test specification
- manufacturer requirements for safe operation of optical fibre equipment
- safety precautions when working with laser-based systems
- specific OHS requirements relating to the activity and site conditions
- techniques for types of termination, including:
  - direct termination
  - fusion splicing
- test methods and performance requirements
- types of optical cable and termination
- workplace and industry environment

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • splice, terminate and test optical fibre cable applying safety precautions when working with laser-based systems • splice at least 12 fibres and house them in splicing cassettes and trays within industry recognised enclosures according to manufacturer's instructions • install a mechanical connector and a fusion, spliced pigtail type connector • complete relevant documentation to manufacturer and design requirements • provide report documenting installation and test results to client • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites where splicing and termination of optical fibre cable may be conducted • use of optical fibre testing equipment currently used in

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	industry • relevant regulatory and equipment documentation that impacts on optical fibre cable installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report, including installation and test results • direct observation of the candidate carrying out splicing of optical fibre within an optical communication system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3010B Install and terminate optical fibre cable on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

OHS practices may relate to:	• determining that optical fibre cable is not live according to guidelines and standards • handling optical fibre cable in a safe manner to avoid risk of injury • labelling fibre cable and laser devices • locating and identifying adjoining services according to enterprise guidelines and OHS practices • observing AS/NZS 2211:2006 Safety of laser products (parts 1 and 2) • testing for presence of dangerous gases according to enterprise guidelines.
Physical conditions may relate to:	• above ground • in cabinet • in joint enclosure.
Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 2211:2006 Safety of laser products (parts 1 and 2) • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • OHS Acts and relevant codes and standards • regulated or industry codes of practice, including ACMA technical standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Hazards may include:	• earth potential rise (EPR) • optical cable: • bare fibres

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	• hazardous laser light • remote power feeding.

Relevant authorities may include:	• cable location services (Dial Before You Dig)
	• environment protection
	• local government
	• private owners
	• utility providers, such as:
	  • electricity
	  • fire services
	  • gas
	  • water
	  • other telecommunications providers.

Dangerous gases may include:	• asphyxiating gas • carbon dioxide • carbon monoxide • combustible • natural gas • noxious gas.
Guards may include:	• barricades • plates • temporary fencing.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need to decommission and isolate work site and lines before beginning work
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe work practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials

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	• tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • suitable light and ventilation • special access requirements • environmental considerations: • clean-up protection • stormwater protection • waste management.
Cable may include:	• air blown • armoured • external • internal • loose tube • tight buffered.
Appropriate equipment may include:	• hand-held optical power meter • OFI-fibre to the x (FTTx) active optical network terminal (ONT) detector • passive optical network (PON) meter • optical time domain reflectometer (OTDR).
Optical fibres may include:	• multi-mode • polymer • single mode.
Splice fibres may relate to:	• fusion splice • preparing connection ends to a smooth flat surface to ensure no optical path redirection from joint • removing all coatings from exposed optical fibre and removing all possible contaminants.
Type of termination may include:	• direct termination • fusion splicing.

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Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2066B Joint and terminate coaxial cable

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor change to element 5. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install, joint and terminate coaxial cable on customer premises.

Coaxial cables are used in all telecommunications applications, including convergence technologies of telephony, data, video and multimedia as part of Next Generation Networks (NGN).

Application of the Unit

Technical staff whose work involves jointing and terminating coaxial cable apply the skills and knowledge in this unit.

They install and terminate coaxial cable in the customer access network (CAN) environment for emerging technologies using high speed broadband and the delivery of cable television services.

This unit applies to domestic, commercial or industrial installations.

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Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to install and joint coaxial cable	1.1 Confirm approval for site access with customer prior to site entry and comply with ***site security arrangements*** and requirements of ***relevant legislation, codes, regulations and standards***
	1.2 Read and interpret ***customer's installation specifications*** and physical conditions at site to determine layout of job
	1.3 Locate and identify adjoining ***other services*** according to enterprise guidelines and occupational health and safety ***(OHS)*** practices
	1.4 Test for presence of dangerous gases in underground enclosures according to enterprise guidelines
	1.5 Undertake approved alterations to the design according to enterprise guidelines

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2. Verify placement and secure coaxial cable	2.1 Use safety equipment to protect self and public according to enterprise guidelines and OHS requirements 2.2 Maintain ***coaxial cable*** segregation to industry standard requirements 2.3 Protect integrity of the coaxial shield cable to ensure no loss of performance 2.4 Place cable in position with sufficient slack to allow termination and to maintain minimum bend radius according to ***manufacturer specifications*** 2.5 Follow installation designs to install cable safely without damage to cable or customer's premises 2.6 Maintain radio frequency (RF) signal strength by installing cable lengths within manufacturer and design specifications 2.7 Locate securing hardware to reduce the cumulative effect on cable wave shape properties and attach cable ties to minimise cable damage
3. Joint coaxial cable	3.1 Strip coaxial cable according to specifications to required length using appropriate ***tools*** 3.2 Select appropriate kit to match the type of coaxial cable in use and the jointing method according to manufacturer recommendations 3.3 Joint cable and ensure jointing fitting retains the segregation of conductor and shield 3.4 Seal all joints according to manufacturer specifications
4. Terminate coaxial cable	4.1 Prepare coaxial cable for termination according to specifications using appropriate tool 4.2 Select ***connectors*** to match the type of coaxial cable in use and use terminating method recommended by manufacturer 4.3 Verify that connector fitting retains the segregation of conductor and shield 4.4 Terminate connectors to torque as recommended by manufacturer to prevent RF leakage 4.5 Test connectors to mating specifications using gauge tester 4.6 Maintain a continuous ground on the terminations and waterproof seal to preserve cable integrity
5. Complete installation operation	5.1 Place cables in enclosure and lay up according to manufacturer's instructions and enterprise guidelines, and check that no safety hazards are evident

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	5.2 Place other services according to enterprise guidelines 5.3 Reinstate site and remove waste and debris for disposal according to environmental requirements and to maintain safe work site conditions
6. Complete installation administration	6.1 Complete reports according to enterprise policy 6.2 Note alterations to plans using appropriate symbols

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- task-management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - use hand and power tools
  - use diagnostic equipment.
  -

Required knowledge

- information required to operate equipment according to a test specification
- features and operating requirements of test equipment
- manufacturer requirements for safe operation of equipment
- test methods and performance requirements
- typical issues and challenges that occur on site
- requirements of legislation, codes of practice and other formal agreements that impact on the work activity
- specific OHS requirements relating to the activity and site conditions.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • joint and terminate coaxial cable using specialised hand or power tools and equipment • apply related OHS requirements and work practices • conduct signal strength tests and interpret results.
Context of, and specific resources for assessment	Assessment must ensure: • sites where jointing metallic conductor cable may be conducted • use of joint testing equipment currently used in industry • relevant regulatory and equipment documentation that impacts on cable jointing and testing activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of hands-on project completed by the candidate • review of oral and written report with test results • direct observation of the candidate jointing and terminating cables and testing joints.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2005B Install customer cable support systems • ICTCBL2006B Place and secure customer cable. Aboriginal people and other people from a non-English speaking background may have second language issues.

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	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Site security arrangements may include:	• access times and methods • approval to enter site • approved entry requirements • electronic surveillance • security clearance.
Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • ARPANSA electromagnetic radiation (EMR) standard • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003

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	• AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • confined spaces regulations • enterprise standards • Environment Protection Acts • equipment standards • fire regulations • heritage legislation • international standards • intrinsically safe lightning protection • local government • mining legislation • noise abatement and heritage legislation • OHS Acts and relevant codes and standards • Radiocommunications Act • regulated or industry codes of practice • site engineering standard • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Telecommunications Act • WIs, CIs, business operating procedures (BOP), Radiocommunications Assignment and Licensing Instruction (RALI), assignment guidelines, spectrum planning reports.
Customer's installation specifications may include:	• cable plans and designs • contract documents • specification schedules.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage (HV) power.

OHS may include:	• safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment

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	• work platforms.

Coaxial cable may be:	• aerial or underground
	• flexible:
	  • external
	  • internal
	• flooded coaxial for underground use
	• hard line:
	  • external
	  • internal
	• powered or unpowered
	• RG6 and RG11 quad shield.

Manufacturer specifications may include:	• electrical characteristics:
	  • isolation voltage
	  • voltage requirements
	• handling instructions
	• installation instructions
	• performance characteristics:
	  • frequency response
	  • impedance
	  • loss
	  • testing details.

Tools may include:	• hand or power tools:
	  • connector gauges
	  • coring
	  • crimping
	  • stripping and preparation tool
	  • torque spanner.

Connectors may include:	• integral pin • internal or external • pin type • separate pin.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2068A Install a telecommunications service to a building

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install a telecommunications service to a building. It involves bringing a telecommunications service from the broader network to a customer's premises using metallic or optical cable or wireless connection. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Technical staff whose work involves installing telecommunications service to a building to provide a new service or an upgrade apply the skills and knowledge in this unit. Cable installers provide new services in emerging technologies, such as internet protocol TV (IPTV) and fast broadband for converging technology applications. A wireless access point or a world interoperability for microwave access (WiMAX) customer premises

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	equipment (CPE) unit could also be an installation to the building to provide the new services.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare service installation	1.1. Arrange access to the site with the ***customer*** and obtain job specifications

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ELEMENT	PERFORMANCE CRITERIA
	1.2. Notify supervisor of identified ***safety hazards*** at the worksite according to occupational health and safety (***OHS***) ***and environmental requirements*** 1.3. Use ***installation specifications*** to determine type of services, network cables and equipment required for the installation 1.4. Select cables and equipment that comply with functionality and compatibility of existing installation 1.5. Select and obtain ***tools and equipment*** to carry out installation activity
2. Install cable and equipment to building	2.1. Locate, connect, and check cables at entry into network for transmission quality and continuity where service to building exists 2.2. Install cable and equipment and seal cable entry to the building in a safe manner according to installation plans and Australian Communications and Media Authority (ACMA) standards 2.3. Test overall functionality of the new service to meet installation specifications 2.4. Rectify faults if required and minimise interruption to existing service in agreement with customer 2.5. Install ***lightning protection***, where required, according to enterprise guidelines and industry practice
3. Complete records and clean up site	3.1. Label cable pairs clearly to provide an accurate identification according to manufacturer's, industry and client standards 3.2. Update records and plans with ***installation details*** to provide an accurate record according to industry codes of practice and AS/ACIF S009:2006 3.3. Remove installation waste and debris from worksite and dispose of according to environmental requirements to maintain safe worksite conditions 3.4. Complete telecommunications cabling advice (TCA) forms and notify customer to obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - perform fault clearance
  - read and interpret:
    - building plans
    - construction plans
    - site layout drawings
    - site plans
    - street plans
  - use diagnostic equipment
  - use hand and power tools

Required knowledge

- information required to operate equipment according to a test specification
- features and operating requirements of test equipment
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- OHS requirements and work practices associated with cable provision including:
  - adequate warning signs
  - protective clothing and personal safety items
  - safety devices

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REQUIRED SKILLS AND KNOWLEDGE
• test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare and install cable and equipment to a building complying with ACMA, enterprise and government regulations • conduct tests related to transmission quality and continuity of cables at network entry point • label and document installation work complying with industry codes of practice • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where telecommunications services may be installed • use of installation and testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of an installation completed by the candidate • review of an oral and written report with completed documentation, including updated installation records and forms • direct observation of the candidate installing telecommunications equipment to a building

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EVIDENCE GUIDE	
	• oral or written questioning to assess required knowledge .
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2134A Fix aerial cable. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

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RANGE STATEMENT	
regional contexts) may also be included.	
Customer may include:	• nominated representative • project manager • site manager.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light or non-visible laser
	  • radio frequency (RF) emission
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as in conduit colours according to AS 1345:1995 associated with a hazardous service.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety harness
	  • safety line
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:

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RANGE STATEMENT	
	• flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Installation specifications may include:	• installation plan • project details: • contact personnel • costs • resource requirements • timelines • type of service • type of service: • aerial or underground structure • cable: • coaxial • multi-pair • optical fibre • structured (Category 5, 6, 6A, 7 or 7A) • wireless: • femtocell • wireless fidelity (WiFi) • WiMAX.
Tools and equipment may include:	• equipment: • cable testers • network tester • passive optical meter • RF meter • tools: • crimpers • jointers

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RANGE STATEMENT	

	• labellers
	• power tools:
	  • cutters
	  • drills
	• splicers
	• terminating tool
	• EWPs and ladders.

Lightning protection may include:	• arrester • bonding building and cable to power earthing system • building's own protection • earth stake • isolator.
Installation details may include:	• cable infrastructure pair locations • cable location and type • equipment details • interconnections • modified plan • pair numbering and labelling • test results.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Cabling

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ICTCBL2131A Install an above ground equipment enclosure

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install an above ground equipment enclosure for cabling provisioning. It involves planning, building and earthing an enclosure. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Technical staff whose work involves installing an above ground equipment enclosure apply the skills and knowledge in this unit. A relevant job role is civil construction worker whose work includes installation of enclosures including pillars, cabinets, remote integrated multiplexers (RIMs) and mobile equipment enclosures for new installations or network upgrades.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to construct and install enclosure	1.1. Obtain construction plan from ***appropriate personnel*** to scope the work and arrange for site access 1.2. Notify appropriate personnel of identified ***safety hazards*** and ***other services*** at the worksite 1.3. Obtain ***plant***, ***tools***, ***safety equipment*** and material to perform tasks safely and efficiently 1.4. Determine the location and type of ***above ground***

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ELEMENT	PERFORMANCE CRITERIA
	enclosure specified in the construction plan that is required for the project
2. Build enclosure	2.1. Use tools according to enterprise guidelines and occupational health and safety (***OHS***) ***regulations*** 2.2. Construct footings or foundations to the construction design specifications 2.3. Construct enclosure to specifications given in the construction design 2.4. Connect enclosure to earth according to construction plan and industry practice
3. Complete project	3.1. Complete reports according to enterprise policy and record alterations to plans using appropriate symbols 3.2. Recover obsolete materials and equipment and return to appropriate point for disposal 3.3. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction 3.4. Notify appropriate personnel of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret plans and specifications
- numeracy skills to take and analyse measurements for construction work
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve logistics problems on site
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or

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REQUIRED SKILLS AND KNOWLEDGE

others, or damage to goods or equipment
• task management skills to work systematically with required attention to detail
• technical skills to:
  • construct footings and foundations
  • construct earthing enclosures
  • use hand and power tools in civil construction work

Required knowledge

• civil construction:
  • construction plant, tools and equipment operation
  • enclosure construction methods
  • footings and foundations
  • plans
• legislation, codes of practice and other formal agreements that impact on the work activity
• specific OHS requirements relating to the activity and site conditions
• typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare to install an enclosure using construction plans with necessary tools and equipment • construct and connect an enclosure according to plans, specifications and OHS requirements • complete reports and document alterations to plans.
Context of, and specific resources for assessment	Assessment must ensure: • sites where enclosure construction and connection may be conducted • use of construction equipment currently used in

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EVIDENCE GUIDE	
	industry • relevant regulatory and equipment documentation that impact on construction.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of an enclosure constructed by the candidate • review of an oral and written report with completed documentation, including reports and records of alterations • direct observation of the candidate installing an above ground equipment enclosure • oral or written questioning to assess required knowledge .
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2133A Construct underground telecommunications infrastructure. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate personnel may include:	• customer representative • project manager • site manager.
Safety hazards may refer to:	• contact with remote power feed • electrical supply and areas of earth potential rise (EPR) that require mandatory separation from cable work • hazardous conduit as in conduit colours according to AS 1345:1995 associated with a hazardous service • unstable ground.
Other services may include:	• fire services • gas and water mains • high voltage (HV) power.

Plant, ***tools***, ***safety equipment*** may include:	• equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	• plant:
	  • back hoe
	  • bobcat
	  • excavator
	  • trencher
	• safety equipment:
	  • personal protective clothing:
	  • earmuffs

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RANGE STATEMENT	
	• gloves • head protection • kneepads • masks • protective suits • safety boots • safety glasses • tools: • concrete tool • diggers • jack-hammers • power tools: • cutters • drills • saws • shovels.
Above ground enclosure may include:	• conduit and pipe • enclosure constructed of: • fibreglass • metal • plastic • fibre hub • hybrid fibre coaxial (HFC) cabinet.
OHS regulations may include:	• appropriate licences: • crane • EWP • forklift • winch • Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007

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RANGE STATEMENT	
	• AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL2132A Erect aerial cable supports

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to erect cable supports in small aerial customer installations and access networks. Aerial cables are needed for telecommunication applications including voice, video and data. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Telecommunications linesmen and line installers apply the skills and knowledge in this unit. They make use of aerial support structures and specialist tools. They may be required to do new installations, upgrades or maintain existing networks in domestic, commercial and industrial installations to deliver services in xdigital subscriber lines (xDSL), fibre to the home (FTTH) and hybrid fibre coaxial (HFC) networks.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install aerial cable structure	1.1. Obtain construction plan from ***appropriate personnel*** to scope the work and arrange for site access 1.2. Notify appropriate personnel of identified ***safety hazards*** at the cabling worksite

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ELEMENT	PERFORMANCE CRITERIA
	1.3. Determine cable route from construction plan identifying and avoiding ***other services***
	1.4. Obtain ***plant***, ***tools***, ***safety equipment*** and material to perform tasks safely and efficiently
2. Install aerial support structures	2.1. Use tools according to enterprise guidelines and occupational health and safety (***OHS regulations***
	2.2. Erect safety barriers according to enterprise guidelines to secure the site
	2.3. Excavate a hole to specifications and according to enterprise guidelines for the erection of mounting pole
	2.4. Install a ***pole*** using mechanical lifting devices according to enterprise guidelines
	2.5. Install fixing structures on pole securely according to manufacturer's specifications
	2.6. Install ***aerial fixing devices*** where the support is other than a pole according to enterprise guidelines
3. Complete project	3.1. Complete reports according to enterprise policy and record alterations to plans using appropriate symbols
	3.2. Recover obsolete materials and equipment and return to appropriate point for disposal
	3.3. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction
	3.4. Notify appropriate personnel of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical and operational matters • literacy skills to: • complete reports in a given format

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REQUIRED SKILLS AND KNOWLEDGE

• read and interpret drawings, plans and specifications
• numeracy skills to take and use measurements
• planning and organisational skills to organise and maintain equipment
• problem solving skills to solve logistics problems
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • use hand and power tools
  • use mechanical lifting devices

Required knowledge
• features and operating requirements of equipment • information required to operate equipment according to a specification • legislation, codes of practice and other formal agreements that impact on the work activity • licence requirements for working at heights • manufacturer's requirements for safe operation of equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install a pole and aerial fixing device after relevant authorities have been notified and approvals obtained

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EVIDENCE GUIDE	
	prior to commencement • use specialised hand or power tools and equipment for the installation of aerial cable supports safely • apply OHS requirements and work practices associated with the installation of aerial cable supports, including protective clothing and personal safety items, adequate warning signs and safety devices • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where aerial cable supports may be installed • use of plant, tools and equipment to erect aerial supports currently used in industry • relevant regulatory and equipment documentation that impact on aerial support erection activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of an aerial erected by candidate the • direct observation of the candidate erecting an aerial support structure • oral or written questioning to assess required knowledge and skill.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2134A Fix aerial cable. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate personnel may include:	• customer representative • project manager • site manager.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service
	• unsafe support structures:
	  • condemned poles
	  • visible signs of decay or stress
	• unsafe weather:
	  • heavy rains

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RANGE STATEMENT	
	• high winds • severe heat or cold • thunderstorms.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage power.

Plant, ***tools***, ***safety equipment*** may include:	• equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	• plant:
	  • back hoe
	  • bobcat
	  • elevated platform vehicle
	  • excavator
	  • ladders
	  • lifting jack
	  • pole lifting device
	  • trencher
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • personal protective clothing:
	  • earmuffs
	  • fall arrest systems
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety barriers:
	  • trench guards

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RANGE STATEMENT	

	• warning signs and tapes
	• tools:
	  • auger
	  • concrete tool
	  • diggers
	  • fixing brackets
	  • height measuring device
	  • jack-hammers
	  • power tools:
	  • cutters
	  • drills
	  • saws
	  • shovels.

OHS regulations may include:	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts
	• OHS
	• road and traffic control legislation and codes technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Pole may be:	• concrete • galvanised steel

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RANGE STATEMENT	
	• steel • steel and concrete • wood.
Aerial fixing devices include:	• bolts and lugs • bridle rings • clamps • mounts • riser pipes • screw hooks.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL2133A Construct underground telecommunications infrastructure

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to construct underground telecommunications infrastructure made up of conduits and enclosures for cabling provisioning. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff whose work involves civil construction of underground telecommunications infrastructure apply the skills and knowledge in this unit. A relevant job role is civil construction worker whose work includes installation of pits and pre-built enclosures with connecting pipes.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to construct underground work	1.1. Obtain construction design plan from ***appropriate personnel*** to scope the work and arrange for site access 1.2. Notify appropriate personnel of identified ***safety hazards*** and ***other services*** 1.3. Obtain ***plant***, ***tools and safety equipment*** to perform tasks safely and efficiently 1.4. Determine the type of ***underground enclosure*** specified in the construction design plan that is required for the project
2. Install enclosure	2.1. Use tools according to enterprise guidelines and occupational health and safety (***OHS***) ***regulations***

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ELEMENT	PERFORMANCE CRITERIA
	2.2. Place a ***foundation of suitable material*** to provide a safe and stable footing prior to installing an underground enclosure in an excavation 2.3. Place a ***recognised barrier*** over the construction where an enclosure is to be installed over power cables according to enterprise requirements or agreements with other authorities 2.4. Install an enclosure specified in the construction design plan to manufacturer's specifications using the specified materials 2.5. Install an earth mat facility under the enclosure where specified and required by the enterprise
3. Install connecting pipe works	3.1. Install conduit in trench to enterprise specifications 3.2. Connect conduit to an enclosure according to manufacturer's specification and industry practice
4. Complete project	4.1. Complete reports according to enterprise policy and record alterations to plans using appropriate symbols 4.2. Recover obsolete materials and equipment and return to appropriate point for disposal 4.3. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction 4.4. Notify appropriate personnel of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical and operational matters • literacy skills to interpret plans and specifications • numeracy skills to take measurements for construction work • planning and organisational skills to organise and maintain equipment • problem solving skills to solve logistics problems • safety awareness skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities • select and use required personal protective equipment conforming to industry and OHS standards • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment • task management skills to work systematically with required attention to detail • technical skills to: • apply regulations and standards related to the installation of the enclosures • install earth mat facility and conduits • interpret drawings • lay foundations • use hand and power tools in civil construction work
Required knowledge
• civil construction: • construction plant, tools and equipment operation • enclosure construction methods • foundations • plans • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for safe operation of equipment • specific OHS requirements relating to the activity and site conditions • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • install enclosures including pipe, pit and

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EVIDENCE GUIDE	
competency in this unit	prefabricated manhole • construct in two different soil types: sand, rock, soil or combination soil types, and shore an excavation site to meet enterprise and regulatory requirements • use specialised hand or power tools and equipment normally used for excavation, pipe, conduit installation and site restoration safely • apply related OHS requirements and work practices associated with excavation, enclosure installation and site restoration.
Context of and specific resources for assessment	Assessment must ensure: • sites where enclosure construction and may be conducted • use of construction equipment currently used in industry • relevant regulatory and equipment documentation that impact on construction.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of an enclosure constructed by the candidate • review completed documentation including reports and records of alterations • direct observation of the candidate constructing an underground telecommunications infrastructure • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2131A Install an above ground equipment enclosure. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate personnel may include:	• customer representative • project manager • site manager.
Safety hazards may refer to:	• contact with remote power feed • electrical supply and areas of earth potential rise that require mandatory separation from cable work • hazardous conduit as in conduit colours according to AS 1345:1995 associated with a hazardous service • unstable ground.
Other services may include:	• fire services • gas and water mains • high voltage (HV) power.

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RANGE STATEMENT	

Plant, tools and safety equipment may include:	• equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	• plant:
	  • back hoe
	  • bobcat
	  • excavator
	  • trencher
	• safety equipment:
	  • personal protective clothing:
	  • earmuffs
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• tools:
	  • concrete tool
	  • diggers
	  • jack-hammers
	  • power tools:
	  • cutters
	  • drills
	  • saws
	  • shovels.

Underground enclosure may include:	• conduit and pipe
	• enclosure constructed of:
	  • bricks
	  • concrete
	  • concrete panels
	  • fibreglass
	  • metal
	  • plastic

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RANGE STATEMENT	
	• pit • pre-fabricated manhole.
OHS regulations may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Foundation of suitable material may include:	• aggregate fill • concrete • gravel • sand.
Recognised barrier may be:	• insulating membrane • polymeric strip material.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units	

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Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL2134A Fix aerial cable

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install aerial cables in customer and access networks. It involves installing, terminating and securing cables. Aerial cable installation may be for a new cable, a cable upgrade or a cable in need of repair. Aerial cables are used in telecommunication applications including voice, video and data using metallic or optical fibre cables. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Telecommunications linesmen and line installers apply the skills and knowledge in this unit. It may make use of support anchors and catenaries. They may be required to do new installations, upgrades or maintain existing networks in domestic, commercial and industrial installations to deliver services in x-digital

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	subscriber line (xDSL), fibre to the home (FTTH) and hybrid fibre coaxial (HFC) networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for aerial cable installation	1.1. Obtain construction plan from ***appropriate personnel*** to scope the work and arrange for site

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ELEMENT	PERFORMANCE CRITERIA
	access 1.2. Notify appropriate personnel of identified ***safety hazards*** at the cabling worksite 1.3. Determine cable route and type of ***cable*** from construction plan identifying and avoiding ***other services*** 1.4. Obtain ***plant***, ***tools***, ***safety equipment*** and material to perform tasks safely and efficiently
2. Install aerial cable	2.1. Use tools according to enterprise guidelines and occupational health and safety (***OHS***) ***regulations*** 2.2. Install ***catenary wire*** or gantry wire or integral bearer cable (IBC) and ***tension*** to required specifications 2.3. Install cable according to ***manufacturer's and enterprise guidelines*** ensuring that no damage is caused and that the physical characteristics of the cable are maintained 2.4. Secure cable permanently to support structure using ***aerial fixing devices*** according to manufacturer's and enterprise guidelines 2.5. Number the cables on towers according to enterprise guidelines
3. Terminate, seal and secure aerial cable	3.1. Terminate and seal cables according to manufacturer's specifications 3.2. Joint cable in suitable closures using enterprise guidelines 3.3. Loop and secure cable on support structure with bending radius tolerance for cable materials to reduce damage to conductors 3.4. Test cable for continuity and rectify fault if required 3.5. Record test results for future reference
4. Complete project	4.1. Complete reports on installation and design amendments and file according to enterprise requirements 4.2. Recover obsolete materials and equipment and return to appropriate point for disposal 4.3. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction 4.4. Notify appropriate personnel of job completion and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - complete reports in a given format
  - read and interpret drawings, plans and specifications
- numeracy skills to take and use measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - use hand and power tools
  - use diagnostic equipment
  - rectify fault

Required knowledge

- features and operating requirements of cable test equipment
- information required to operate equipment according to a test specification
- installation of a range of aerial cable types
- legislation, codes of practice and other formal agreements that impact on the work activity
- licence requirements for working at heights
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install an aerial cable, including hauling aerial cable, cable securing and sealing • identify safe support structures from pole status markings, visual inspection or approved testing procedures • use specialised hand or power tools and equipment for installing aerial cable safely • apply all related OHS requirements and work practices associated with installing aerial cable pole and ladder safety • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where aerial cable may be installed • use of plant, tools and equipment to erect aerial cable currently used in industry • relevant regulatory and equipment documentation that impact on aerial cable installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of an aerial cable installed by the candidate • direct observation of the candidate installing aerial cables • oral or written questioning to assess required knowledge and skill.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2132A Erect aerial cable supports. Aboriginal people and other people from a non-English

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EVIDENCE GUIDE	
	speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate personnel may include:	• customer representative • project manager • site manager.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed
	• electrical supply and areas of earth potential

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RANGE STATEMENT	

	rise that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service
	• unsafe support structures:
	  • condemned poles
	  • visible signs of decay or stress
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

Cable may include:	• coaxial • data cabling • distribution cable • lead-in cable • multi-pair copper • optical fibre • radio feeder.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage (HV) power.

Plant, ***tools***, ***safety equipment*** may include:	• plant:
	  • cherry picker
	  • elevated platform vehicle
	  • ladders
	  • scissor lifts
	  • wire raising tool (insulated)
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • personal protective clothing:
	  • earmuffs
	  • fall arrest systems
	  • gloves
	  • head protection

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RANGE STATEMENT	
	• kneepads • masks • protective suits • safety boots • safety glasses • safety barriers • trench guards • warning signs and tapes • test equipment: • cable tester • continuity tester • local area network (LAN) Cat tester • passive optical network (PON) meter • tools: • auger • cable tensioner • fixing brackets • height measuring device • spanner.
OHS regulations may include:	• appropriate licences: • crane • EWP • forklift • winch • Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts

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RANGE STATEMENT	
	• OHS • road and traffic control legislation and codes technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Catenary wire may refer to:	• integrated or installed separately to cable • constructed of steel: • single or multi-stranded depending on cable size.
Tension may be specified by:	• enterprise • manufacturer • power company.
Manufacturer's and enterprise guidelines refer to:	• cable loop being bent within bending radius tolerance for cable materials • maintaining long enough cable end for jointing, maintenance and water drip points requirements • provision for expansion of hard-line cable made according to manufacturer's specifications.
Aerial fixing devices may include:	• bolts and lugs • clamps • hooks • mounts • riser pipes • screw hooks.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL2135A Joint metallic conductor cable in access network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to joint metallic conductor cable on the service provider side of the network boundary in communications applications. All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media (ACMA)-accredited registrar.

Application of the Unit

Application of the unit	Technical staff who joint metallic conductor cable for indoor and outdoor installation apply the skills and knowledge in this unit. They may be required to do new installations, cable upgrades and maintain infrastructure in domestic, commercial and industrial situations for service providers and asset owners. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN) wide area networks (WAN) and multimedia.

Licensing/Regulatory Information

Not Applicable

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for jointing metallic conductor cable for Access Network	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Arrange access to the site according to required procedure
	1.3. Inform appropriate personnel of existing and potential ***hazards*** on worksite
	1.4. Review site ***plans and documentation***
	1.5. Select cable type and appropriate connectors for ***cable joint***
	1.6. Set up ***tools and equipment***, and materials required for safe work practice
	1.7. Obtain information on location of other services

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ELEMENT	PERFORMANCE CRITERIA
	from ***relevant authorities***
2. Joint metallic conductor cable for Access Network	2.1. Joint metallic cable following occupational health and safety (***OHS***) ***and environmental requirements*** 2.2. Perform relevant cable tests to ensure joint complies with site specifications, manufacturer's specifications, and relevant legislation, codes, regulations and standards 2.3. Rectify any cable faults 2.4. Record cable tests and any modifications required 2.5. Label and tag the cable joint according to enterprise guidelines and industry practice
3. Protect and alarm cable	3.1. Pressurise cable and check for any leakage 3.2. Reconnect alarms, if applicable, according to enterprise guidelines 3.3. Remove waste and debris from work site and disposed of according to environmental requirements and to maintain safe worksite conditions
4. Complete records and clean up site	4.1. Complete required records including alterations and notify customer 4.2. Reinstate site according to customer and company requirements 4.3. Present all records to customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical and operational matters • literacy skills to interpret technical documentation, such as equipment manuals, specifications and requirements for jointing metallic conductor cable • numeracy skills to take and analyse measurements • planning and organisational skills to organise and maintain equipment • problem solving skills to solve equipment and logistics problems • safety awareness skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities • select and use required personal protective equipment conforming to industry and OHS standards • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment • task management skills to work systematically with required attention to detail and adherence to all safety requirements • technical skills to: • perform fault clearance • use diagnostic equipment • use hand and power tools
Required knowledge
• ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000 • features and operating requirements of test equipment • information required to operate equipment according to a test specification • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for safe operation of equipment • safety precautions when working with cables • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • joint cable with appropriate connectors and according to specifications

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EVIDENCE GUIDE	
	• perform relevant cable tests to comply with site specifications and industry standards • rectify any cable faults.
Context of and specific resources for assessment	Assessment must ensure: • sites where jointing metallic conductor cable may be conducted • use of cable testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable jointing activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with test results • direct observation of the candidate jointing metallic conductor cable.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2133A Construct underground telecommunications infrastructure • ICTCBL3067A Modify and cut over cable. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require

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EVIDENCE GUIDE	
	language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • crane
	  • forklift
	  • winch
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• Australian Construction Industry Forum (ACIF) standards and codes
	• cabling security codes and regulations
	• Environmental Protection Acts
	• OHS Acts
	• road and traffic control legislation and codes
	• technical standards AS/ACIF S008:2006 and

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RANGE STATEMENT	
	AS/ACIF S009:2006.
Hazards may include:	• building debris • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • vermin.
Plans and documentation may include:	• access location • cable coding system and identifiers • cable plan.

Cable joint may involve:	• jointing enclosures
	• joints due to:
	  • access points requirements
	  • additional service points for connection
	  • cable damage
	  • fault rectification
	  • long cable runs
	• stub joints
	• underground pits.

Tools and equipment may include:	• hand tools:
	  • crowbar
	  • glue
	  • hammers
	  • pick
	  • saws
	  • shovels
	• mechanical equipment:
	  • auger
	  • backhoe
	  • borer
	  • concrete gutter
	  • ditch witch
	  • excavators
	  • mole plough
	  • trenching machine.

Relevant authorities may	• cable location services (Dial Before you Dig)

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RANGE STATEMENT	

include:	• environment protection
	• local government
	• private owners
	• utility providers such as:
	  • electricity
	  • fire services
	  • gas
	  • telecommunications providers
	  • water.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Addition to required knowledge. Minor changes to knowledge requirements and range statement to reflect changed terminology. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to safely install, maintain and modify the customer premises communications cabling required according to the Australian Communications and Media Authority's (ACMA) ‘Restricted’ Cabling Provider Rule.

Restricted cabling is used in typical domestic premises, small offices, home offices and small business premises. Restricted cablers can install cable in large commercial and industrial premises provided the cabling is behind a compliant device and is not via jumperable distributors or patch panels.

The Telecommunications Cabling Provider Rules (CPRs) 2000 place various limitations on Restricted cablers. These include a prohibition on them performing cabling work where they may have access to a reticulated electrical supply that exceeds typical domestic single-phase and three-phase electrical supply voltages – nominally 240 volts AC (for single phase) or 415 volts AC (for three-phase).

Assessment by a TITAB-registered assessor is recommended.

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All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

This unit applies to customer cabling terminated on sockets and network termination devices (NTD). It applies to the installation, maintenance and modification of indoor and external cabling.

Customer cabling, for the purpose of the 'Restricted' Cabling Provider Rule, may be used to connect devices for a range of applications, including telecommunications, simple data and computer use, security alarm panels and fire control panels.

Cabling may be metallic or optical fibre and may be aerial or underground.

The cabling task may be a new cable installation or upgrade of cable capacity for an existing network or subsystem for convergence to Next Generation Networks (NGN) applications.

The cabling installer may provide services in telephony, voice over internet protocol (VoIP), internet protocol TV (IPTV) and computer data over a single metallic customer cable or optical fibre cable in a specific customer location.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised*

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Elements	Performance Criteria
unit of competency.	*text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Work within the constraints imposed by customer premises and ACMA regulatory environment	1.1 Prepare for ***restricted cabling work*** within the ***regulatory and cabling environment, cable type, cable identification, termination systems, earthing and protection, records*** and according to requirements of ***relevant legislation, codes, regulations and standards*** 1.2 Identify ***building infrastructure*** that places critical constraints on ***cabling*** 1.3 Develop ***strategies to manage other infrastructure*** in relation to cabling 1.4 Notify appropriate personnel of ***safety hazards*** at the cabling work site
2. Manage remote power feed	2.1 Identify and avoid the risks posed by contact with remote power feeding services when performing cabling activity 2.2 Make site safe by identifying remote power feeding services that operate at above telecommunications network voltage (TNV) inside customer premises
3. Install cables and protective earth wires	3.1 Install cables according to manufacturer's application specifications, including tension and bending stress requirements 3.2 Identify and avoid sources of possible damage to cable, including hot pipes, sharp edges and cable burn 3.3 Allow sufficient excess at cable ends to facilitate ***termination*** 3.4 Place and secure cable to maintain safety and interference segregation according to legislative and industry standards 3.5 Install cable ties with correct tension to prevent cable sheath damage or transmission impairment and trimmed flush to prevent risk of personal damage 3.6 Install underground cables to minimum depth of cover and segregation from hazardous electrical and other services according to AS/CA TS009:2013

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	3.7 Install underground cables excluding blown fibre tube systems to incorporate a blocking agent within the cable to prevent the ingress of water 3.8 Install aerial cables to minimum clearance, segregation from hazardous electrical and other services and minimum height requirements according to AS/CA TS009:2013 3.9 Install over-voltage protection devices according to AS/CA TS009:2013 to all cable pairs, where required, to suppress voltage surges and protect from earth potential rise (EPR) hazards and protectively earth the devices 3.10 Protect earth wire insulation against damage and segregate protective earths according to relevant legislative and industry standards
4. Terminate and test cables and earth wires	4.1 Remove cable sheath to allow for correct termination length and without damage to underlying conductors and their insulation 4.2 Install NTD terminating modules according to manufacturer specifications and with cable pairs neatly and sequentially fanned for termination 4.3 Terminate conductors according to recommended colour code sequence using appropriate termination tools in the manufacturer's specified manner 4.4 Earth cable shield, if applicable, to manufacturer specifications, relevant industry codes of practice and AS/CA TS009:2013 4.5 Conduct visual inspection to confirm termination colour code sequence has been followed prior to end-to-end testing of wire and pair termination integrity 4.6 Terminate earth wires with connectors recommended by manufacturers according to accepted industry codes of practice and AS/CA TS009:2013 4.7 Maintain earth wire continuity throughout and observe interface requirements with electrical systems 4.8 Test earthing installation for continuity, insulation resistance and conductive resistance according to accepted industry standards, including AS/CA TS009:2013 4.9 Confirm compatibility of alterations with existing systems and test new work both in isolation and when integrated with existing systems
5. Inspect cable route to ensure correct	5.1 Inspect ***separations*** along the entirety of the cable route and rectify separations that do not comply with regulations

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separations	5.2 Install barriers to achieve separations where sufficient spatial separation cannot be met
6. Create records	6.1 Provide the client with a job sign-off and telecommunications cabling advice form, at the completion of each cabling task 6.2 Complete NTD record cards for the work undertaken
7. Monitor work activity	7.1 Supervise cablers not holding appropriate registration for the task to ensure cabling activity is according to legislative requirements for safety and network integrity, including AS/ACIF S008:2006 and AS/CA TS009:2013

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with work associates, supervisors, team members and clients
- literacy skills to interpret:
  - requirements of related legislation, codes regulations and standards
  - technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - check environmental conditions are suitable for termination
  - make site safe and secure for cable installation
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task-management skills to:
  - apply work practices that avoid cable damage
  - conform to work specifications and relevant industry standards
- technical skills to:
  - check cable route for obstructions and make clear, using suitable methods
  - handle cable according to manufacturer specifications so that conductors, sheath and insulation are not damaged during installation
  - select cabling system to meet customer performance needs

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- read and interpret drawings related to:
  - cable coding system, identifiers and distributor locations
  - cable layouts
  - outlet location
- terminate copper twisted pair, including indoor, external, aerial and underground cabling
- use diagnostic equipment
- use hand and power tools.
-

Required knowledge

- basic electrical principles relating to insulation, resistance, capacitance and induction, as causes of impedance, attenuation and cross-talk
- ACMA cabling provider rules, cabler registration rules, regulations and standards
- features and operating requirements of recognised cabling specific industry test equipment
- information required to operate equipment according to a test specification
- manufacturer requirements for safe operation of equipment
- requirements of legislation, codes of practice and other formal agreements that impact on the work activity
- specific occupational health and safety (OHS) requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	
	• complete a cabling installation and termination:
	  • three different types of telephone sockets:
	  • Australian modular socket
	  • Mode 3 alarm socket
	  • United States modular socket
	  • one NTD
	  • one alarm panel, including completion of a TCA compliance form and NTD records

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	• one Ethernet cable • apply cable conductor identification codes • conduct and interpret cable test results • interpret and apply standards and regulations • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • a site on which communications cabling activities may be carried out • use of cabling and field equipment currently used in industry • licensing requirements and other site-related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking cabling installations and tests, and applying cable conductor identification codes • oral or written questioning to assess knowledge of test results, standards requirements and specific technical procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Restricted cabling work refers to:	• aerial and underground cabling work on private property • cabling work that is performed only in relation to a customer's premises • customer cabling that terminates directly at the network boundary on a socket or network termination device.
Regulatory environment refers to:	• accredited registrars and registration • ACMA • Certified Components List • Communications Alliance • labelling requirements • Telecommunications Act 1997.

Cabling environment may refer to:	• indoor environments, including concealed locations:
	  • ceilings and false ceilings
	  • internal wall space
	  • modular workstations
	  • under floor
	• outdoor environments, including cable installations:
	  • aerial telecommunications cabling for restricted cabling work, which does not include installations on poles shared with low voltage (LV) or high voltage (HV) electrical power cables or terminations

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	• external walls • underground cabling in an exclusive trench or shared trench with electrical LV cables and other utilities.
Cable type may include:	• aerial • coaxial • copper twisted pair • data cables: Category 5, 6, 6A, 7 or 7A • external • indoor • optic fibre cable • underground.

Cable identification refers to:	• cable conductor identification codes:
	  • banded
	  • colour coded
	  • lettered
	  • numbered.

Termination systems must include:	• network termination device
	• socket types:
	  • Australian modular socket
	  • Mode 3 alarm socket
	  • United States modular socket.
	Note: Jumperable distributors are not included in this requirement.

Earthing and protection must include:	• earthing for protection • surge suppression.
Records may include:	• NTD record cards • telecommunication cabling advice forms TCA1 and TCA2.
Relevant legislation, codes, regulations and standards may include:	• accredited registrars and registration • Australian Communications Industry Forum (ACIF) standards and codes • ACMA • AS/NZS 3000:2007 • AS/ACIF S008:2006 and AS/CA TS009:2013 • Certified Components List (CCL) • AS Communications Cabling Manual (CCM) – Restricted • labelling • overview of Telecommunications Act 1997.
Building infrastructure may include:	• availability and suitability of existing cabling trays and fixing systems • building hazards

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	• elevated working • high voltage (HV) power • restricted access.
Cabling may include:	• aerial customer • external customer • indoor customer • underground customer.
Strategies to manage other infrastructure may include:	• appropriate separations • correct use of cable trays and support systems • fastening techniques.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light or non-visible laser
	  • radio frequency (RF) emission
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service.

Termination may include:	• Australian modular socket • Ethernet connectors terminated at both ends of an Ethernet cable and tested • Mode 3 alarm socket • NTD • United States modular socket Note: Jumperable distributors are not included in this requirement.

Separations refer to:	• correct separations between communications cable and other services:
	  • LV
	  • HV single core
	  • HV multi-core
	  • open terminations
	• separations covered by AS/CA TS009:2013.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor additional to critical evidence. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to safely install, maintain and modify customer premises communications cabling required according to the Australian Communications and Media Authority's (ACMA) ‘Open’ Cabling Provider Rule.

This rule is associated with small installations connected to sockets and larger commercial and industrial installations involving many lines, multi-pair cables, backbone cabling, multi-story buildings and more complicated termination modules and distributors.

The cabling activity may be a new cable installation or an upgrade of cable capacity for an existing network or subsystem, or cabling infrastructure for convergence to Next Generation Networks (NGN).

Convergence in the telecommunications and IT areas is the emergence of a single infrastructure for a range of telephony and IT services. Telephone, voice over internet protocol (VoIP), internet protocol TV (IPTV) and computer data may all travel over a single metallic customer cable, optical fibre cable or wireless link in a specific location.

Assessment by a TITAB-registered assessor is recommended.

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This unit meets the minimum ACMA prescribed level of knowledge and skill that safeguards matters of health, safety and network integrity, and addresses matters of interoperability where customer equipment and standard telephone service are involved only.

Note:

- Completion of this unit does not imply industry competency using specialised cabling, such as coaxial, optical fibre and structured cabling
- Completion of the following six cabling units: ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B exceed the requirements of this standard and fulfil the requirements for ACMA Cabling Provider Rules: Open Cabling Category for Cabler Registration
- To be permitted to work with lift cabling, cablers are required to have completed the relevant Electrotechnology qualification, such as the Certificate III in Electrotechnology Electrician or equivalent.

Application of the Unit

This unit applies to customer cabling terminated on distributors. It applies to installation, maintenance and modification of indoor, external, underground cabling on private and public property.

Customer cabling, for the purpose of this standard, may be used to connect devices for a range of applications, including telecommunications, Ethernet, video and multimedia, security and alarms, and fire protection.

The cabling task may be a new cable installation or upgrade of cable capacity for an existing network or subsystem for convergence to NGN applications.

Cabling installers providing services in telephony, VoIP, IPTV and computer data over a single metallic customer cable or optical fibre cable in a specific customer location apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Work within the constraints imposed by customer premises and ACMA regulatory environment	1.1 Prepare for ***open cabling work*** according to the ***regulatory and cabling environment, cable type, cable identification, termination systems, earthing and protection, records*** and according to requirements of ***relevant legislation, codes, regulations and standards*** 1.2 Identify ***building infrastructure*** that places critical constraints on ***cabling*** 1.3 Develop ***strategies to manage other infrastructure*** in relation to cabling 1.4 Notify appropriate personnel of identified ***safety hazards*** at cabling work site
2. Manage remote power feed	2.1 Identify and avoid the risks posed by contact with remote power feeding services when performing cabling activity 2.2 Make site safe, identifying remote power feeding services that operate at above telecommunications network voltage (TNV) inside customer premises
3. Install and modify cable support, earthing and termination infrastructure	3.1 Install fixings and ***cable support structures*** of adequate strength safely and aligned with the environment according to manufacturer and customer specifications 3.2 Secure catenary supports to building structure and tension, where necessary, to ensure cable weight can be carried in operating conditions with interference and safety segregation maintained, including adherence to AS/CA TS009:2013

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	3.3 Install protective earthing of metal work to industry standards where required 3.4 Inspect installed support structure to ensure cable will not be exposed to damage during installation and general operation 3.5 Position terminating equipment and fixing to accepted industry codes of practice, standards and customer requirements 3.6 Inspect back-mount and outlet layout for compliance to manufacturer specifications and allow adequate work space for ease of access and avoid overlaying 3.7 Segregate incoming and outgoing cables for ease of access and avoid overlaying
4. Install cables and earth wires	4.1 Install cables according to manufacturer's application specifications, including tension and bending stress requirements 4.2 Identify and avoid sources of possible damage to cable, including hot pipes, sharp edges and cable burn 4.3 Allow sufficient excess at cable ends to facilitate ***termination*** 4.4 Label telecommunication outlet ends of cable uniquely to match identifier at originating location 4.5 Place and secure cable to maintain safety and interference segregation according to legislative and industry standards 4.6 Install cable ties with correct tension to prevent cable sheath damage or transmission impairment and trimmed flush to prevent risk of personal damage 4.7 Install aerial cables supported by catenaries in external environment to meet minimum above ground clearances and clearances from hazardous electrical services according to AS/CA TS009:2013 4.8 Install underground cables to minimum depth of cover and segregation from hazardous electrical and other services according to AS/CA TS009:2013 4.9 Install cables underground (excluding blown fibre tube systems) to incorporate a blocking agent within the cable to prevent the ingress of water 4.10 Install over-voltage protection devices to all cable pairs, where required, according to AS/CA TS009:2013, to suppress voltage surges with the devices protectively earthed 4.11 Conduct a visual inspection to verify telecommunications reference conductor (TRC)/ communications earthing system (CES)/ earth wire insulation is protected against damage and

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	TRC/CES/protective earth is segregated according to relevant industry and legislative standards and AS/CA TS009:2013
5. Terminate and test cables and earth wires	5.1 Remove cable sheath to allow for correct termination length and without damage to underlying conductors and their insulation 5.2 Install terminating modules according to manufacturer specifications and with cable pairs neatly and sequentially fanned for termination 5.3 Terminate conductors according to recommended colour code sequence using appropriate termination tools in the manufacturer's specified manner 5.4 Earth cable shield, if applicable, to manufacturer specifications, relevant industry codes of practice and AS/CA TS009:2013 5.5 Conduct visual inspection to confirm termination colour code sequence has been followed prior to end-to-end testing of wire and pair termination integrity 5.6 Terminate TRC/CES/earth wires with connectors recommended by manufacturers according to accepted industry codes of practice and AS/CA TS009:2013 5.7 Maintain TRC/CES/earth wire continuity throughout to meet interface requirements with electrical systems 5.8 Test TRC/CES/earthing installation for continuity, insulation resistance and conductive resistance according to accepted industry standards, including AS/CA TS009:2013 5.9 Confirm compatibility of alterations with existing systems and test new work both in isolation and when integrated with existing systems 5.10 Test cable according to performance specifications
6. Inspect cable route to ensure correct separations	6.1 Inspect ***separations*** along the entirety of the cable route and rectify separations that do not comply with regulations 6.2 Install barriers to achieve separations where sufficient spatial separation cannot be met
7. Evaluate earthing needs for cable systems on customer premises	7.1 Locate existing earthing systems in customer premises and analyse the earthing needs of cable systems in a range of building types 7.2 Calculate the upper and lower limits of resistance for a variety of cable system earths using relevant cable characteristics

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8. Label earthing systems	8.1 Identify label requirements for all types of earthing systems 8.2 Attach label to earthing systems according to industry regulations
9. Create or update cable plans and records	9.1 Document ***installation details*** on record sheets and plans and store according to customer requirements 9.2 Label cable pairs clearly to provide an accurate identification according to manufacturer, industry and client standards 9.3 Record ***cabling details*** in cable pair record books to provide an accurate record according to industry codes of practice and AS/CA TS009:2013 9.4 Complete telecommunications cabling advice (TCA) form
10. Monitor work activity	10.1 Maintain close supervision of cablers not holding appropriate registration for the task to ensure installation and maintenance activity is strictly according to legislative requirements and industry standards for safety and network integrity including AS/ACIF S008:2006 and AS/CA TS009:2013

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with team members, supervisors and customers on technical and operational matters
- interpersonal skills related to work associates, supervisors, team members and clients
- literacy skills to interpret:
  - requirements of relevant legislation, codes, regulations and standards
  - technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - check environmental conditions are suitable for installation
  - make site safe and secure for cable installation

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    - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task-management skills to:
    - apply work practices that avoid cable damage
    - conform to work specifications and relevant industry standards
- technical skills to:
    - check cable route for obstructions and make clear, using suitable methods
    - handle cable according to manufacturer specifications so that conductors, sheath and insulation are not damaged during installation
    - read and interpret drawings related to:
        - cable coding system, identifiers and distributor locations
        - cable layouts
        - outlet location
    - select cabling system to meet customer performance needs and conform to work specifications and relevant industry standards
    - terminate copper twisted pair, including indoor, external, aerial and underground cabling
    - use diagnostic equipment
    - use hand and power tools.
    -

Required knowledge

- ACMA cabling provider rules, cabler registration rules, regulations and standards
- features and operating requirements of recognised cabling specific industry test equipment
- information required to operate equipment according to a test specification
- manufacturer requirements for safe operation of equipment
- protection earthing
- requirements of legislation, codes of practice and other formal agreements that impact on the work activity
- specific occupational health and safety (OHS) requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • terminate systems at both distributor and outlet locations • install and terminate one jumperable distributor (campus distributor or building distributor) with a capacity of 100 pair or greater • terminate one non-jumperable distributor (LD) and a patch panel • terminate at least one 50 pair, one 4 pair and one Ethernet cable, including accurate completion of installation records, drawing alterations and compliance forms • place cables on support structures and building faces for both internal and external locations • secure methods for the above locations • demonstrate work practices that avoid cable damage • install the three common types of earthing system used in customer premises for cabling systems • read and interpret drawings related to cable layouts, outlet location, cable coding system, and identifiers and distributor locations • conduct and interpret cable test results • interpret and apply requirements of relevant legislation, codes, regulations and standards • comply with all OHS requirements and work practices • meet ACMA knowledge test requirements.
Context of, and specific resources for assessment	Assessment must ensure: • a site on which communications cabling activities may be carried out • use of cabling and field equipment currently used in industry • licensing requirements and other site-related documentation.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate terminating:

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	• systems at both distributor and outlet locations • one jumperable distributor (campus distributor or building distributor) with a capacity of 100 pair or greater • one non-jumperable distributor (LD) and a patch panel • at least one 50 pair, one 4 pair and one Ethernet cable • review of completed documentation prepared by the candidate, including accurate completion of installation records, drawing alterations and compliance forms • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: ICTCBL2138B Install, maintain and modify customer premises communications cabling: ACMA Lift Rule. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Open cabling work refers to:	• aerial and underground cabling work on private and public property • customer cabling that terminates directly at the network boundary on a socket, network termination device (NTD)or a distributor.
Regulatory environment refers to:	• accredited registrars and registration • ACMA • Certified Components List (CCL) • Communications Alliance • labelling requirements • Telecommunications Act 1997.

Cabling environment may refer to:	• indoor environments, including concealed locations:
	  • ceilings and false ceilings
	  • internal wall space
	  • modular workstations
	  • under floor
	• outdoor environments, including cable installations:
	  • aerial telecommunications cabling for restricted cabling work, which does not include installations on poles shared with low voltage (LV) or high voltage (HV) electrical power cables or terminations
	  • external walls
	  • underground cabling in an exclusive trench or shared trench with electrical LV cables and other utilities.

Cable type may include:	• aerial • coaxial • copper twisted pair • data cables: Category 5, 6, 6A, 7 or 7A • external • indoor • optic fibre cable • underground.
Cable identification	• cable conductor identification codes:

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refers to:	• banded • colour coded • lettered • numbered.
Termination systems may include:	• jumperable distributor (campus distributor or building distributor) • non-jumperable distributor (local distributor) and a patch panel.
Earthing and protection may include:	• earthing of screened cable, barriers and cable trays for the reduction or elimination of interference from electromagnetic, radio frequency (RF) and power sources • equipotential bonding conductors to multiple earth neutral (MEN) and use of earth stakes • functional earths, including TRC and CES types to provide customer switching system facilities • protective earth barriers for segregation, cable tray, duct and metal equipment enclosures • protective earths for over-voltage and surge or spike suppression according to AS/CA TS009:2013.

Records may include:	• building, cabling and equipment location plans
	• labelling of:
	  • distributor pairs
	  • distributor verticals
	  • equipment closets
	  • NTD record cards
	  • patch panels
	  • rooms
	  • telecommunication outlets
	• record books and cards:
	  • building distributors (BD)
	  • campus distributors (CD)
	  • floor distributors (FD)
	  • local distributors (LD)
	• TCA forms (TCA1 andTCA2).

Relevant legislation, codes, regulations and standards may include:	• accredited registrars and registration • AS Communications Cabling Manual (CCM) – Open • Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • AS/ACIF S008:2006 • AS/CA TS009:2013

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	• AS/NZS 3000:2007 • cabling security codes and regulations • CCL • labelling • overview of Telecommunications Act 1997.
Building infrastructure may include:	• availability and suitability of existing cabling trays and fixing systems • building hazards • elevated working • HV power • restricted access.
Cabling may include:	• aerial customer • external customer • indoor customer • underground customer.
Strategies to manage other infrastructure may include:	• appropriate separations • correct use of cable trays and support systems • fastening techniques.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light or non-visible laser
	  • RF emission
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service.

Cable support structures may include:	• cable ducts may be closed or open
	• cable trays may be:
	  • galvanised steel or PVC
	  • perforated with low or high side
	  • single or multi-channel
	• line poles
	• pits and pipes
	• suspension catenary wire
	• wall and island mounted patched and jumperable distributors:
	  • BD
	  • CD
	  • FD
	  • LD.

Termination may	• Australian modular socket

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include:	• Ethernet connectors terminated at both ends of an Ethernet cable • jumperable distributor (campus distributor or building distributor) with a capacity of 100 pair or greater • Mode 3 alarm socket • NTD • non-jumperable distributor (local distributor) and a terminated patch panel • United States modular socket.

Separations refer to:	• correct separations between communications cable and other services:
	  • LV
	  • HV single core
	  • HV multi-core
	  • open terminations
	• separations covered by AS/CA TS009:2013.

Installation details may include:	• cable infrastructure • cable location and type.
Cabling details may include:	• interconnections • pair locations • pair numbering and labelling.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2138B Install, maintain and modify customer premises communications cabling: ACMA Lift Rule

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to safely install, maintain and modify customer premises communications cabling required according to Australian Communications and Media Authority's (ACMA) 'Lift' Cabling Provider Rule.

To be permitted to work with lift cabling, cablers are required to have completed the relevant Electrotechnology qualification such as the Certificate III in Electrotechnology Electrician or equivalent.

Lift cabling is used between the local distributor (LD) adjacent to the lift machine or motor room and the lift control cubicle and lift cars.

It involves customer cabling terminated on LDs in the installation, maintenance and modification of lift cabling.

Assessment by a TITAB registered assessor is recommended.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

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Application of the Unit

Technical staff whose work involves customer cabling in relation to lift installations apply the skills and knowledge in this unit.

Customer cabling, for the purpose of this standard, may be used to connect devices for a range of applications including telecommunications phones, data including video, audio and alarms.

The cabling task may be a new cable installation or upgrade of cable capacity for an existing network or subsystem for convergence to Next Generation Networks (NGN) applications.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Work within the constraints imposed by customer premises and ACMA regulatory	1.1 Prepare for ***lift cabling work*** according to the ***regulatory environment, cabling environment, cable type, cable identification, termination systems, earthing and protection, records*** and ***relevant legislation, codes, regulations and***

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environment	***standards*** 1.2 Identify ***building infrastructure*** which places critical constraints on cabling when undertaking a typical lift cabling installation from LD to lift car socket 1.3 Develop strategies to manage other infrastructure in relation to cabling 1.4 Notify appropriate personnel of identified ***safety hazards*** at cabling worksite
2. Manage remote power feed	2.1 Identify and avoid the risks posed by contact with remote power feeding services when performing cabling activity 2.2 Make site safe by identifying remote power feeding services which operate at above telecommunications network voltage (TNV) inside customer premises
3. Install and modify cable support, earthing and termination infrastructure	3.1 Install fixings and ***cable support structures*** of adequate strength safely and align with the environment according to manufacturer's and customer's specifications 3.2 Secure catenary supports to building structure and tension where necessary to ensure cable weight can be carried in operating conditions with interference and safety segregation maintained including adherence to AS/ACIF S009:2006 3.3 Install protective earthing of metal work to industry standards where required 3.4 Inspect installed support structure to ensure cable will not be exposed to damage during installation and general operation 3.5 Position terminating equipment and fixing to accepted industry codes of practice, AS/ACIF S009:2006 and customer requirements 3.6 Inspect control cubicles, travelling cable supports, junction boxes, line isolator units, back-mount and outlet layout complying to manufacturer's specifications and allow adequate work space for ease of access and avoid overlaying 3.7 Segregate incoming and outgoing cables to ensure ease of access and avoid overlaying
4. Install cables and earth wires	4.1 Install a lift cable from LD to lift car socket 4.2 Install cables according to manufacturer's application specifications including tension and bending stress requirements 4.3 Identify and avoid sources of possible damage to cable including hot pipes, sharp edges and cable burn 4.4 Allow sufficient excess at cable ends to facilitate

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	termination 4.5 Place and secure cable to maintain safety and interference segregation according to legislative and industry standards 4.6 Install cable ties with correct tension to prevent cable sheath damage or transmission impairment and trimmed flush to prevent risk of personal damage 4.7 Install aerial cables supported by catenaries in external environment to meet minimum above ground clearances and clearances from hazardous electrical services according to AS/ACIF S009:2006 4.8 Install and secure travelling cables to maintain safety and according to relevant legislative, industry and manufacturer's standards 4.9 Install local isolation units (LIU) as required by TS001 and AS/ACIF S009:2006 4.10 Install over-voltage protection devices to all cable pairs, where required, to suppress voltage surges, with the devices protectively earthed, and according to AS/ACIF S009:2006 4.11 Protect earth wire insulation against damage with protective earths segregated according to relevant industry and legislative standards
5. Terminate and test cables and earth wires	5.1 Remove cable sheath to allow for correct termination length and without damage to underlying conductors and their insulation 5.2 Install terminating modules according to manufacturer's specifications ensuring cable pairs are neatly and sequentially fanned for termination 5.3 Terminate conductors according to recommended colour code sequence using appropriate termination tools in the manufacturer's specified manner 5.4 Earth cable shield, if applicable, to manufacturer's specifications and relevant industry codes of practice, including AS/ACIF S009:2006 5.5 Undertake visual inspection to confirm termination colour code sequence has been followed, prior to end to end testing of wire and pair termination integrity 5.6 Terminate earth wires with connectors recommended by manufacturer according to relevant industry codes of practice including AS/ACIF S009:2006 5.7 Maintain earth wire continuity throughout to meet interface requirements with electrical systems

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	5.8 Test earthing installation for continuity, insulation resistance and conductive resistance according to relevant industry standards including AS/ACIF S009:2006 5.9 Confirm compatibility of alterations with existing systems and test new work both in isolation and when integrated with existing systems
6. Inspect cable route to ensure correct separations	6.1 Inspect ***separations*** along entire cable route and rectify separations which do not comply with regulations 6.2 Install barriers to achieve separations where sufficient spatial separation cannot be met
7. Evaluate earthing needs for cable systems on customer premises	7.1 Locate existing customer earthing systems and analyse the earthing needs of cable systems 7.2 Calculate the upper and lower limits of resistance for a variety of cable system earths using relevant cable characteristics
8. Label earthing systems	8.1 Identify label requirements for all types of earthing systems 8.2 Attach label to earthing systems according to industry regulations
9. Create or update cable plans and records	9.1 Document ***installation details*** on record sheets and plans and store according to customer requirements 9.2 Label cable pairs clearly to provide accurate identification according to manufacturer's, industry and client standards 9.3 Record ***cabling details*** in cable pair record books to provide an accurate record according to industry codes of practice and AS/ACIF S009:2006 9.4 Complete telecommunications cabling advice (TCA) form
10. Monitor work activity	10.1 Maintain close supervision of cablers not holding appropriate registration for the task to ensure installation and maintenance activity is strictly according to legislative requirements and industry standards for safety and network integrity including AS/ACIF S008:2006 and AS/ACIF S009:2006

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

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Required skills

- communication skills to liaise with team members, supervisors and customers on technical and operational matters
- literacy skills to interpret:
  - relevant legislation, codes, regulations and standards
  - technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - check environmental conditions are suitable for installation
  - make site safe and secure for cable installation
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to:
  - apply work practices which avoid cable damage
  - conform to work specifications and relevant industry standards
- technical skills to:
  - check cable route for obstructions and make clear using suitable methods
  - handle cable according to manufacturer's specifications so that conductors, sheath and insulation are not damaged during installation
  - read and interpret drawings related to:
    - cable coding system, identifiers and distributor locations
    - cable layouts
    - outlet location
  - select cabling system to meet customer performance needs and conform to work specifications and relevant industry standards
  - use diagnostic equipment
  - use hand and power tools.
  -

Required knowledge

- ACMA regulations and standards on lifts cabling
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- protection earthing

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- specific occupational health and safety (OHS) requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install a lift cabling system from LD to lift car socket, including accurate completion of installation records, drawing alterations and compliance forms • read and interpret cable drawings and plans for locations and terminations • apply cable conductor identification codes • conduct and interpret cable test results • interpret and apply related regulations and industry codes • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • a site on which lift communications cabling activities may be carried out • use of cabling and field equipment currently used in industry • licensing requirements and other site related documentation.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking a lift cabling installation from LD to lift car socket • direct observation of the candidate applying cable

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	conductor identification codes • oral or written questioning to assess interpretation of cable drawings and plans for locations and terminations • oral or written questioning to assess knowledge of cable test results, standards requirements and specific technical procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, e.g. • ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Lift cabling work refers to:	• cabling used between the LD adjacent to the lift machine or motor room and the lift control cubicle and lift cars • communications cabling of the lift travelling cables and connections • communications customer cabling in lift installation.
Regulatory environment refers to:	• accredited registrars and registration • ACMA • AS 1979:1976 Travelling cables • Certified Components List • Communications Alliance • labelling requirements • Telecommunications Act 1997.
Cabling environment may include:	• inside and outside the lift car • lift machine or motor room • lift shaft.

Cable type may include:	• coaxial
	• copper twisted pair
	• data cables:
	  • Category 5, 6, 6A, 7 or 7A
	• optical fibre cable
	• travelling cable complying to Australian standards:
	  • circular
	  • flat.

Cable identification refers to:	• cable conductor identification codes:
	  • banded
	  • colour coded
	  • lettered
	  • numbered.

Termination systems may include:	• connectors • distributors • modules • sockets

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	• travelling cable terminations.
Earthing and protection may include:	• earthing of screened cable, barriers and cable trays for the reduction or elimination of interference from electromagnetic, radio frequency (RF) and power sources • equi-potential bonding conductors to multiple earth neutral (MEN) and use of earth stakes • functional earths, including telecommunications reference conductor (TRC) and communications earthing system (CES) types to provide customer switching system facilities • protective earth barriers for segregation, cable tray, duct and metal equipment enclosures • protective earths for over voltage and surge or spike suppression according to AS/ACIF S009:2006.

Records may include:	• building, cabling and equipment location plans
	• labelling of:
	  • distributor pairs
	  • distributor verticals
	  • equipment closets
	  • network termination device (NTD) record cards
	  • patch panels
	  • rooms
	  • telecommunication outlets
	• record books and cards:
	  • campus distributors (CD)
	  • building distributors (BD)
	  • floor distributors (FD)
	  • local distributors (LD)
	• TAC forms (TCA1 and TCA2).

Relevant legislation, codes, regulations and standards may include:	• accredited registrars and registration • Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • AS/ACIF S008:2006 and AS/ACIF S009:2006 • AS/NZS 3000:2007 • AS1979:1976 Travelling cables • cabling security codes and regulations • Certified Components List (CCL) • labelling • Overview Telecommunications Act 1997 • AS Communications Cabling Manual (CCM) –Open.

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Building infrastructure may include:	• availability and suitability of existing cabling trays and fixing systems • building hazards • elevated working • high voltage (HV) power • restricted access.
Strategies to manage infrastructure may include:	• appropriate separations • correct use of cable trays and support systems • fastening techniques.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light or non-visible laser
	  • RF emission
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:L1995 conduit colours associated with a hazardous service.

Cable support structures may include:	• cable ducts may be closed or open
	• cable trays may be:
	  • galvanised steel or PVC
	  • perforated with low or high side
	  • single or multi-channel
	• line poles
	• pits and pipes
	• suspension catenary wire
	• wall and island mounted patched and jumperable distributors:
	  • BD
	  • CD
	  • FD
	  • LD.

Termination may include:	• a jumperable distributor CD or BD • a non-jumperable distributor LD and a terminated patch panel • Ethernet connectors terminated at both ends of an Ethernet cable • travelling cable terminations.

Separations refer to:	• correct separations between communications cable and other services:
	  • HV single core
	  • HV multi-core

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	• low voltage • open terminations • separations covered by AS/ACIF S009:2006.
Installation details may include:	• cable infrastructure • cable location and type.
Cabling details may include:	• interconnections • pair locations • pair numbering and labelling.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2139B Apply safe technical work practices for cabling registration when configuring ADSL circuits

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor change to title, descriptor and performance criterion. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to gain proficiency in current work practices and methodologies used for Open and Restricted Cabling Registration.

It covers safe installation and alteration practices for configuring the Carrier NTD/ADSL Filter and Modem/Mode 3 socket/cabling for an alarm system connected to a monitoring station using a carrier line supporting an asymmetric digital subscriber line (ADSL) modem service.

Application of the Unit

Cablers, installers and technicians in the field apply the skills and knowledge in this unit in the context of technology convergence and digital subscriber lines (DSL) technologies as applied in the telecommunications industry.

It can be applied to installation, maintenance or upgrades of existing systems in voice, data or security systems.

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Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Build and test DC and AC circuits and telephone earthing	1.1 Identify any hazards and occupational health and safety (OHS) issues for a safe work site and notify appropriate personnel 1.2 Connect a series and a parallel ***DC and AC circuit configuration*** following ***safe work practices*** 1.3 Choose the appropriate ***test equipment*** and measure the values of ***electrical quantities*** of the circuits 1.4 Use ***calculations*** to verify the measured values of the electrical quantities in a series and in a parallel circuit configuration 1.5 Compare measured values to calculated values and determine the reasons for any variations 1.6 Evaluate results and determine the ***probable faults*** if relevant

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	1.7 Measure voltages present on a telephone line and compare to exchange battery voltage 1.8 Measure resistance to earth, ensuring an electrical earth in a telecommunications installation
2. Configure a safe ADSL circuit configuration with Mode 3 connection	2.1 Determine the effects of bandwidth, frequency and attenuation on ***xDSL circuits*** as used for broadband customer access 2.2 Design and configure an ***ADSL circuit*** from network boundary through to Mode 3 socket for an alarm system connected to a monitoring station 2.3 Configure connection to ensure that an ADSL circuit is not disconnected for safety reasons when an alarm activation in conjunction with a Mode 3 socket disconnects the plain old telephone service (POTS) circuit 2.4 Use a ***level 3 tester*** to verify correct termination and installation practices on a digital transmission line
3. Diagnose and rectify faults	3.1 Determine urgency and impact of faults and required response timeframe for clearance 3.2 Identify ***type of fault*** and determine most probable causes of fault from data and historical trends where available 3.3 Select tools and test equipment relevant to the system and type of fault 3.4 Diagnose fault in a methodical and safe manner using suitable ***fault-finding technique*** 3.5 Isolate fault progressively to remove likely variables from diagnostic 3.6 Determine options to rectify the fault and present to customer for decision on rectification 3.7 Document test methods and results and file with other system installation records
4. Alter existing services	4.1 Identify existing and proposed cable systems for ***altering services*** to an existing installation 4.2 Plan alterations to cause minimal disruption to ongoing client activity 4.3 Use ***appropriate tools*** to safely ***terminate telecommunications cables and outlets*** 4.4 Identify and rectify any ***cable fault*** 4.5 Carry out alterations in a safe manner and according to both mandatory and recommended industry standards

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	4.6 Identify risks posed by contact with remote power feeding services 4.7 Test alteration and obtain sign-off from customer

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to listen and liaise with clients on technical and operational matters related to sign-off for alteration of services
- literacy skills to interpret technical documentation and incorporate technical language into written tasks, such as reporting on recommendations to minimise recurrent fault occurrence
- numeracy skills to:
  - interpret technical data, such as specifications of telecommunications networks
  - perform mathematical problem solving in AC and DC tasks and fault-finding
- problem-solving skills to apply AC and DC fault-finding techniques to different situations
- research skills to access technical information and sources to understand fundamental principles of telecommunication networks
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - select and use appropriate test equipment and practices to perform basic AC and DC testing
  - perform fault-finding tasks
  - alter services.
  -

Required knowledge

- application of binary number conversion and interpretation
- AC and DC electrical quantities, including SI units, OHS issues and the application of Ohm’s law

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- fault-finding techniques and use of testing equipment, including:
  - multimeter to measure DC voltage, current and resistance
  - continuity tester to check continuity wiring
  - testing of open circuits and short circuits
- overview of:
  - ADSL circuitry and configurations
  - digital transmission concepts, including installation practices and testing
  - procedures in altering existing services, including sign-off
  - difference between analog and digital signals.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use concepts of ADSL application and design • use fault-finding techniques to locate cabling faults in telecommunications networks • use Ohm's law to solve DC and AC electrical problems • apply digital transmission principles and testing • use test equipment • alter existing customer services complying with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • a site where altering existing services for a customer may be conducted • appropriate AC and DC testing equipment • manufacturer's documentation and equipment • correct tools and measuring equipment currently used in industry.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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	• direct observation of the candidate undertaking AC and DC measurements and fault-finding • oral or written questioning to assess knowledge of fundamental concepts of telecommunications practices and recurrent fault-finding techniques • evaluation of written ADSL design concepts • direct observation of visual checks and evaluation of written procedures in altering existing services • direct observation of the candidate altering existing customer services.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule • ICTTEN2140B Use hand and power tools • ICTWHS2170B Follow work health and safety and environmental policies and procedures. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

DC and AC circuit configuration may include:	• DC circuit:
	  • resistances
	  • single DC voltage source:
	  • battery
	  • DC voltage supply
	  • solar panel
	• AC circuit:
	  • inductors, capacitors and resistances
	  • single AC voltage source:
	  • AC generator
	  • AC voltage supply
	  • alternator
	  • low voltage (LV) AC source.

Safe work practices may relate to:	• component tolerances are not exceeded
	• correct use of power supply and test equipment
	• identifying any electrical safety hazards
	• isolation from main supply
	• overdrawing of current
	• power down during set-up procedure
	• well laid out circuitry:
	  • avoid contact with external sources
	  • avoid shorting of components.

Test equipment may include:	• digital multimeter • multimeter • ohmmeter • voltmeter.
Electrical quantities may include:	• current • power • voltage.
Calculations may include:	• application of Ohm’s law • engineering notation • power calculations

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	• power consumption and efficiencies • voltage dividers • voltage, resistance and current calculations.
Probable faults may include:	• faulty component • faulty source voltage • open circuits • short circuits.
xDSL circuits may include:	• ADSL • ADSL2 • ADSL2+.
ADSL circuit may include:	• ADSL filters connected at a main distribution frame (MDF) • central filters and splitters installed at a network termination device (NTD) • central filters and splitters installed internally • domestic installations and small shops that use a telecommunications outlet (TO) or NTD as a network boundary • DSL and Mode 3 connections.
Level 3 tester may include:	• continuity • F set • local area network (LAN) Cat tester • split pair • wire map.
Type of fault may include:	• cable • electrical • hardware • software • system.
Fault-finding technique may include:	• half term testing • isolation of sections • logical mapping • using testing equipment.
Altering services may include:	• changing cable installation • client interaction • identifying mission critical services • identifying remote power feeding • upgrading a service.
Appropriate tools may include:	• basic hand tools • F sets for cable identification • Krone termination tool

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	• multimeter • wire strippers.

Terminate telecommunications cables and outlets may include:	• stripping a:
	  • 2 pair internal rated
	  • 3 pair external rated cable
	  • 4 pair Category 5 unshielded twisted pair (UTP) cable
	• terminating a TO
	• termination using screw terminals.

Cable fault may include:	• earth contact • foreign battery • no voltage • open circuit • short circuit • split pair.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL2163A Install a cable lead-in

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install indoor and outdoor aerial and underground cable lead-ins. It involves digital reception installation, broadband and customer installations.

The brief may be for a new metallic or optical cable installation, or an upgrade of cable capacity for an existing network or subsystem, or cabling infrastructure for convergence to Next Generation Networks (NGN).

Application of the Unit

Technical staff who haul underground or fix aerial cable lead-in apply the skills and knowledge in this unit. They may make use of tension meters and hauling equipment.

The unit can be applied to new installations and upgrades of telecommunications cabling projects in domestic, commercial and industrial installations.

Licensing/Regulatory Information

Users should confirm licensing requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for cable installation	1.1 Prepare for given work according to ***industry standards***
	1.2 Arrange access to the site according to required procedure
	1.3 Inform ***appropriate personnel*** of identified ***hazards and constraints*** on work site
	1.4 Obtain ***cable*** installation plan and set up installation equipment according to manufacturer requirements
	1.5 Select suitable ***protective clothing, tools and equipment***, and ***safety equipment***, and ***confirm support structures are safe***
2. Install aerial cable lead-in	2.1 Identify and use safe support structures
	2.2 Select type of cable bearer and determine need for separate catenary wire installation
	2.3 Secure catenary wire or bearer wire permanently to support structure using ***aerial fixing devices***, and adjust tension to meet relevant height and minimum sag requirements to required specifications
	2.4 Secure cable safely to catenary wire, leaving cable loop on support structure
	2.5 Terminate cable in customer enclosure and aerial enclosure
3. Install underground cable lead-in	3.1 Run push rod through pipe and attach cable for hauling
	3.2 Haul cable using lubricant, cable slippers or rollers to ensure no sheath damage when hauling at correct tension into and out of enclosures
	3.3 Provide sufficient cable allowance in enclosures for jointing and maintenance requirements
	3.4 Terminate cable in customer enclosure and pit enclosure

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4. Seal and secure cable	4.1 Seal cable ends to prevent ingress of foreign material 4.2 Secure cable loop on support structure to minimise damage to conductors 4.3 Weather seal building entry points where appropriate 4.4 Fit over voltage protection devices to all cables with metallic component where required
5. Complete tasks on site	5.1 Record any approved alteration to the original design and return to appropriate personnel 5.2 Complete ***appropriate records*** and sign reports where required according to enterprise policy 5.3 Restore the site to original condition and dispose of waste in an environmentally safe manner 5.4 Notify customer and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with work associates, supervisors, team members and clients
- literacy skills to interpret:
  - technical documentation, such as equipment manuals, specifications and requirements for aerial and underground installation
  - requirements of relevant legislation, codes, regulations and standards
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and work health and safety (WHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - read and interpret drawings related to:

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  - cable coding system and identifiers
  - cable layouts
  - frame locations
  - outlet location
- use hand and power tools.
-

Required knowledge

- features and operating requirements of testing equipment
- manufacturer requirements for safe operation of equipment
- specific WHS requirements relating to the activity and site conditions
- termination methods and performance requirements
- typical issues and challenges that occur on site
- workplace procedures reflecting the requirements of legislation, codes of practice and other formal agreements that impact on the work activity

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install at least one type of aerial cable and one type of underground cable, including placing and securing cables on support structures and building faces for both internal and external locations to industry standards; applying related WHS requirements and work practices • haul, secure and seal cable • identify safe support structures from pole status markings and visual inspection • terminate cables at the customer and network ends of aerial and underground installations • document installation and test results and provide report to client • comply with all related WHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure:

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	• sites where aerial and underground cable lead-ins may be conducted • use of equipment and personal protective equipment currently used in industry • use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impacts on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation • direct observation of the candidate terminating cables.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, e.g. • ICTCBL2008B Terminate metallic conductor customer cable. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Industry standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • ISO Draft 11801 (International) • regulated or industry codes of practice, including appropriate Australian Communications and Media Authority (ACMA) technical standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Appropriate personnel may include:	• construction manager • project manager • site manager • site supervisor.
Hazards and constraints may include:	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable and limitations on work • optical cable at all access points that may contain a hazardous light • risks associated with remote power feeding services.
Cable may include:	• coaxial • metallic cable

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	• optical fibre.

Protective clothing may include:	• earmuffs
	• gloves:
	  • leather
	  • plastic
	  • rubber
	• head protection
	• kneepads
	• masks
	• protective suits
	• safety boots
	• safety glasses.

Tools and equipment may be:	• mechanical or hand tools, such as:
	  • augers
	  • cable tensioner
	  • cherry pickers
	  • drills
	  • fixing brackets
	  • hammers
	  • height measuring devices
	  • ladders
	  • scissor lifts
	  • spanners.

Safety equipment may include:	• aerial safety belts and lines
	• personal protective equipment
	• site hazard identification and control equipment:
	  • flashing lights
	  • guards
	  • traffic signs
	  • warning signs and tapes
	  • witches hats.

Confirm support structures are safe refers to:	• checking for condemned pole status markings • checking for visible signs of decay or stress • using industry-accepted testing methods.
Aerial fixing devices may include:	• clamps • hooks • pig rings • riser pipes • screw hooks.

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Appropriate records may include:	• building distributor (BD), campus distributor (CD), floor distributor (FD) record books and local distributor (LD) record cards
	• building, cabling and equipment location plans
	• computerised plans
	• databases
	• labelling of:
	  • distributor pairs
	  • distributor verticals
	  • equipment closets
	  • patch panels
	  • rooms
	  • telecommunication outlets
	• telecommunications administration centre (TAC) or NTD cards conforming to AS/ACIF S009:2006
	• telecommunications cabling advice (TCA) forms:
	  • cable drawings
	  • cable plans
	  • record books
	  • record cards
	  • TCA1 (sign-off form)
	  • TCA2.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL3009B Install, terminate and certify structured cabling installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor changes to an element, a performance criterion and range statement. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to place, secure and terminate structured cabling and to certify installation.

Assessment by a TITAB-registered assessor is recommended.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media (ACMA)-accredited registrar.

Application of the Unit

Technical staff who install, terminate and certify structured cabling installation apply the skills and knowledge in this unit.

This unit applies to indoor and outdoor installation within customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

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Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for the installation of structured cabling	1.1 Confirm ***customer requirements*** and ensure compliance with requirements of ***relevant legislation, codes, regulations and standards*** 1.2 Arrange access to the site according to required procedure 1.3 Inform appropriate personnel of identified ***hazards*** on work site 1.4 Organise ***tools and equipment*** for given work 1.5 Erect ***barriers*** according to safety requirements 1.6 Select ***cable type*** and match ***structured cabling*** to installation environment and customer requirements 1.7 Verify proposed route to meet manufacturer specifications and industry standards
2. Install structured cable	2.1 Place and secure the correct type of cable following ***occupational health and safety (OHS) and environmental requirements*** and according to accepted industry practice and

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	standards 2.2 Maintain cable and services separations in runs and cross overs to meet manufacturer and industry standards 2.3 Install structured cabling to ***industry standards*** 2.4 Minimise twist ratio defects to avoid accumulation effect on structured cable performance 2.5 Fit ***over-voltage protection devices*** to all cables and metallic components where required
3. Terminate structured cable	3.1 Terminate the cable according to accepted industry practice and standards 3.2 Maintain correct twist ratio to optimise system performance at rated level 3.3 Use correctly rated ***termination hardware*** with appropriate termination tool to ensure integrity and performance of termination 3.4 Earth cable shield to manufacturer specifications and relevant industry standards if applicable
4. Certify system performance to required level and complete customer documentation	4.1 Test installation and termination to comply with ***certification requirements*** 4.2 Record and verify system performance promptly where required 4.3 Authorise and issue appropriate documentation to client to certify system performance and complete ***records*** where required 4.4 Reinstate site to original condition and dispose of waste in an environmentally safe manner 4.5 Notify customer and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to read and interpret:

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    - technical documentation, such as equipment manuals and specifications
    - drawings related to:
        - cable coding system and identifiers
        - cable layouts
        - frame locations
        - outlet location
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
    - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
    - select and use required personal protective equipment conforming to industry and OHS standards
    - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task-management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
    - use hand and power tools
    - use diagnostic equipment
    - perform fault clearance.
    -

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- manufacturer requirements for safe operation of equipment
- requirements of legislation, codes of practice and other formal agreements that impact on the work activity
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install, terminate and certify structured cabling installation to industry standards applying related OHS requirements and work practices • install termination hardware • conduct and interpret test results • determine compliance with manufacturer's certification and warranties • provide report documenting installation and test results to client.
Context of, and specific resources for assessment	Assessment must ensure: • sites where installation, termination and certification of structured cabling may be conducted • use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impacts on installation and certification activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, including test results • direct observation of the candidate installing, terminating and certifying customer premises structured cabling installation.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3049A Install systems and equipment on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues.

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	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Customer requirements may include:	• ACMA telecommunication cabling advice forms TCA1 and TCA2 • cable plans and designs • contract documents • specification schedules • test results • timelines.

Relevant legislation, codes, regulations and standards may include:	• appropriate licences:
	  • winch
	  • crane
	  • forklift
	  • elevated work platform (EWP)

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	• Australian Communications Industry Forum (ACIF) standards and codes • ACMA Cabling Provider Rules • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environment Protection Acts • OHS Acts and relevant codes and standards • ISO Draft 11801 (International) • regulated or industry codes of practice, including appropriate ACMA and AS/ACIF technical standards • relevant Institute of Electrical and Electronics Engineers (IEEE) standards • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build-up • needle stick injury • radio frequency equipment emitting radiation • remote power feeding services that operate at above telecommunications network voltage (TNV) • slippery surfaces • vermin.

Tools and equipment may include:	• tools:
	  • cable ties
	  • crimping tool
	  • drills
	  • hammers

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	• labeller • ladders • saws • terminating tool • equipment: • continuity tester • LAN Cat tester • multimeter • test equipment: • conforming to AS/NZS IEC 61935.1:2006.
Barriers may include:	• flashing lights • trench guards • warning signs and tapes • witches hats.
Cable type may include:	• Category 5 or 5E • Category 6 or 6E • Category 7.
Structured cabling may include:	• unshielded twisted pair (UTP) • shielded twisted pair (STP) • solid conductor • stranded conductor (short links only).
OHS and environmental requirements may relate to:	• identifying other services, including power and gas • need for decommissioning and isolating work site and lines before beginning work • personal protective clothing: • earmuffs • gloves: • leather • plastic • rubber • head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe work practices, such as the safe use and handling of: • asbestos

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	• chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Industry standards may relate to:	• bending ratios to manufacturer's and AS/ACIF or ACMA standard requirements • cable anchors maintaining pair alignment and not compressing cable sheath • cable free from tension • cabling labelled to enterprise and industry standards • twist ratio defects minimised to avoid accumulation effect on structured cable performance • twist ratio in cable maintained to optimise performance.
Over-voltage protection devices requirements must comply with:	• ACMA standards • enterprise or local environmental hazard • manufacturer.
Termination hardware include:	• ACMA-approved products • blocks • connectors • frames • sockets.
Certification requirements may include:	• installer based or independent: • formal and documented testing procedures and results • installer's warranty and documented test results • manufacturer's certificate.
Records may include:	• ACMA telecommunication cabling advice forms TCA1 and TCA2

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	• NTD record cards.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL3010B Install and terminate optical fibre cable on customer premises

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor addition to required knowledge and range statement. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install and test optical fibre cable on customer premises for communications applications.

Assessment by a TITAB-registered assessor is recommended.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Technical staff who place, secure and terminate optical fibre cable apply the skills and knowledge in this unit. Types of termination include direct termination, fusion splicing and mechanical splicing.

They may be required to do new installations or upgrades, or maintain existing networks in domestic, commercial and industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

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Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for installation of optical fibre cable	1.1 Prepare for given work according to requirements of ***relevant legislation, codes, regulations and standards***
	1.2 Arrange access to the site according to required procedure
	1.3 Inform appropriate personnel of identified ***hazards*** on work site
	1.4 Organise tools, equipment and materials for given work
	1.5 Match ***optical fibre cable type*** and ***connectors*** to installation environment and ***customer requirements***
	1.6 Check proposed route and bend ratios to meet manufacturer specifications and industry standards
	1.7 Test cable on drum for optical continuity
2. Install, terminate and test the optical fibre cable	2.1 Install cable following ***occupational health and safety (OHS) and environmental requirements*** and complying with manufacturer specifications and industry standards
	2.2 Join cable and perform the ***type of termination*** specified in

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	the plan using safe work practices and according to manufacturer specifications 2.3 Test joint for transmission loss and strength, and re-terminate joint if transmission loss exceeds manufacturer specifications 2.4 Record all measurements
3. Remove fibre hazards from work area	3.1 Clean work area thoroughly to minimise risk of injury from loose glass fibre 3.2 Dispose of waste safely and according to relevant environmental requirements 3.3 Restore work site to original condition
4. Document installation	4.1 Update plans and records with details of installation and test results 4.2 Notify client of work completion and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to interpret technical documentation, such as equipment manuals, specifications and requirements for optical fibre cable installation
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task-management skills to work systematically with required attention to detail and adherence to all safety requirements

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- technical skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use hand and power tools.
  -

Required knowledge

- detailed knowledge of:
  - AS/NZS 3080:2003 Telecommunications Installations – Generic cabling for commercial premises, clause 10.3.2
  - ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
  - AS/NZS 2211:2006 Safety of laser products (parts 1 and 2)
- features and operating requirements of test equipment for optical fibre cable
- information required to operate equipment according to a test specification
- manufacturer requirements for safe operation of optical fibre equipment
- safety precautions when working with laser-based systems
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- techniques for types of termination including:
  - direct termination
  - fusion splicing
  - mechanical splicing
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install, terminate and test optical fibre cable applying safety precautions when working with laser-based systems • install a connector type for fusion, mechanical splicing and direct terminations • complete relevant documentation to manufacturer and

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	design requirements • provide report documenting installation and test results to client • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where installation and termination of optical fibre cable may be conducted • use of optical fibre testing equipment currently used in industry • relevant regulatory and equipment documentation that impacts on optical fibre cable installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report prepared by candidate outlining installation and test results • direct observation of the candidate placing, securing and terminating customer premises optical fibre cable.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule • ICTCBL3013A Perform cable and system test on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and

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	the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) Standards and Codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003 Telecommunications Installations – Generic cabling for commercial premises, clause 10.3.2 includes:
	  • colour codes used to identify the various types of fibre
	  • signals these cables would normally carry
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702 :2007
	• cabling security codes and regulations
	• OHS Acts and relevant codes and standards
	• regulated or industry codes of practice, including appropriate ACMA technical standards
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

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Hazards may include:	• earth potential rise (EPR)
	• optical cable:
	  • bare fibres
	  • hazardous laser light
	• remote power feeding
	• radio frequency (RF) emission.

Optical fibre cable type may include:	• air blown
	• armour plated
	• compliance with appropriate ACMA technical standard requirements for:
	  • aerial
	  • underground
	• designed for different environments and intended uses
	• external
	• internal
	• loose tube
	• multi-mode
	• single mode
	• tight buffered
	• various grades.

Connectors may include:	• any approved or specified fibre connector for MM or SM • ACMA approved • either epoxy, anaerobic, hot melt glue or mechanical splice style • either OM1, 2, 3 or 4 or OS1 • fusion splicing (cable to cable fibre splice or cable to pigtail splice).

Customer requirements may be:	• advised in on-site meetings
	• found in:
	  • cable plans and designs
	  • contract documents
	  • specification schedules.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating work site and lines before beginning work
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather

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	• head protection • kneepads • masks • protective suits • safety boots • safety glasses for laser work • safe work practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • noise, dust and clean-up management • stormwater protection • waste management • waste disposal containers: • drop sheets • sharps containers.
Type of termination may include:	• direct termination • fusion splicing • mechanical splicing.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL3011B Install and terminate coaxial cable

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0.* Minor changes to an element, performance criteria, required knowledge and range statement. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install and terminate coaxial cable on customer premises in communications applications, digital and analog, including telephony, data and video, including digital broadcasting, computer networks, including local area networks (LAN), wide area networks (WAN) and multimedia.

Assessment by a TITAB-registered assessor is recommended.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Cable and cabling products used must be compliant with appropriate ACMA technical standard requirements.

Application of the Unit

Technical staff who install and terminate customer premises coaxial cable apply the skills and knowledge in this unit.

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They may be required to do new installations or upgrades, or maintain existing networks in domestic, commercial and industrial installations.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to install and terminate coaxial cable	1.1 Prepare for given work according to requirements of ***relevant legislation, codes, regulations and standards***
	1.2 Arrange access to the site according to required procedure
	1.3 Inform appropriate personnel of identified ***hazards*** on work site
	1.4 Select ***coaxial cable type, connectors*** and ***manufacturer's tool*** to comply with installation environment and customer requirements
	1.5 Check proposed route and bend radius to meet ***manufacturer specifications*** and industry standards
	1.6 Test cable on drum for continuity and inspect visually for crushing and kinks

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	1.7 Discuss proposed method of installation and cable route with customer and adjust if necessary
2. Install, terminate and test coaxial cable	2.1 Maintain cable segregation to industry standards 2.2 Protect integrity of coaxial shield cable to ensure no loss of signal during operation and maintain bend ratios to not exceed manufacturer specifications and industry standard 2.3 Install cable securing hardware to ensure cable is not crushed or kinked while maintaining cable manufacturer's bend radius 2.4 Install cable following occupational health and safety ***(OHS) and environmental requirements*** and complying with manufacturer specifications and industry standards 2.5 Terminate the cable and perform the type of termination specified in the plan using safe work practices and according to manufacturer specifications 2.6 Test termination for transmission loss and strength and re-terminate the coaxial cable if transmission loss exceeds manufacturer specifications 2.7 Record all measurements 2.8 Fit ***over-voltage protection devices*** to all cables with metallic component where required
3. Remove termination waste from work area	3.1 Clean work area thoroughly to minimise risk of injury from loose metal strands 3.2 Dispose of waste safely and according to relevant environmental requirements 3.3 Restore work site to original condition
4. Document installation	4.1 Update plans and records with details of installation and test results 4.2 Show customer completed work and ensure work matches agreed method of installation and cable route 4.3 Notify client of work completion and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

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- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to interpret technical documentation, such as equipment manuals, specifications and requirements for coaxial cable installation
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task-management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - perform fault clearance
  - read and interpret drawings related to:
    - cable coding system and identifiers
    - cable layouts
    - frame locations
    - outlet location
  - use diagnostic equipment
  - use hand and power tools.
  -

Required knowledge

- detailed knowledge of:
  - AS/NZS 1367:2007 Coaxial cable and optical fibre systems for the RF distribution of analog and digital television and sound signals in single and multiple dwelling installations
  - ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- features and operating requirements of test equipment for coaxial cable
- information required to operate equipment according to a test specification
- manufacturer requirements for safe operation of coaxial cable equipment
- safety precautions when working with coaxial cable and RF-based systems
- specific OHS requirements relating to the activity and site conditions

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- test methods and performance requirements
- techniques for types of termination, including:
  - direct termination
  - crimp termination
  - mechanical connectorisation.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install and terminate coaxial cable types, including hard line (internal or external) and flexible (internal or external) to industry standards, applying related OHS requirements and work practices • install different connector types • conduct and interpret test results • determine compliance with manufacturer's certification and warranties • provide report documenting installation and test results to client • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites where installation and termination of coaxial cabling may be conducted • use of equipment and personal protective equipment currently used in industry • use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impacts on installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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	• review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, including test results • direct observation of the candidate installing and terminating coaxial cable.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3009B Install, terminate and certify structured cabling installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 1367:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• Australian building codes and regulations
	• cabling security codes and regulations
	• OHS Acts and relevant codes and standards
	• other services and utilities codes of practice and standards:
	  • electricity
	  • gas
	  • water
	• relevant Institute of Electrical and Electronics Engineers (IEEE) standards
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Hazards may include:	• building debris • earth potential rise (EPR) • live power lines • manual handling • mud and water • natural gas and other gas build-up • radio frequency equipment emitting radiation • remote power feeding services that operate at above telecommunications network voltage (TNV) • slippery surfaces

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	• vermin.
Coaxial cable type may relate to:	• aerial • compliance with appropriate ACMA technical standard requirements • flexible (internal and external) • hard line (internal and external) • installed individually or in small teams • powered and unpowered • underground • various grades as designed for different environments and intended uses.
Connectors may relate to:	• fitting retains the segregation of conductor and shield • terminating method according to manufacturer specification • termination maintains a continuous reference • terminations are waterproof where appropriate to prevent risk of damage to termination and cable function.

Manufacturer's tool may include:	• hand or power tools, including:
	  • coring
	  • crimping
	  • stripping and preparation tool
	  • torque spanner.

Manufacturer specifications may include:	• bend radius not exceeding manufacturer placement of cable with sufficient slack to allow termination • cable lengths not exceeding manufacturer or design specifications and maintaining RF signal integrity • installation of cable safely without damage to cable or clients premises • use of cable ties and brackets that are flexible and do not damage cable.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating work site and lines before beginning work
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads

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	• masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe work practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Over-voltage protection devices includes:	• ACMA standards • manufacturer, enterprise or local environmental hazard requirements.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL3013A Perform cable and system test on customer premises

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to test the performance of equipment on customer premises for the purpose of commissioning, fault identification or routine maintenance. It includes ensuring a safe and secure work environment while work is being undertaken. Assessment by a TITAB registered assessor is recommended. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers may apply the skills and knowledge in this unit. This unit applies to indoor and outdoor cable and systems within customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for cable and system test	1.1. Establish ***purpose of the test*** to be conducted on ***cables and systems*** with ***customer***
	1.2. Confirm ***customer's requirements*** and methods to comply with ***relevant legislation***, ***codes***, ***regulations and standards***
	1.3. Select ***required tests*** according to site conditions,

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ELEMENT	PERFORMANCE CRITERIA
	client documentation and ***manufacturer's specifications*** 1.4. Arrange access to site and confirm service is available for testing 1.5. Select ***test equipment***, tools and materials to meet required industry standards
2. Perform tests	2.1. Use tools and test equipment according to manufacturer's specifications 2.2. Perform work safely to remove risk of injury to operator, other users and equipment 2.3. Perform checks and adjustments to ensure operating ***environmental factors*** will not prejudice test results
3. Interpret test results and determine action	3.1. Read ***test results*** accurately and compare with manufacturer's and site specifications for cable performance 3.2. Evaluate test results taking into account measurement error margins against a known reference where appropriate 3.3. Assess test results fairly and accurately using verifiable data 3.4. Rectify any faults or escalate to the appropriate level
4. Complete records and clean up site	4.1. Document test results and ensure test results remain current 4.2. Verify test results and provide to client where required 4.3. Update site and installation files to ensure information on system performance is traceable 4.4. Reinstate site according to customer and company requirements 4.5. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

• analytical skills to interpret test equipment settings and readings
• communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
• literacy skills to interpret technical specifications and related documentation
• numeracy skills to make calculations and necessary calibration changes
• planning and organisation skills to arrange site access and equipment delivery arrangements according to schedule
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technology skills to correctly handle, connect and calibrate test equipment

Required knowledge
• cabling types, connectors and cabling structures • connections to carrier infrastructure or equipment, such as main distribution frame (MDF) or customer interface units (CIU) • electrical and/or optical properties to be measured • overview knowledge of customer premises equipment • typical performance parameters and typical faults that may be encountered in customer equipment and related connection and transmission media • various test equipment types suitable for tests to be made

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • perform tests on cable and equipment • use a range of test devices

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EVIDENCE GUIDE	
	• interpret test results • rectify a range of faults and escalate to the appropriate level if required • report on the completed cable and system test.
Context of and specific resources for assessment	Assessment must ensure: • sites where cable and system tests may be conducted • use of cable and system testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable and system testing installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing cable and system test on customer premises • review of reports completed by the candidate for different test examples and situations • oral or written questioning to assess knowledge of cable and systems tests.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3015A Locate and identify cable system faults. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required

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EVIDENCE GUIDE	
	knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Purpose of the test may relate to :	• commissioning • extent of functionality • fault identification • need to assess continuity • poor performance.

Cables and systems may include:	• cable types:
	  • coaxial
	  • copper (all categories)
	  • optical fibre
	• compliance with ACMA technical standard requirements for cable:
	  • Category 5, 6, 6A, 7 or 7A
	  • aerial
	  • underground
	  • unshielded twisted pairs (UTP)
	• requirement that all cabling products other than cable must be ACMA approved
	• systems:
	  • LAN or WAN equipment
	  • modems

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RANGE STATEMENT	
	• private branch exchange (PBX) • related cabling and management systems • transmission equipment.
Customer may include:	• building owner • clients • consultants • end user • supervisor.
Customer's requirements may include:	• special access to worksites, such as: • chemical plant • radio hazard situations • rail corridor • under high voltage (HV) power lines.
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS IEC 61935.1:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • National Association of Testing Authorities (NATA) requirements • OHS • technical standards AS/ACIF S009:2006 and AS/ACIF S008:2006.
Required tests may be:	• addressing the following: • attenuation • balance • expected response times • insulation resistance • length • near end cross talk • noise levels • open circuits • pair assignment

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RANGE STATEMENT	
	• reflection • reversals • short circuits • signal loss • speed balanced • between a site and other customers equipment • between sites • one or two directional • unbalanced • within a building.
Manufacturer's specifications may include:	• diagnostic procedures • installation instructions • maintenance schedule • warranty conditions.
Test equipment may include:	• hand-held cable testers • insulation resistance tester • multimeter • oscillator and probe set • optical time domain reflectometer (OTDR) • proprietary devices • pulse echo • signal generator • signal level meter • spectrum analyser • time domain reflectometer (TDR).
Environmental factors may include:	• dirt • dust • humidity • magnetic radiation • radio frequency (RF) • safety of electrical equipment • temperature • trip hazards • vibration.
Test results may include:	• distortion measurements • end to end transmissions • insertion loss measurements • optical continuity • return loss measurements.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3014A Hand over systems and equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively transfer control of a newly installed or upgraded system to a customer. It includes the transfer of information to the client and the completion of relevant documentation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers may apply the skills and knowledge in this unit. This unit may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Inform client of system functions and capacities	1.1. Provide ***client*** with ***cables and systems*** information 1.2. Demonstrate physical installation and answer client queries on ***system functions*** 1.3. Confirm variations to specifications with client
2. Hand over records and documentation	2.1. Update ***documentation*** and plans 2.2. Present complete and orderly ***records and system documentation*** to client 2.3. Adhere to all relevant company policies and ***relevant legislation***, ***codes***, ***regulations and standards***
3. Complete contract	3.1. Provide guarantees to client in the required format

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ELEMENT	PERFORMANCE CRITERIA
documentation	where work is subject to guarantee 3.2. Present invoices to client to complete contractual arrangements 3.3. Obtain client's sign off to confirm acceptance of cabling work completed where required 3.4. Advise the client of opportunities for system upgrades, additional services and training where appropriate

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- computer skills for communicating and data entry if required
- communication skills to:
  - liaise with customers to ensure requirements are known and can be met within timeframes
  - demonstrate processes
- literacy skills to interpret technical specifications and related documentation
- numeracy skills to make calculations, where necessary, to account for variations in costs and quantities
- planning and organisation skills to make site access and client meeting arrangements
- technical skills to operate and configure equipment

Required knowledge

- cabling types, connectors and cabling structures
- overview knowledge of customer premise equipment
- typical performance parameters and typical faults that may be encountered in customer equipment
- various test equipment types suitable for tests to be made
- warranty information for equipment supplied and contractor work guarantees

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • demonstrate and explain system to the customer • document instructions on system, including maintenance • complete relevant documentation • respond to client requests.
Context of and specific resources for assessment	Assessment must ensure: • sites where system and equipment has been installed or upgraded • relevant regulatory and equipment documentation that impact on system and equipment installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing a hand over of systems and equipment • oral or written questioning to assess knowledge of equipment, cabling types, connectors and cabling structures • review of reports completed by the candidate outlining instructions provided to client including system functions..
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3049A Install systems and equipment on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues.

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EVIDENCE GUIDE	
	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Client may include:	• building owner or agent • consultant • contract supervisor • direct customer.
Cables and systems may include:	• LAN or WAN equipment • modems • private branch exchange (PBX) • related cabling and management systems • transmission equipment.
System functions may cover:	• basic safety functions

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RANGE STATEMENT	
	• operating procedures • patch layout • physical frame and point locations • services features and functions.
Documentation may be:	• built variations • compliance sheets • paper or computer-based • plans • specifications • test results.

Records and system documentation may include:	• cable records, such as:
	  • cabinets
	  • exchange cable
	  • jumper cables
	  • main distribution frame (MDF)
	  • pillars
	  • structured cable
	• system records and documentation such as:
	  • access network equipment record exchange
	  • customer equipment documentation
	  • equipment records and documentation.

Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Contract Law • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Trade Practices Act.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3015A Locate and identify cable system faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to locate and identify cable system faults in communications cables at enterprise and customer premises sites. The cable types may be telecommunications, voice or data cabling. All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Application of the unit	Technical staff apply the skills and knowledge in this unit to locate and rectify communications cable system faults, including local area networks (LAN) and wide area networks (WAN). Their roles could include carrying out installation, maintenance and cable upgrades including structured cabling and network cabling. They may make use of test routines and databases.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to locate and rectify cable fault	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Inform appropriate personnel of existing and potential ***hazards*** on worksite 1.3. Arrange access to the site according to required procedure 1.4. Establish the ***type of cable*** and ***nature of fault*** from the ***customer*** for the ***cable system*** 1.5. Select suitable ***testing tools and equipment*** and ***personal protective equipment*** to meet required industry standards
2. Locate and diagnose the cable fault	2.1. Conduct ***appropriate test*** following occupational health and safety (***OHS***) ***and environmental***

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ELEMENT	PERFORMANCE CRITERIA
	requirements to identify ***type of cable fault*** 2.2. Isolate the fault progressively to remove likely variables from assessment 2.3. Locate the cable fault without undue interruptions to the customer activity in the shortest possible time 2.4. Notify the customer of the findings
3. Rectify the fault	3.1. Present customer with options to rectify the fault 3.2. Advise the customer of the costs of any repair not covered by service agreement 3.3. Conduct the fault rectification, if the customer agrees, in a manner which is safe to the repair team and the customer 3.4. Escalate any unresolved faults to other parties for resolution if required
4. Complete documentation and clean up worksite	4.1. Advise the customer of successful fault clearance and obtain sign off 4.2. Complete all records 4.3. Complete reports to justify the fault diagnosis and rectification methodology if required 4.4. Remove all waste and debris from worksite and dispose of according to environmental requirements 4.5. Restore any changes made to the worksite during fault repair to the client's satisfaction

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical and operational matters • literacy skills to interpret technical documentation, such as equipment manuals and specifications • numeracy skills to take and analyse measurements • planning and organisational skills to organise and maintain equipment • problem solving skills to:

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REQUIRED SKILLS AND KNOWLEDGE

• solve equipment and logistics problems
• provide solutions on fault rectification to customer
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• task management skills to work systematically with required attention to detail and adherence to all safety requirements
• technical skills to:
  • perform fault clearance
  • use diagnostic equipment
  • use hand and power tools

Required knowledge
• ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000 • features and operating requirements of test equipment • information required to operate equipment according to a test specification • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for safe operation of testing tools and equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify different faults using simple checks, tests and fault-finding methodology • determine and rank likely causes of fault • provide fault rectification solutions to customer • rectify faults • escalate unresolved faults to other parties for resolution • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where cable system tests may be conducted • use of fault-finding equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable system testing and fault-finding activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report, including test results and fault-finding methodologies • direct observation of the candidate locating and identifying cable system faults.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2016A Joint metallic conductor cable on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations

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RANGE STATEMENT	
	• Contract Law • National Association of Testing Authorities (NATA) requirements • OHS • regulated or industry codes of practice including appropriate ACMA technical standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Trade Practices Act.
Hazards may include:	• building debris • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Type of cable may include:	• access cable • coaxial cable • customer cable • data cable • optical fibre cable.
Nature of fault may include:	• distortion • earth hum • interference • intermittent • low signal level • noise • poor signal quality.

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RANGE STATEMENT	
Customer may include:	• fault centre • individual reporting the fault • network manager • network operations centre staff • site manager.
Cable system may include:	• access network cabling • coaxial cabling • data cabling: • Category 5, 6E or 7 • lead-in cable • optical network cabling • structured cabling.
Testing tools and equipment may include:	• bridge set • cable locater • cable test set • digital fault test set • Megger • optical time domain reflectometer (OTDR) • pulse echo test set.

Personal protective equipment (***PPE***) may include:	• electrical isolators
	• gas detectors
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses.

Appropriate test may include:	• capacitive balancing • continuity • distortion • foreign battery test • frequency measurement • insertion loss

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RANGE STATEMENT	
	• insulation • return loss.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• safe working practices, such as the safe use and handling of:
	  • tools and equipment
	  • materials
	  • chemicals
	  • work platforms
	  • asbestos
	• suitable light and ventilation
	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management.

Type of cable fault may include:	• attenuation • bad connections • cable damage • cracked fibre • crossed wires • faulty splice • high impedance • incorrect terminations • moisture ingress • near end crosstalk • open circuits • reversal.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3018A Install underground enclosures and conduit

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install underground enclosures and conduit for new or cable maintenance tasks in access networks or customer premises. Assessment by a TITAB registered assessor is recommended. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who install underground infrastructure for new and upgrades of telecommunications cabling apply the skills and knowledge in this unit. This unit applies to indoor and outdoor installation within customer premises. It may be applied to domestic, commercial or industrial installations.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for installation of underground enclosure and conduit	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Arrange access to the site according to required procedure 1.3. Inform appropriate personnel of existing and potential ***hazards*** on worksite 1.4. Verify location of proposed installation according to the appropriate ***plans*** obtained from ***authorised personnel*** 1.5. Obtain information on location of other services from ***relevant authorities*** 1.6. Organise ***tools and equipment*** for given work and

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ELEMENT	PERFORMANCE CRITERIA
	safe work practice 1.7. Erect ***barriers*** according to safety requirements
2. Install enclosure and conduit	2.1. Excavate site maintaining ***stability*** and allowing ***ease of access*** 2.2. Construct or install ***enclosure*** according to design specifications and following occupational health and safety (***OHS***) ***and environmental requirements*** 2.3. Install conduit to specifications and manufacturer's requirements ensuring that internal surfaces are free from ***impediments to cable hauling*** 2.4. Seal conduit entry into enclosure against ingress of foreign matter 2.5. Install cable support structure and access facilities in enclosures to specifications
3. Restore site and complete documentation	3.1. Complete backfill safely using suitable spoil and materials that ensures conduit protection 3.2. Reinstate site to identified requirements 3.3. Complete ***reports*** on installation and design amendments accurately and file promptly according to enterprise requirements 3.4. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to:
  • liaise with internal and external personnel on technical and operational matters
  • relate to work associates, supervisors, team members and clients
• literacy skills to interpret technical documentation, such as equipment manuals, specifications and service orders
• numeracy skills to take and analyse measurements
• planning and organisational skills to organise and maintain equipment
• problem solving skills to solve equipment and logistics problems
• safety awareness skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities • select and use required personal protective equipment conforming to industry and OHS standards • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment • task management skills to work systematically with required attention to detail and adherence to all safety requirements • technical skills to: • perform fault clearance • use diagnostic equipment • use excavation machinery • use hand and power tools
Required knowledge
• ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000 • features and operating requirements of test equipment • information required to operate equipment according to a test specification • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for safe operation of equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • excavate for installation of an enclosure and conduit to industry standards applying related OHS

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EVIDENCE GUIDE	
	requirements and work practices • install enclosure and conduit according to specifications and industry standards • restore site and complete documentation.
Context of, and specific resources for assessment	Assessment must ensure: • sites where installation of underground enclosures and conduit may be conducted • use of installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation outlining design amendments • direct observation of the candidate installing underground enclosures and conduit.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3019A Install underground cable. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require

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EVIDENCE GUIDE	
	language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • crane
	  • forklift
	  • winch
	• Australian Communications Industry Forum (ACIF) Standards and Codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts
	• OHS Acts
	• road and traffic control legislation and codes
	• technical standards AS/ACIF S008:2006and,

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RANGE STATEMENT	
	AS/ACIF S009:2006.
Hazards may include:	• building debris • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Plans may include:	• building • constructions • design • site layout drawings • street.
Authorised personnel may include:	• construction manager • project manager • site manager • site supervisor.

Relevant authorities may include:	• cable location services (Dial Before you Dig)
	• environment protection
	• local government
	• private owners
	• utility providers, such as:
	  • electricity
	  • fire services
	  • gas
	  • other telecommunications providers
	  • water.

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RANGE STATEMENT	

Tools and equipment may include:	• hand tools, such as:
	  • crowbar
	  • glue
	  • hammers
	  • pick
	  • saws
	  • shovels
	• mechanical equipment, such as:
	  • auger
	  • backhoe
	  • borer
	  • concrete gutter
	  • ditch witch
	  • excavators
	  • mole plough
	  • trenching machine.

Barriers may include:	• flashing lights • trench guards • warning signs and tapes • witches hats.
Stability may refer to:	• structural support • vertical and secure walls • water diversion and extraction.
Ease of access may include:	• access points • egress • location of backfill.

Enclosure may include:	• constructed on site from:
	  • bricks
	  • concrete
	  • polyethylene
	• pits
	• purpose built or prefabricated to ACMA requirements
	• tunnels.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas • need for decommissioning and isolating worksite and lines prior to commencement

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RANGE STATEMENT	

	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Impediments to cable hauling may include:	• construction debris
	• poor internal joints
	• spoil, such as:
	  • gravel
	  • rocks
	  • sand

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RANGE STATEMENT	
	• soil.
Reports may include:	• Dial before you dig specifications • job cards • plans • work sheets.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3019A Install underground cable

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install underground cable for all communications applications in Access Networks or customer premises. Assessment by a TITAB registered assessor is recommended. All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Application of the unit	Technical staff who install underground cable for new and upgrades of telecommunications cabling infrastructure apply the skills and knowledge in this unit. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia. It may make use of formal documentation, such as accurate completion of a telecommunications cabling advice (TCA) form (TCA1 form) and cable records.

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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for underground cable hauling	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** including ***cable*** installation standards 1.2. Arrange access to the site according to required procedure 1.3. Verify ***cable installation requirements*** from ***plan***

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ELEMENT	PERFORMANCE CRITERIA
	and recognise ***constraints*** 1.4. Inform appropriate personnel of existing and potential ***hazards*** on worksite 1.5. Obtain information on location of other services from ***relevant authorities*** 1.6. Select suitable ***tools and equipment*** and ***protective equipment*** to meet required industry standards 1.7. Erect ***barriers*** according to safety requirements 1.8. Set up cable installation equipment according to manufacturer's requirements and enterprise guidelines 1.9. Clean debris and obstructions from conduit using suitable safe methods 1.10. Seal cable ends to exclude ingress of foreign matter
2. Haul underground cable	2.1. Run hauling feeder through conduit to enable cable hauling following occupational health and safety (***OHS***) ***and environmental requirements*** 2.2. Attach cable to hauling feeder according to manufacturer's specifications 2.3. Employ cable slippers or rollers to ensure no sheath damage when hauling into and out of enclosures 2.4. Lubricate cable and haul evenly at correct tension to reduce risk of cable damage 2.5. Maintain sufficient cable length allowance for jointing
3. Seal and secure cable and complete all documentation	3.1. Tag all cables to enable future identification 3.2. Seal cable ends to prevent ingress of foreign material 3.3. Place cable on supports in enclosures to reduce damage to conductors and enable ease of access for maintenance 3.4. Fit over voltage protection devices to all cables with metallic component where required 3.5. Complete reports on installation and design amendments accurately and file promptly according to customer requirements 3.6. Reinstate site to identified requirements if required 3.7. Notify customer and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as cable plans, equipment manuals, specifications and service orders
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to work systematically with required attention
- technical skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use excavation machinery
  - use hand and power tools

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • haul underground cable to industry standards • restore site and complete documentation • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where installation of underground cable may be conducted • use of installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on cable installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, including updated cable plans and records • direct observation of the candidate installing underground cable.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3018A Install underground enclosures and conduit. Aboriginal people and other people from a non-English speaking background may have second language issues.

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EVIDENCE GUIDE	
	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** includes:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS 3260:1993 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006

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RANGE STATEMENT	
	• AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • Environmental Protection Acts • fire regulations • National Association of Testing Authorities requirements • OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Cable may include:	• Category 5 • Category 6 or 6A • Category 7 or 7A • coaxial • copper • optical fibre.
Cable installation requirements may include:	• cable size and type • distance to be hauled • existing cables • pipe size • standards.
Plan may include:	• building • constructions • design • site layout drawings • street.
Constraints may include:	• availability of cable size and type • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • condition of enclosures and pipe • optical cable may contain a hazardous light • radio frequency (RF) equipment may emit hazardous radiation • remote power feeding which operate at above telecommunications network voltage (TNV) • site conditions.

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RANGE STATEMENT	

Hazards may include:	• EPR
	• optical cable:
	  • bare fibres
	  • hazardous laser light
	• RF emission
	• remote power feeding.

Relevant authorities may include:	• cable location services (Dial Before you Dig)
	• Environment Protection
	• local government
	• private owners
	• utility providers such as:
	  • electricity
	  • fire services
	  • gas
	  • other telecommunications providers
	  • water.

Tools and equipment may include:	• hand tools, such as:
	  • crowbar
	  • feeders
	  • glue
	  • hammers
	  • hauling eyes
	  • jinker
	  • picks
	  • saws
	  • shovels
	  • slippers
	  • spools and drums
	• mechanical equipment, such as:
	  • auger
	  • backhoe
	  • borer
	  • concrete gutter
	  • ditch witch
	  • excavators
	  • forklift
	  • mole plough
	  • trenching machine.

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RANGE STATEMENT	
Protective equipment may include:	• earmuffs • gloves • head protection • kneepads • masks • protective suits • safety boots • safety glasses.
Barriers may include:	• flashing lights • trench guards • warning signs and tapes • witches hats.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3020A Construct aerial cable supports

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install aerial cable supports in all communications applications. Assessment by a TITAB registered assessor is recommended. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who install aerial cable for customer and hybrid fibre coaxial (HFC) networks apply the skills and knowledge in this unit. They use basic rigging procedures, methods and equipment for working safely at heights. This unit may make use of formal documentation, such as accurate completion of a telecommunication cabling advice (TCA) form (TCA1 form) and cable records. This unit applies to outdoor installation within a customer

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	premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare site for installation	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Arrange access to the site according to required procedure 1.3. Verify ***aerial cable support installation requirements*** according to the appropriate ***plans*** and recognise ***constraints*** 1.4. Obtain information on location of other services from ***relevant authorities*** 1.5. Inform appropriate personnel of existing and potential ***hazards*** on work site 1.6. Assess ***support structure as safe*** for normal working conditions 1.7. Set up cable support installation equipment according to manufacturer's requirements and enterprise guidelines
2. Install aerial support structures	2.1. Select type of aerial cable support for catenary wire installation 2.2. Use basic rigging procedures, methods and equipment for working safely at heights 2.3. Erect barriers according to safety requirements 2.4. Construct support foundations to ***specifications*** and provide for safe and secure operation of support structure 2.5. Install ***aerial cable supports*** securely following occupational health and safety (***OHS***) ***and environmental requirements*** according to plan and manufacturer's specifications
3. Restore site and complete documentation	3.1. Reinstate site to identified requirements 3.2. Complete ***reports*** on installation and design amendments and file according to enterprise requirements 3.3. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as cable plans, equipment manuals, specifications and service orders
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adhere to all safety requirements
- technical skills to:
  - perform fault clearance
  - use basic rigging procedures, methods and equipment for working safely at heights
  - use diagnostic equipment
  - use hand and power tools

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- safety precautions when working at heights
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare site for aerial cable support construction ensuring all relevant authorities have been notified and approvals obtained prior to commencement • install aerial support structures using pole and wall supports applying all related OHS requirements and work practices • use rigging procedures, methods and equipment for working safely at heights • restore site and complete documentation.
Context of, and specific resources for assessment	Assessment must ensure: • sites where construction of aerial cable supports may be conducted • use of aerial support installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on aerial cable installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, including updated cable plans and records • direct observation of the candidate constructing aerial cable supports.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3021A Install aerial cable. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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EVIDENCE GUIDE	
	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Resources to support learning and assessment are provided in Volume 3 of the Training Package.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM)

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RANGE STATEMENT	
	Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Aerial cable support installation requirements may include:	• approvals from relevant authorities
	• details of:
	  • location of other services
	  • location of plant and equipment
	  • proposed route
	  • reinstatement requirements
	  • site access requirements
	• joint use with electrical services
	• public or private structures
	• regulated or industry codes of practice and include appropriate ACMA technical standards
	• use of:
	  • pole
	  • tower
	  • wall.

Plans may include:	• building • construction • design • site layout drawings • street.
Constraints may include:	• availability of cable size and type • condition of poles • earth potential rise (EPR):

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RANGE STATEMENT	
	• event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages. • optical cable may contain a hazardous light • radio frequency (RF) equipment may emit hazardous radiation • remote power feeding which operate at above telecommunications network voltage (TNV) • site conditions.

Relevant authorities may include:	• cable location services (Dial Before you Dig)
	• environment protection
	• local government
	• private owners
	• utility providers such as:
	  • electricity
	  • fire services
	  • gas
	  • telecommunications providers
	  • water.

Hazards may include:	• EPR
	• optical cable:
	  • bare fibres
	  • hazardous laser light
	• RF emission
	• remote power feeding.

Support structure as safe may refer to:	• condemned pole status markings • suitable testing methods • visible signs of decay or stress.

Specifications may include:	• ACMA technical standard requirements:
	  • cable
	  • cabling products
	• hazard requirements including:
	  • enterprise
	  • local environmental
	  • manufacturer's
	• regulated or industry codes of practice.

Aerial cable supports may	• brackets • clamps

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RANGE STATEMENT	
include:	• hooks • pig rings • riser pipes • screw hooks • turn buckles.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety harness
	  • safety line
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation

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RANGE STATEMENT	

	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Reports may include:	• job cards • plans • worksheets.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3021A Install aerial cable

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install aerial cable in all communications applications. Assessment by a TITAB registered assessor is recommended. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Technical staff who install aerial cable for customer and hybrid fibre coaxial (HFC) networks apply the skills and knowledge in this unit. They use basic rigging procedures, methods and equipment for working safely at height. It may make use of formal documentation such as accurate completion of a telecommunications cabling advice (TCA) form (TCA1 form) and cable records. This unit applies to outdoor installation within a customer

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	premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for aerial cable installation	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Arrange access to the site according to required procedure 1.3. Verify location of proposed ***aerial cable installation requirements*** according to the appropriate ***plans*** and recognise ***constraints*** 1.4. Obtain information on location of other services from ***relevant authorities*** 1.5. Inform appropriate personnel of existing and potential ***hazards*** on worksite 1.6. Select ***tools and equipment*** required for safe work practice 1.7. Erect ***barriers*** according to safety requirements 1.8. Assess ***support structure as safe*** for normal working conditions 1.9. Set up ***cable*** installation equipment according to manufacturer's requirements and enterprise guidelines
2. Attach aerial cable to catenary	2.1. Select type of cable bearer for catenary wire installation 2.2. Use basic rigging procedures, methods and equipment for working safely at heights 2.3. Secure catenary wire or bearer wire permanently to support structure using safe installation practices according to ***specifications*** 2.4. Haul and secure cable to catenary wire following occupational health and safety (***OHS***) ***and environmental requirements***
3. Seal and secure aerial cable	3.1. Seal cable ends to prevent ingress of foreign material 3.2. Secure cable loop on support structure to reduce damage to conductors and to enable ease of access for maintenance 3.3. Weather seal building entry points where appropriate 3.4. Fit ***over-voltage protection*** devices to all cables with metallic component where required 3.5. Complete reports on installation and design amendments accurately and file promptly according

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ELEMENT	PERFORMANCE CRITERIA
	to enterprise requirements
4. Restore site and complete documentation	4.1. Restore worksite to the customer's satisfaction 4.2. Complete ***reports*** on installation 4.3. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to interpret technical documentation, such as equipment manuals, specifications and requirements for aerial cable installation
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to use:
  - hand and power tools, diagnostic equipment and perform fault clearance
  - basic rigging procedures, methods and equipment for working safely at heights

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity

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REQUIRED SKILLS AND KNOWLEDGE
• manufacturer's requirements for safe operation of equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare site for installation ensuring all relevant authorities have been notified and approvals obtained prior to commencement • install aerial cable using effective practices • use basic rigging procedures, methods and equipment for working safely at heights • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where aerial cable installation may be conducted • use of aerial installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on aerial cable installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, including updated cable plans and records

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EVIDENCE GUIDE	
	• direct observation of the candidate installing aerial cable.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3020A Construct aerial cable supports. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

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RANGE STATEMENT	
regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts
	• OHS
	• road and traffic control legislation and codes
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Aerial cable installation requirements may include:	• approvals from relevant authorities
	• details of:
	  • location of other services
	  • location of plant and equipment
	  • proposed route
	  • reinstatement requirements
	  • site access requirements
	• joint use with electrical services
	• regulated or industry codes of practice and include appropriate ACMA technical standards
	• structures that may be public or private
	• use of:
	  • pole
	  • tower

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RANGE STATEMENT	
	• wall.
Plans may include:	• building • construction • design • site layout drawings • street.
Constraints may include:	• availability of cable size and type • condition of poles • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • optical cable may contain a hazardous light • radio frequency (RF) equipment may emit hazardous radiation • remote power feeding which operate at above telecommunications network voltage (TNV) • site conditions.

Relevant authorities may include:	• cable location services (Dial Before you Dig)
	• environment protection
	• local government
	• private owners
	• utility providers such as:
	  • electricity
	  • fire services
	  • gas
	  • telecommunications providers
	  • water.

Hazards may include:	• EPR
	• optical cable:
	  • bare fibres
	  • hazardous laser light
	• remote power feeding
	• RF emission.

Tools and equipment may include:	• hand tools such as:
	  • crowbar
	  • glue
	  • hammers

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RANGE STATEMENT	

	• pick
	• saws
	• shovels
	• mechanical equipment such as:
	  • auger
	  • borer
	  • concrete gutter
	  • EWP
	  • ladders
	  • mole plough
	  • trenching machine.

Barriers may include:	• flashing lights • trench guards • warning signs and tapes • witches hats.
Support structure as safe may refer to:	• condemned pole status markings • suitable testing methods • visible signs of decay or stress.
Cable may include:	• Category 5 • Category 6 or 6A • Category 7 or 7A • coaxial • copper • optical fibre.
Specifications include:	• cable compliant with appropriate ACMA technical standard requirements • cabling products other than cable must be ACMA-approved • regulated or industry codes of practice and include appropriate ACMA technical standards • relevant legislation, codes, regulations and standards.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolating worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves

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RANGE STATEMENT	
	• leather • plastic • rubber • head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • noise, dust and clean-up management • stormwater protection • waste management.
Over voltage protection includes:	• ACMA standards • hazard requirements including: • enterprise • local environmental • manufacturer.

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RANGE STATEMENT	
Reports may include:	• job cards • plans • worksheets.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3049A Install systems and equipment on customer premises

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install customer premises equipment. This may include communications applications, such as telephony, broadband data, video, including digital broadcasting, computer networks, including local area networks (LAN), wide area networks (WAN) and multimedia. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit for voice, data and security installation and maintenance. This unit applies to indoor and outdoor installation within a customer premises and applies to both customer premises cabling and equipment.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for customer premises systems and equipment installation	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Arrange access to the site according to required procedure 1.3. Inform appropriate personnel of existing and potential ***hazards*** on worksite 1.4. Verify location of proposed customer ***communications equipment*** installation according to ***plans*** obtained from ***authorised personnel*** 1.5. Develop installation plans to ensure minimal disruption to the workplace and according to standards

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ELEMENT	PERFORMANCE CRITERIA
	1.6. Select suitable ***tools and equipment***
2. Install system hardware	2.1. Install network equipment following occupational health and safety (***OHS***) ***and environmental requirements*** according to manufacturer's instructions 2.2. Confirm service interruption is within limits agreed with the customer 2.3. Complete cable jumpering to ***distribution infrastructure*** and ***terminal equipment*** to specification 2.4. Document all installation drawings for the customer
3. Configure and test the system	3.1. Install software and configure the system according to specifications 3.2. ***Test*** to verify system performance according to customer requirements 3.3. Record all test results
4. Clean up worksite and compete documentation	4.1. Remove and dispose of installation waste and debris from worksite according to environmental requirements 4.2. Restore worksite to customer's satisfaction 4.3. Complete all installation documents and present to the customer 4.4. Notify the customer and obtain signoff

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test equipment settings and readings
- communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- numeracy skills to make:
  - calculations
  - necessary calibration changes

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REQUIRED SKILLS AND KNOWLEDGE

• planning and organisation skills to arrange site access and equipment delivery
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technology skills to:
  • accomplish termination of telecommunications media
  • correctly handle, connect and calibrate test equipment for physical installation of equipment and related media

Required knowledge

• cabling types, connectors and cabling structures
• connections to carrier infrastructure or equipment, such as main distribution frame (MDF) or customer interface units (CIU)
• electrical and or optical properties to be measured
• OHS considerations including:
  • electrical safety, lifting hazards
  • manufacturer's requirements for safe operation of equipment
• overview knowledge of customer premise equipment
• test methods and performance requirements
• typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • read and interpret: • related floor plans

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EVIDENCE GUIDE	
	• building plans • reflected ceiling plans • schematic drawings • install customer premises equipment • configure and test systems and equipment • apply relevant regulations and standards • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites where installation of systems and equipment may be conducted • use of installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing customer premises systems and equipment • review of reports completed by the candidate outlining installation drawings and test results • oral or written questioning to assess knowledge of planning, types of systems and applications.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3013A Perform cable and system test on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the

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EVIDENCE GUIDE	
	candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • crane
	  • forklift
	  • winch
	• Australian Construction Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• Cabling security codes and regulations

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RANGE STATEMENT	
	• Environmental Protection Acts • OHS Acts • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Hazards may include:	• optical cable • building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural and other gas build up • needle stick injury • radio frequency (RF) equipment emitting radiation • remote power feeding services • vermin.
Communications equipment may include:	• multiplexing • network equipment • radio • security equipment • switching • transmission • voice and data.
Plans may include:	• building • construction • design • site layout drawings • street.
Authorised personnel may include:	• construction manager • project manager • site manager • site supervisor.

Tools and equipment may include:	• tools such as:
	  • angle grinders
	  • cable strippers
	  • cable tie tensioners
	  • crimpers
	  • cut off saws

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RANGE STATEMENT	
	• cutters • drills • hacksaws • hammers • insulation displacement tools • jigsaws • knives • mechanical lifts/hoists • pliers • power tools • screwdrivers • soldering irons • spanners • tape measures • tension wrenches • termination tools • wire strippers • test equipment such as: • anti-static testers • cable testers • digital analysers • humidity and temperature testers • LAN Cat testers • laser source • load testers • multimeters • optical fibre power meters • optical time domain reflectometer (OTDR) • PC • protocol analyser • voltmeters.
OHS and environmental requirements may relate to:	• identifying other services, including power and gas • need for decommissioning and isolating worksite and lines prior to commencement • personal protective clothing: • earmuffs • gloves • leather

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RANGE STATEMENT	
	• plastic • rubber • head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe working practices ,such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Distribution infrastructure may include:	• connector panels • MDF • patch panels • racks.
Terminal equipment may include:	• equipment supplied by service provider: • customer access • interface unit • isolation unit

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RANGE STATEMENT	
	• modems • transmission equipment.
Test may include:	• bit error rate (BER) • continuity • end to end • frequency response • functionality test • gain and attenuation • loop back • signal to noise ratio (SNR) • speed.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3052A Cut over new systems and equipment on customer premises

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to cut over new customer premises systems and equipment. This may include communications applications in telephony, broadband, data, video, radio frequency identification (RFID), security and computer networks, including local area networks (LAN), wide area networks (WAN) and multimedia. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Technicians or lineman installers whose work involves cut over of new customer premises systems and equipment apply the skills and knowledge in this unit. They may install or upgrade an existing customer

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	installation to include applications in emerging technologies, including internet protocol (IP) based equipment, RFID units, IP security and computer networking. This unit applies to indoor and outdoor installation within customer premises and may be a domestic, commercial or industrial installation.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare the system and equipment cut over	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements
	1.3. Notify appropriate personnel of identified ***safety hazards*** at the worksite
	1.4. Determine cable route and type of ***cable*** and ***equipment*** from project plan and identify and avoid ***other services***
	1.5. Obtain ***plant***, ***tools and safety equipment*** and material to perform tasks safely and efficiently
	1.6. Prepare an implementation plan with ***cut over tasks*** based on identified nature of job and seek customer approval
	1.7. Notify customer and network carrier of proposed ***cut over details*** and arrange for customer representation
2. Cut over the system or equipment into service	2.1. Perform cut over tasks and connect network facilities as with approved plan following occupational health and safety (***OHS***) ***and environmental requirements*** for the given work
	2.2. Test all cable connections, equipment and facilities as instructed in technical manuals and specifications
	2.3. Evaluate ***test*** results to ensure proper system operation and performance and rectify if required
3. Complete project documentation	3.1. Record test results for future reference and complete reports on cut over installation and design amendments according to enterprise requirements
	3.2. Recover obsolete materials and equipment and return to appropriate point for disposal
	3.3. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction
	3.4. Notify appropriate personnel of job completion and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate test results
- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - organise and maintain equipment
  - scope work and develop implementation plan for cut over project
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technology skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use hand and power tools

Required knowledge

- cabling types, connectors and cabling structures
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- overview knowledge of customer premise equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements, including features and operating requirements of test equipment
- typical issues and challenges that occur on site

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • read and interpret plans • develop and implement a cut over work plan • install customer premises equipment • configure and test systems and equipment • apply relevant regulations and standards.
Context of, and specific resources for assessment	Assessment must ensure: • sites where installation of systems and equipment involving cut over may be conducted • use of installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing cut over of systems and equipment • review of plans and reports completed by the candidate outlining system and equipment cut over and test results • oral or written questioning to assess knowledge of planning, types of systems and issues associated with cut over.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2068A Install telecommunications service to a building • ICTCBL3067A Modify and cut over cable. Aboriginal people and other people from a non-English

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EVIDENCE GUIDE	
	speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• AS Communications Cabling Manual (CCM)

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RANGE STATEMENT	
	Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • ISO Draft 11801 (International) • OHS • regulated or industry codes of practice and include appropriate ACMA standards • relevant Institute of Electrical and Electronics Engineers (IEEE) standards • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Appropriate personnel may be:	• consultant • project engineer • site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345: 1995 conduit colours associated with a hazardous service
	• unsafe support structures:
	  • condemned poles
	  • visible signs of decay or stress
	• unsafe weather:
	  • heavy rains
	  • high winds

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RANGE STATEMENT	
	• severe heat or cold • thunderstorms.
Cable may include:	• coaxial • data cabling • distribution cable • lead-in cable • multipair copper • optical fibre • radio feeder.

Equipment may include:	• cable TV (CATV) unit
	• internet protocol TV (IPTV) unit
	• network equipment:
	  • data switch
	  • gateway
	  • router
	  • server
	• private automatic branch exchange (PABX)
	• pay TV unit
	• RFID unit
	• security panel
	• wireless access point.

Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage (HV) power.

Plant, tools and safety equipment may include:	• plant:
	  • elevated platform vehicle
	  • ladders
	  • scissor lifts
	  • wire raising tool (insulated)
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • personal protective clothing:
	  • earmuffs
	  • fall arrest systems
	  • gloves

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RANGE STATEMENT	
	• head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety barriers • trench guards • warning signs and tapes • test equipment: • cable tester • continuity tester • LAN Cat tester • network analyser • passive optical network (PON) meter • protocol analyser • tools: • auger • fixing brackets • spanner.
Cut over tasks may include:	• cable jumpering of distribution frames • installing new cable and equipment • job preparation for cut over activity • loading of new software • saving and backing up existing system configurations • splicing new optical fibre.
Cut over details may include:	• back up support from vendor or supplier • contingency plan • date, time and duration • nature and type of work involved • request for customer representation.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • identifying other services, including power and gas • personal protective clothing: • earmuffs • gloves:

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RANGE STATEMENT	
	• leather • plastic • rubber • head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Test may include:	• ability to make and receive a call • connectivity • end to end performance test • programme checks • qualitative test • software diagnostics • toll and metering functions

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RANGE STATEMENT	
	• traffic flow.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3067A Modify and cut over cable

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to modify an infrastructure to cut over new cables into an existing cabling installation. This may include communications applications in telephony, broadband, data, video, radio frequency identification (RFID), security and computer networks, including local area networks (LAN), wide area networks (WAN) and multimedia. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Field officers, technicians or lineman installers from carriers, contractors or other service providers apply the skills and knowledge in this unit. They may upgrade coaxial or optical fibre cables as part of a hybrid fibre coaxial (HFC) network, a broadband

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	Access Network or a large customer private network. Cabling can be for indoor and outdoor installation within a customer premises or a service provider Access Network and may be a domestic, commercial or industrial installation.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for cable modification and cut over	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for the given work 1.2. Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements 1.3. Notify appropriate personnel of identified ***safety hazards*** at the worksite 1.4. Determine cable route and type of ***cable*** from project plan and identify and avoid ***other services*** 1.5. Obtain ***plant***, ***tools and safety equipment*** and material to perform tasks safely and efficiently 1.6. Prepare an implementation plan with ***cut over tasks*** based on identified nature of job and seek customer approval 1.7. Notify customer and network carrier of proposed ***cut over details*** and proposed ***disruption to services*** 1.8. Undertake ***additional preparatory non-jointing work***, as required, according to enterprise guidelines and site conditions 1.9. Select labour support required according to cut over tasks and available skills 1.10. Select ***technical equipment for cut over*** to suit materials being used, cable type and ***joint enclosure***
2. Joint and cut over cable	2.1. Follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work 2.2. Joint cable according to sequencing plan, materials, joint type, location, and enterprise and manufacturer's guidelines 2.3. Test cable for performance and rectify any faults relating to the cut over according to location, materials available, and industry practise 2.4. ***Seal all joints*** according to the cable type, location, and enterprise and manufacturer's guidelines
3. Complete project documentation	3.1. Record test results for future reference and complete reports on cut over installation and design amendments to reflect existing cable layout according to enterprise requirements 3.2. Recover obsolete materials and return to appropriate point for disposal

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ELEMENT	PERFORMANCE CRITERIA
	3.3. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction 3.4. Notify appropriate personnel completion of cut over and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate test results
- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - organise and maintain equipment
  - scope work and develop implementation plan for cut over project
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technology skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use hand and power tools

Required knowledge

- cabling types, connectors and cabling structures
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment

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REQUIRED SKILLS AND KNOWLEDGE
• overview knowledge of customer premises equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements, including features and operating requirements of test equipment • typical issues and challenges that occur on site • warranties and service level agreements (SLAs)

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare for cut over • rearrange cable • conduct tests to determine success of cut over • interpret results and rectify faults occurring as a result of cut over • apply regulations and standards related to the cable rearrangement • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • systems and equipment involving cut over • use of installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing cut over into an existing cabling installation

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EVIDENCE GUIDE	
	• review of plans and reports completed by the candidate outlining system and equipment cut over and test results • oral or written questioning to assess knowledge of planning, types of systems and issues associated with cut over.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2068A Install a telecommunications service to a building • ICTCBL3052A Cut over new systems and equipment on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts
	• ISO Draft 11801 (International)
	• OHS
	• regulated or industry codes of practice and include appropriate ACMA and AS/ACIF technical standards
	• relevant Institute of Electrical and Electronics Engineers (IEEE) standards
	• road and traffic control legislation and codes
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Appropriate personnel may be:	• cable administrator • consultant • project engineer

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RANGE STATEMENT	
	• site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service
	• unsafe support structures:
	  • condemned poles
	  • visible signs of decay or stress
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

Cable may include:	• aerial or underground • coaxial • data cabling • distribution cable • hybrid fibre coaxial (HFC) cable • lead-in cable • multi-pair copper • optical fibre • radio feeder.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage (HV) power.

Plant, ***tools and safety equipment*** may include:	• plant:
	  • elevated platform vehicle
	  • ladders
	  • scissor lifts
	  • wire raising tool (insulated)
	• safety equipment:

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RANGE STATEMENT	

	• flashing lights
	• gas and other hazard detection equipment
	• personal protective clothing:
	  • earmuffs
	  • fall arrest systems
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safety barriers
	• trench guards
	• warning signs and tapes
	• test equipment:
	  • cable tester
	  • continuity tester
	  • LAN Cat tester
	  • passive optical network (PON) meter
	• tools:
	  • auger
	  • fixing brackets
	  • spanner.

Cut over tasks may include:	• alternate air supply • cable jumpering of distribution frames • installing temporary cable • job preparation for cut over activity • provide alternate cable path • reroute signal and traffic • shut down procedures • splicing new optical fibre.
Cut over details may include:	• contingency plan • date, time and duration • nature and type of work involved • request for customer representation • vendor or supplier.
Disruption to services may	• alarm systems

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RANGE STATEMENT	
include:	• billing services • emergency calls • fire services • network traffic • security.
Additional preparatory non-jointing work may include:	• cable identification • double-jumpering • multiplying pairs or parallel pairs • splicing temporary fibres.
Technical equipment for cut over may include:	• personnel communications • service identifiers • testing equipment.
Joint enclosure may include:	• cabinet • fibre hub • housing • lead wiped sleeve • thermo shrink sleeve.

OHS and environmental requirements may relate to:	• decommissioning and isolate worksite and lines prior to commencement
	• identifying other services, including power and gas
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety harness
	  • safety line
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals

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RANGE STATEMENT	

	• materials
	• tools and equipment
	• work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Seal all joints may provide:	• air-tight seal • moisture seal.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Cabling

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ICTCBL3069A Install network cable equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install network cable equipment in customer premises or service provider Access Networks. This may include communications applications in telephony, broadband, data, video, radio frequency identification (RFID), security and computer networks, including local area networks (LAN), wide area networks (WAN) and multimedia. Cable equipment is used for line and signal conditioning and may use optical or electronic technology in optical fibre hubs or hybrid fibre coaxial (HFC) housings. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Technicians and lineman installers who install network cable equipment within the broadband infrastructure deployment apply the skills and knowledge in this unit.

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	They may upgrade coaxial or optical fibre cables as part of an HFC network, a broadband access network or a large customer private network. Cabling equipment can be for indoor and outdoor installations within a customer premises or a service provider access network and may be a domestic, commercial or industrial installation.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for installation	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for the given work 1.2. Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements 1.3. Notify appropriate personnel of identified ***safety hazards*** at the worksite 1.4. Determine cable route and type of ***network cable equipment*** from project plan and identify and avoid ***other services*** 1.5. Obtain ***plant***, ***tools and safety equipment*** and material to perform tasks safely and efficiently 1.6. Evaluate nature of job and infrastructure hierarchy from plan and obtain approval from customer on key features of installation to meet ***customer requirements*** 1.7. Coordinate ***other parties*** to minimise disruption to services and down time 1.8. Segregate incoming and outgoing cables to facilitate access and avoid overlaying and backtracking of cable
2. Install required cable and equipment support structure	2.1. Evaluate existing equipment support structure and develop a plan for additional support structure provisioning 2.2. Install additional cable support, equipment support structure and cable runs according to manufacturer's specifications, industry practice and occupational health and safety (***OHS***) ***and environmental requirements*** 2.3. Determine cable route between ***rack*** and sub-rack and cable termination point to comply with customer requirements, site limitations, equipment specifications and regulations 2.4. Install ***cabling infrastructure*** to interface rack and subrack according to installation instructions 2.5. Complete ***cabling requirements*** to support installation of equipment
3. Install equipment and earthing protection	3.1. Install lightning protection equipment where required, according to manufacturer's specifications and industry practice 3.2. Install ***earthing protection*** and line conditioning

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ELEMENT	PERFORMANCE CRITERIA
	where required, according to relevant Australian Communications and Media Authority (ACMA), local power company and industry practice 3.3. Install equipment component into rack and sub-rack and complete ***connections*** according to manufacturer's specifications and compliance with warranty requirements
4. Perform tests	4.1. Power-on test individual equipment items 4.2. Visually check that all connections and interconnections are firm and sound 4.3. Electrically test all terminations for continuity according to enterprise guidelines
5. Complete project documentation	5.1. Install labels to new equipment and radiation warning signs, where required, according to enterprise guidelines practice 5.2. Record test results for future reference, complete reports on equipment installation and amend design to reflect existing cable layout and equipment according to enterprise requirements 5.3. Recover obsolete materials and return to appropriate point for disposal 5.4. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction 5.5. Notify appropriate personnel of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to interpret test equipment settings and readings • communication skills to liaise with customers to ensure requirements are known and can be met within timeframes • literacy skills to interpret technical specifications and related documentation • numeracy skills to make calculations

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REQUIRED SKILLS AND KNOWLEDGE

• planning and organisation skills to arrange site access and equipment delivery
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • correctly handle and connect test equipment for physical installation of equipment and related media

Required knowledge

• cabling types, connectors and cabling structures
• connections to carrier infrastructure or equipment, such as main distribution frame (MDF) or customer interface units (CIU)
• customer premises equipment
• electrical and or optical properties to be measured
• OHS considerations including:
  • electrical safety and lifting hazards
  • manufacturer's requirements for safe operation of equipment
• test methods and performance requirements
• typical issues and challenges that occur on site
• warranties and service level agreement

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare for installation of network cable equipment • provide cable infrastructure • install cable equipment support structure for power,

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EVIDENCE GUIDE	
	alarms and interrogation requirements • install equipment, test and interpret test results • label equipment correctly • safely use any specialised hand or power tools and equipment • apply regulations and standards related to the installation • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where installation of network cable equipment may be conducted • use of installation equipment currently used in industry • relevant regulatory and equipment documentation that impact on installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing cable and equipment support structure • direct observation of the candidate installing network cable equipment and earthing protection • review of reports completed by the candidate outlining amended design of cable layout and test results • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3049A Install systems and equipment on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004

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RANGE STATEMENT	
	• AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • ISO Draft 11801 (International) • OHS • regulated or industry codes of practice and include appropriate ACMA and AS/ACIF technical standards • relevant Institute of Electrical and Electronics Engineers (IEEE) standards • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Appropriate personnel may be:	• cable administrator • consultant • project engineer • project manager • site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service
	• unsafe support structures:
	  • condemned poles
	  • visible signs of decay or stress
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

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RANGE STATEMENT	

Network cable equipment may be:	• equipment connected at:
	  • carrier's premises
	  • customers' premises
	  • elevated joint
	  • openable joint
	  • pillar
	• line conditioning
	• multiplexer
	• radio optical receivers
	• switching equipment
	• video processor.

Other services may include:	• availability and suitability of existing cabling trays and fixing systems • fire sprinkler systems • gas and water mains • high voltage (HV) power.

Plant, tools and safety equipment may include:	• plant:
	  • elevated platform vehicle
	  • ladders
	  • scissor lifts
	  • wire raising tool (insulated)
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • personal protective clothing:
	  • earmuffs
	  • fall arrest systems
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	• test equipment:

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RANGE STATEMENT	
	• cable tester • continuity tester • passive optical network (PON) meter • LAN Cat tester • tools: • auger • fixing brackets • spanner.
Customer requirements may include:	• equipment replacement • increase capacity • increase economic or cost efficiency • providing cable relief • providing new facilities or infrastructure to a customer or geographic area • providing new services.
Other parties may include:	• customer • equipment and materials suppliers • local government • statutory authorities • network operation centre.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • identifying other services, including power and gas • personal protective clothing: • earmuffs • gloves: • leather • plastic • rubber • head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe working practices, such as the safe use and

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RANGE STATEMENT	
	handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Rack may include:	• cable entries • frame • mesh tray • mounting supports • power supplies • ventilation.
Cabling infrastructure may include:	• catenary • conduit • ducting • trays.
Cabling requirements may include:	• inter-rack cabling and termination • power, alarm and interrogation requirements • rack and sub-rack to a distribution frame for network access.
Earthing protection may include:	• earth stake • equipment earthing • isolator • lightning conductor • link to multiple earth neutral • MDF bonding

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RANGE STATEMENT	
	• over voltage • screen earth • screening • surge suppressors • surges and spikes • telecommunications reference conductors.
Connections may be made to:	• cable pair • digital distribution frame • feeder or antennae system • mainframe • optical fibre frame • optical fibre splicing frame.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3103A Maintain cable network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to maintain cable network in customer premises or service provider access networks. This may include communications applications in telephony, broadband, data, video, radio frequency identification (RFID), security and computer networks, including local area networks (LAN), wide area networks (WAN) and multimedia. Cable equipment is used for line and signal conditioning and may use optical or electronic technology in optical fibre hubs or hybrid fibre coaxial (HFC) housings. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Technicians and lineman installers who install and maintain network cable equipment within the broadband infrastructure deployment apply the skills and knowledge in this unit.

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	They may upgrade a coaxial or optical fibre cable as part of a HFC network, a broadband access network or a large customer private network. A cable network can be for indoor and outdoor installations within a customer premises or a service provider access network and may be a domestic, commercial or industrial installation.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for cable maintenance	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements 1.3. Notify appropriate personnel of identified ***safety hazards*** at the worksite 1.4. Determine cable route and type of ***cable*** from schedule and identify and avoid ***other services*** 1.5. Obtain ***plant***, ***tools and safety equipment*** and material to perform tasks safely and efficiently
2. Maintain cables, cable supports and enclosures	2.1. Follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work and avoid contact with other services 2.2. Clean area of debris, vegetation and foreign matter if required 2.3. Conduct ***visual inspections*** on ***cable infrastructure*** for assessment of evident damages according to enterprise guidelines and notify appropriate personnel 2.4. Undertake ***remedial action*** on damages according to warranties and service level agreements prior to maintenance routine 2.5. Perform maintenance tasks and tests in a safe manner and note activities on ***maintenance schedule***
3. Complete maintenance documentation	3.1. Record test results, maintenance activities and corrective actions for future reference and complete maintenance schedule attendance chart according to enterprise requirements 3.2. Recover obsolete materials and return to appropriate point for disposal 3.3. Restore site according to the requirements of enterprise or approving authority and to customer satisfaction 3.4. Notify appropriate personnel of job completion and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test equipment settings and readings
- communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- planning and organisation skills to arrange site access and monitor own work
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - correctly handle and connect test equipment
  - repair damage to cable networks

Required knowledge

- cabling types, connectors and cabling structures
- connections to carrier infrastructure or equipment, such as main distribution frame (MDF) or customer interface units (CIU)
- customer premises equipment
- electrical and optical properties to be measured
- OHS considerations including:
  - electrical safety and lifting hazards
  - manufacturer's requirements for safe operation of equipment
- test methods and performance requirements
- typical issues and challenges that occur on site
- warranties and service level agreement

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • maintain cables, cable supports and enclosures • test and interpret results • undertake remedial action on damages • safely use specialised hand or power tools and equipment • apply regulations and standards related to the maintenance • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where maintenance of network cable may be conducted • use of equipment currently used in industry • relevant regulatory and equipment documentation that impact on maintenance activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit. • direct observation of the candidate visually inspecting cable infrastructure • direct observation of the candidate undertaking remedial action • review of reports completed by the candidate outlining test results, maintenance activities and corrective action taken • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3127A Supervise work site activities.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• appropriate licences:
	  • crane
	  • EWP
	  • forklift

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RANGE STATEMENT	
	• winch • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • ISO Draft 11801 (International) • OHS • regulated or industry codes of practice including appropriate ACMA standards • relevant Institute of Electrical and Electronics Engineers (IEEE) standards • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Appropriate personnel may be:	• cable administrator • consultant • customer • project engineer • project manager • site supervisor.
Safety hazards may refer to:	• access points that may contain: • hazardous light (non-visible laser) • radio frequency (RF) emission • contact with remote power feed • electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable • hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service • unsafe support structures: • condemned poles

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RANGE STATEMENT	

	• visible signs of decay or stress
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

Cable may be:	• aluminium • coaxial • copper • lead encased • optical fibre • plastic sheathed • structured data cables.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • drainage and sewerage • fire sprinkler systems • gas and water mains • high voltage (HV) power.

Plant, tools and safety equipment may include:	• plant:
	  • elevated platform vehicle
	  • ladders
	  • scissor lifts
	  • wire raising tool (insulated)
	• safety equipment:
	  • personal protective clothing:
	  • earmuffs
	  • fall arrest systems
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers

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RANGE STATEMENT	
	• trench guards • warning signs and tapes • test equipment: • cable tester • continuity tester • LAN Cat tester • passive optical network (PON) meter • tools: • auger • fixing brackets • spanner.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • identifying other services, including power and gas • personal protective clothing: • earmuffs • gloves: • leather • plastic • rubber • head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights

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RANGE STATEMENT	
	• gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Visual inspections may include:	• damaged items: • cabinets • cable sheath • cable supports • cables • conduit • enclosures • equipment • lead-in cable • terminations • gas pressure alarms.
Cable infrastructure may include:	• cables • cable supports • enclosures: • cabinets • fibre hubs • housing • pits.
Remedial action may include:	• by-pass to another route • repair damage • replace damaged item.
Maintenance schedule may include:	• customer requirements • location and type of cable and equipment • maintenance schedule report • maintenance tasks • process notification for disruption to service • spare parts availability

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RANGE STATEMENT	
	• tests required • visual inspections details.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCBL3240B Install ribbon fibre cable in the FTTX distribution network

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install ribbon cable in the fibre access node (FAN) site and also distribution, local and access underground enclosure joints. Cables range from 12 fibre to 576 fibre cables.

For splicing and terminating of optical fibre, the following unit of competency should be completed based on the needs of the work environment: ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers.

For more comprehensive safe work practices on optical installations, particularly on live fibre, the following unit of competency should be completed based on the needs of the work environment: ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation.

Network owner specifications will apply to this work and should be checked and confirmed before undertaking work on National Broadband Network (NBN) sites.

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Application of the Unit

The unit applies to optical fibre cable installers and splicers deploying broadband access networks using optical technologies. They combine technical skills with specific work health and safety skills to work safely on ribbon fibre.

This unit is written in the context of the technology used for the NBN and may be adapted to suit other situations using ribbon fibre cable.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

ICTCBL2065B Splice and terminate optical fibre cable for carriers and service providers

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for installation of ribbon fibre	1.1 Select safety equipment to protect self, co-workers and public in line with ***work health and safety (WHS) and environmental requirements***
	1.2 Identify and obtain tools and ***appropriate equipment*** required for the installation
	1.3 Check ***physical conditions*** relevant to the installation and confirm layout of equipment to be installed

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	1.4 Inform appropriate personnel of identified ***hazards*** on work site 1.5 Locate other services from ***relevant authorities*** 1.6 Secure the work site with tests for ***dangerous gases*** and ***guards*** around open manholes 1.7 Obtain approval for alterations to the design within organisational guidelines
2. Check and secure existing optical fibre cable	2.1 Following ***WHS practices***, verify that cable was installed according to the installation plan and inspect cable for signs of sheath damage 2.2 Maintain minimum bend ratios of cable according to manufacturer specifications while manoeuvring into position 2.3 Secure cable according to safe industry practice, avoiding damage to cable and sheath
3. Install ribbon fibres into high density drawers and/or pivot sub-racks in internal cabinets	3.1 Introduce cable into ***cabinet*** rack though appropriate route 3.2 Remove cable sheath and lay up ribbon loose tubes into sub-racks without damage to fibre 3.3 Remove loose tubes, clean ribbon fibres and prepare for splicing using organisational techniques 3.4 ***Splice ribbon fibres*** and secure into splice holders 3.5 Confirm that fibres are accurately spliced according to organisational specifications
4. Install and splice ribbon cable in underground enclosures	4.1 Select appropriate ***enclosure*** for function and cable type 4.2 Prepare cables for mid-span and butt splicing following vendor guidelines 4.3 Feed cable accurately into enclosure according to network owner guidelines 4.4 Lay up ribbon fibre in enclosure splice tray to allow accurate and efficient splicing 4.5 Cross-reference fibre numbering to match fibres accurately 4.6 Strip ribbon fibres to specifications 4.7 Splice ribbon fibres accurately 4.8 Apply heat-shrink sleeves to ensure protection of spliced ribbon fibres 4.9 Secure spliced ribbon fibres in splice holders
5. Close and seal enclosure	5.1 Check cable and ribbon fibre placement in splice trays conform to vendor and network owner specifications and

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	adjust if necessary 5.2 Close and secure splice trays and fit enclosure cap 5.3 Heat shrink seals around cable entry ports when using heat shrinking techniques, according to vendor and network owner guidelines 5.4 Close and tighten seals around ribbon fibre cables when using mechanical sealing techniques according to vendor and network owner guidelines 5.5 Check for signs of effective seal and re-seal if necessary
6. Complete site reinstatement, reporting and sign-off requirements	6.1 Place sealed enclosure in pit and secure to vendor and network owner specifications 6.2 Identify signs of damage or potential damage to pit and cable and take steps to mitigate 6.3 Reinstate site to network owner specifications 6.4 Prepare and finalise reports, including test results and alterations to plans, according to network owner requirements 6.5 Advise client of work completion and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - ask effective questions and clarify requirements
  - listen to, and liaise with, relevant personnel on technical and operational matters
  - identify, raise and report WHS matters, discussing and relaying WHS information to others
  - communicate job-related hazards and risk-management approaches to colleagues
- literacy skills to:
  - interpret technical documentation and standards, and safety signs and symbols
  - use technical language in written tasks, such as reports or recommendations, to optimise cable installation
- numeracy skills to interpret technical data, such as specifications for cable installation
- problem-solving skills to detect and rectify cable installation failures

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- research skills to access technical information and sources to understand and report on installation issues
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards associated with work activities
  - select and use required personal protective equipment that conforms to industry and WHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
  - select and use appropriate methods for cable installation
- technical skills to:
  - install customer access network (CAN) cable
  - use correct installation practices
  - use diagnostic equipment
  - use optical fibre jointing techniques
  - use specialised tools and equipment
  - use hand and power tools
  - work with ribbon fibre cables to:
    - lay up ribbon fibre cables in pits and cabinets to network owner specifications
    - strip protective coating on small and large (576 fibre) cables
    - clean gel coats from fibre casings
    - install ribbon fibre into enclosures according to network owner specifications
    - seal enclosures with heat seals and mechanical seals
    - perform ribbon fibre splicing.
    -

Required knowledge

- applicable network owner standards, specifications and procedures for cable installation
- cable installation knowledge, including:
  - causes of signal strength loss in optical fibre
  - colour coding and numerical coding of fibres
  - detailed knowledge of AS/NZS 2211:2006 Safety of laser products (Parts 1 and 2)
  - industry and organisational policies and procedures when splicing optical fibre cable
  - manufacturer requirements for safe operation of optical fibre equipment
- common construction site hazards
- health, safety and environmental control processes, including WHS and environmental responsibilities and duty of care
- optical fibres and equipment:
  - hazards relating to handling of optical fibre and laser light source in the workplace
  - injuries:

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    - damage to retina from lasers
    - damage to lungs from inhalation of fibre offcuts and particles
    - needle stick injury from fibres and offcuts
  - laser warning signs and labels relating to optical fibre components and equipment
  - safety requirements when handling and working with:
    - devices
    - laser light sources
    - optical fibre connectors
    - optical fibres
    - patch cords
- traffic control for a single vehicle
- ribbon fibre knowledge, including:
  - bend ratios for ribbon fibre
  - procedures for handling and placing ribbon fibre in enclosures
  - procedures for physical handling of ribbon fibre cables
  - structure of ribbon fibre cables
  - splicing techniques for ribbon fibre
  - types and functions of ribbon fibre enclosures
- risks associated with confined spaces and appropriate responses.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• prepare cable for mid-span splicing – strip and coil
	• prepare cable for butt end splicing – strip and coil
	• install cable into:
	  • three types of enclosures
	  • two types of FAN cabinet racks and sub-racks
	• splice ribbon fibre according to specifications
	• observe all network owner requirements and product practices to ensure optimal performance of cable systems
	• adapt techniques to a range of technical and environmental

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	conditions.
Context of and specific resources for assessment	Assessment must ensure access to: • optic fibre cabling and equipment • a range of cabinet types and other housings requiring cable-handling techniques • personal protective equipment • first aid and fire safety equipment.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• direct observation of the candidate installing cable into:
	  • enclosures
	  • cabinets
	• direct observation of the candidate following network owner and product-specific instructions
	• oral questioning to assess knowledge of installation principles and practices.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

WHS and environmental requirements may relate to:	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management
	• identifying other services, including power and gas
	• need to decommission and isolate work site and lines before beginning work
	• personal protective clothing and equipment
	• safe work practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • traffic cones
	  • trench guards
	  • warning signs and tapes
	• special access requirements
	• suitable light and ventilation.

Appropriate equipment may include:	• hand-held optical power meter • OFI-FTTx network terminal detector • optical time domain reflectometer (OTDR) • passive optical network (PON) meter.
Physical conditions relate to:	• access to the site • equipment at the site • other construction activities at or adjacent to the site • road and other traffic conditions

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	• weather.

Hazards may include:	• earth potential rise (EPR)
	• optical cable:
	  • bare fibres
	  • hazardous laser light
	• remote power feeding.

Relevant authorities may include:	• cable location services (Dial Before You Dig)
	• environment protection
	• local government
	• private owners
	• utility providers, such as:
	  • electricity
	  • fire services
	  • gas
	  • other telecommunications providers
	  • water.

Dangerous gases may include:	• asphyxiating gas • carbon dioxide • carbon monoxide • combustible gas • natural gas • noxious gas.
Guards may include:	• barricades • plates • temporary fencing.
WHS practices may relate to:	• determining that optical fibre cable is not live according to guidelines and standards • handling optical fibre cable in a safe manner to avoid risk of injury • labelling fibre cable and laser devices • locating and identifying adjoining services according to organisational guidelines and WHS practices • observing AS/NZS 2211:2006 Safety of laser products (Parts 1 and 2) • testing for presence of dangerous gases according to organisational guidelines.
Cabinets may include:	• FAN distribution cabinets • fibre distribution hub (FDH) cabinets • distribution cabinets.
Splice ribbon fibres	• ribbon fusion splice techniques • preparing connection ends to a smooth flat surface to

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may relate to:	ensure no optical path redirection from joint • removing all coatings from exposed optical fibre and removing all possible contaminants.
Enclosures may include:	• access joint location (AJL) • distribution joints • local joint location (LJL).

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL4002B Prepare design drawings and specification for a cable installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to prepare design drawings and specification for a cable installation.

Cable used must be compliant with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements (e.g. for underground, aerial, Category 5, 6, 6A, 7 or 7A, or unshielded twisted pairs (UTP)).

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Technical staff who prepare design drawings and specifications for a cable installation apply the skills and knowledge in this unit.

This unit applies to indoor and outdoor installation within a customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

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Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Gather information on existing and proposed installation	1.1 Confirm cable installation requirements with the customer 1.2 Inspect site to confirm building plans where possible 1.3 Review existing cable ***plans and drawings***
2. Determine installation options	2.1 Assess available installation options against customer requirements and ***relevant legislation, codes, regulations and standards*** 2.2 Establish and assess the cost of options against customer's budget 2.3 Select most suitable option based on function and cost considerations and present to customer
3. Prepare suitable drawings	3.1 Prepare clear and accurate cable installation drawings indicating proposed outlets and services 3.2 Provide drawings to relevant parties and file copies for later reference according to ***company policies***

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4. Prepare cabling specifications	4.1 Prepare detailed ***cabling specifications*** for the ***cabling system*** 4.2 Prepare accurate costing from detailed specification, including equipment and material required
5. Verify specifications with customer	5.1 Verify prepared documentation with customer 5.2 Obtain authorisation and sign off from the customer to proceed according to company policy

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to read and interpret drawings related to:
  - cable coding system and identifiers
  - cable layouts
  - frame locations
  - outlet location
- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to:
  - take and analyse measurements
  - prepare accurate costing
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to prepare design drawings and specification.
-

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- information required to operate equipment according to a test specification
- features and operating requirements of test equipment

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- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific occupational health and safety (OHS) requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine installation options • produce amended schematic and floor plan drawings • produce amended specifications • verify specifications with customer.
Context of, and specific resources for assessment	Assessment must ensure: • sites where cable installation may be conducted • use of equipment currently used in industry • relevant regulations, company policies and cabling specifications that impact on cable installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • oral or written questioning to assess knowledge of installation options • direct observation of the candidate assessing installation requirements • review of design drawings and specification for a cable installation, including costings prepared by the candidate.
Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, for example: • ICTCBL4004B Schedule and supply cabling installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Plans and drawings may include:	• design drawings covering:
	  • floor plan drawings
	  • schematic
	• floor plan drawings which may be formal or informal, and may include:

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	• box locations • cable routes • frame location • location and entry points of risers • location of existing cabling • service delivery points • support systems • schematic drawings which may be formal or informal, and may include: • box input and output • frame capacities • frame locations • proposed cable routes • site locations • other drawing terminology in use, including: • cable plan • reflected ceiling plans • termination drawing • specifications, which may include: • capacity of cable • estimated labour hours • proprietary system requirements • support requirements • termination system • type of cable • volume of cable.
Relevant legislation, codes, regulations and standards include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations

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	• cabling security codes and regulations • fire regulations • industry drafting codes of practice • mining legislation • noise abatement and heritage legislation • OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Company policies may refer to:	• industry standards including:
	  • appropriate AS and ACIF technical standards
	  • regulated or industry codes of practice
	• relevant parties including:
	  • builders
	  • cablers
	  • contractor
	  • customer
	  • relevant regulatory authorities.

Cabling specifications may include:	• capacity for future expansion • contingencies during installation • required services.

Cabling system may include:	• cable compliant with appropriate ACMA technical standard requirements:
	  • underground
	  • aerial
	  • Category 5, 6, 6A, 7 or 7A
	  • unshielded twisted pairs (UTP)
	  • shielded twisted pairs (STP)
	• ACMA-approved cabling products.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL4004B Schedule and supply cabling installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to schedule and supply cabling installation.

Cable used must be compliant with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6, 6A, 7 or 7A, or unshielded twisted pairs (UTP). Cabling products must be ACMA-approved.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Technical staff who schedule and supply cabling installations apply the skills and knowledge in this unit. Appropriate ACMA, Australian standards and Australian Communications Industry Forum (ACIF) technical standards apply to this unit.

This unit applies to indoor and outdoor installation within a customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Schedule supply and installation events	1.1 Confirm cabling installation requirements and project specifications from the customer 1.2 Prepare work schedules and installation plans identifying ***key dates and milestones*** 1.3 Obtain information on location of other services from ***relevant authorities*** 1.4 Prepare a schedule of ***material supplies*** to be available when required for installation
2. Monitor and adjust supply requirements	2.1 Adjust labour load variations to meet installation needs to enable completion within budget and timeframes 2.2 Prepare a quote and confirm additional work requests with customer prior to commencement 2.3 Monitor work progress against project schedules and budgets 2.4 Monitor compliance regularly with customer specification, ***licensing, relevant legislation, codes, regulations and***

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	standards 2.5 Prepare a report detailing project scheduling and supply requirements

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to read and interpret drawings related to:
  - cable coding system and identifiers
  - cable layouts
  - frame locations
  - outlet location
- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to:
  - take and analyse measurements
  - prepare quotes
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- research skills to source labour and material supplies
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to schedule and monitor work.
-

Required knowledge

- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- information required to operate equipment according to a test specification
- knowledge of safety standards and practice to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use occupational health and safety (OHS) standards
  - specific OHS requirements relating to the activity and site conditions

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  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- typical issues and challenges that occur in scheduling and on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and provide appropriately skilled labour, volume and type of material to meet key dates and milestones for installations • identify labour and material sources and negotiate with contractors, suppliers and other service providers to meet installation deadlines for installations • monitor work progress and adjustment of resource requirements to meet both customer's needs and costing parameters in installations.
Context of, and specific resources for assessment	Assessment must ensure: • sites and equipment where cabling installation may be conducted • relevant regulatory and equipment documentation that impact on installation activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of report prepared by the candidate detailing project scheduling and supply requirements • direct observation of the candidate scheduling and supplying a cabling installation.

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Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3009B Install, terminate and certify structured cabling installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Key dates and milestones may include:	• installation of other services • materials delivery • start and finish date or time.

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Relevant authorities may include:	• cable location services (Dial Before you Dig)
	• environment protection
	• local government
	• private owners
	• utility providers such as:
	  • electricity
	  • fire services
	  • gas
	  • other telecommunications providers
	  • water.

Material supplies include:	• ACMA approved cabling products
	• cable compliant with appropriate ACMA technical standard requirements:
	  • aerial
	  • Category 5, 6, 6A, 7 or 7A
	  • shielded twisted pairs (STP)
	  • underground
	  • UTP.

Licensing may include:	• ACMA customer premises cabling • heavy vehicles • power tools.
Relevant legislation, codes, regulations and standards include:	• ACIF standards and codes • ACMA technical standards • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • industrial awards and conditions • OHS • regulated or industry codes of practice • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Trade Practices Act.

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Unit Sector(s)

Telecommunications - Cabling

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ICTCBL4023B Supervise cabling project

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to supervise a cabling project. It requires planning, preparing financial budgets and monitoring of cabling work.

Cable used must be compliant with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6, 6A, 7 or 7A, or unshielded twisted pairs (UTP). Cabling products must be ACMA-approved.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Technical staff who supervise a cabling project apply the skills and knowledge in this unit. Their job roles combine technical and organisational skills to ensure an effective outcome for the client.

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This unit applies to indoor and outdoor installation within a customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area network (LAN), wide area networks (WAN) and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Plan and organise cabling activities	1.1 Obtain cabling installation specifications and project specifications from the customer 1.2 Prepare work schedules and installation plans identifying ***key dates and milestones*** 1.3 Organise ***resource requirements*** 1.4 Verify location of proposed installation according to the plans obtained from authorised personnel 1.5 Obtain information on location of other services from ***relevant authorities*** 1.6 Document plans for cabling project and advise relevant parties

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2. Prepare financial budgets	2.1 Prepare budget identifying cost and expenditure items from scheduling and planning ***documentation***
	2.2 Advise relevant personnel of purchasing and other delegations within budget allocations
	2.3 Prepare budget projections within estimated and approved contract pricing
3. Source human resource requirements for cabling	3.1 Estimate number and determine availability of suitable human resources according to contract requirements and relevant industrial and enterprise policy
	3.2 Establish necessary competency and licence requirements of project personnel prior to recruitment
	3.3 Schedule personnel workloads and allocate within industrial and enterprise requirements
4. Monitor cabling works	4.1 Follow occupational health and safety (OHS) processes and site-specific safety requirements according to plan
	4.2 Monitor compliance regularly with customer specification, ***relevant legislation, codes, regulations and standards***
	4.3 Notify customer promptly on difficult or known problem areas
	4.4 Reallocate work as required to meet client and company requirements
	4.5 Monitor costs and time schedules to identify and resolve any potential problem
	4.6 Provide a report on work progress activity and schedule
5. Evaluate outcomes of cabling projects	5.1 Review cabling projects to identify areas where performance has been below client and enterprise expectations
	5.2 Implement recommendations to ensure effective improvements
6. Complete administrative tasks	6.1 Complete documentation
	6.2 Notify customer and obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

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- analytical skills to read and interpret drawings related to:
  - cable coding system and identifiers
  - cable layouts
  - frame locations
  - outlet location
- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - interpret technical documentation, such as equipment manuals and specifications
  - prepare reports and document work
- numeracy skills to:
  - identify cost and expenditure from specifications
  - prepare budget
- planning and organisational skills to monitor progress of project
- problem solving skills to:
  - anticipate and respond to issues in project progress
  - solve equipment and logistics problems
- research skills to source labour and material supplies
- task management skills to:
  - adhere to all safety requirements
  - reprioritise work as required
  - work systematically with required attention to detail
- technical skills to schedule and monitor work.
-

Required knowledge

- features and operating requirements of test equipment
- information required to advise operation of equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer’s requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • complete all appropriate plans and financial budgets for cabling activities • supervise cabling project applying human resource policies including awards and conditions and all related OHS and work practices • monitor and implement alternate plans where necessary to meet work schedules and customer requirements • complete a project report on a cabling projects detailing recommendations for improvement.
Context of, and specific resources for assessment	Assessment must ensure: • site with cabling project • access to human resource policies, including awards and conditions and all related OHS and work practices • relevant regulatory and equipment documentation that impact on monitoring activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report prepared by the candidate, including completed documentation • direct observation of the candidate supervising a cabling project.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3009B Install, terminate and certify structured cabling installation. Aboriginal people and other people from a non-English speaking background may have second language issues.

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	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Key dates and milestones may include:	• installation of other services • materials delivery • start and finish date or time.

Resource requirements may include:	• cable must be:
	  • compliant with appropriate ACMA technical standard requirements for:
	  • underground
	  • aerial
	  • Category 5, 6, 6A, 7 or 7A
	  • UTP
	• cabling hardware requirements
	• cabling products must be ACMA-approved

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	• competent staff • consumables • facilities and equipment • finances • time availability.
Plans may include:	• building • constructions • design • site layout drawings • street.
Authorised personnel may include:	• construction manager • project manager • site manager • site supervisor.

Relevant authorities may include:	• cable location services (Dial before you dig)
	• environment protection
	• local government
	• private owners
	• utility providers such as:
	  • electricity
	  • fire services
	  • gas
	  • other telecommunications providers
	  • water.

Documentation may include:	• ACMA requirements • contract documentation • enterprise and client policy and procedures • estimations and quotations • work contracts • work plans and schedules.
Relevant legislation, codes, regulations and standards include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007

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	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• industrial awards and conditions
	• industry standards include:
	  • regulated or industry codes of practice
	  • appropriate ACMA technical standards
	• OHS
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006
	• Trade Practices Act.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL4057B Test cable bearers

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0.*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to test cable bearers. It involves setting up, testing, interpreting test results and determining appropriate action.

This unit applies to the testing of all cable types (metallic, optical fibre and coaxial).

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Technicians and line installers whose work involves testing cable bearers apply the skills and knowledge in this unit for customer cable and service provider networks.

They may use cable test routines for testing connections, signal strength or loss of cable links to manufacturer’s and design specifications.

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Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority.

If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training package fulfils this requirement.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare and set up for cable test	1.1 Obtain ***relevant legislation, codes, regulations and standards***
	1.2 Scope the work by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements
	1.3 Notify appropriate personnel of identified ***safety hazards*** at the worksite
	1.4 Determine type of ***cable bearer*** and cable route from project plan and identify test requirements using work instructions
	1.5 Obtain ***tools and safety equipment*** and material to perform

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	tasks safely and efficiently 1.6 Select and use required protective equipment and make site safe and secure for testing work 1.7 Determine need for outage, extent, location and timing, if required. and negotiate with appropriate personnel 1.8 Select and set up suitable test equipment according to manufacturer's specifications for the ***cable tests*** to be performed to ensure relevance of test data 1.9 Ensure equipment calibration certification is current to reduce possibility of unreliable test data and ensure traceability where appropriate
2. Perform cable tests	2.1 Follow occupational health and safety ***(OHS) and environmental requirements*** for the given work and identify and avoid ***other services*** 2.2 Determine and record ***cable parameters*** for consideration in assessment of performance 2.3 Conduct ***performance tests*** as required by both equipment and enterprise specification for the specific cable type and purpose
3. Interpret test results and determine action	3.1 Record test results for evaluation and compare against manufacturer's and site specifications 3.2 Analyse test results and evaluate cable performance with consideration of recorded cable parameters 3.3 Diagnose problems to determine cable faults and make arrangements for repairs or modifications 3.4 Retest faulty cable after the faults have been rectified
4. Document test results and clean up site	4.1 Produce evaluated test results according to enterprise guidelines and without delay to ensure test results remain current 4.2 Update site and installation files to ensure traceability of information on system performance is maintained 4.3 Archive test records details for the life of the cable according to enterprise guidelines 4.4 Remove waste and debris from worksite and dispose of according to environmental requirements 4.5 Notify appropriate personnel of job completion and obtain sign off

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to use hand and power tools, diagnostic equipment and perform fault clearance.
-

Required knowledge

- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • perform tests on cable bearers • use a range of tests

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competency in this unit	• interpret test results • rectify a range of faults • report on the completed tests • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where testing may be conducted • use of cabling and equipment currently used in industry • relevant regulatory and equipment documentation that impact on testing cable bearers.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing cable test on customer premises • review of reports completed by the candidate for different test examples and situations • oral or written questioning to assess knowledge of cable bearer tests.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL4023B Supervise cabling project. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required

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	knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts
	• OHS
	• road and traffic control legislation and codes
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

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Appropriate personnel may be:	• asset manager • network operations centre (NOC) • project supervisor • site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• active lasers with no safety labels
	• active optical fibres
	• contact with remote power feed
	• electrical supply that require mandatory separation from communications cable
	• exposed fibres
	• unsafe support structures
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

Cable bearer may include:	• aerial • coaxial cable • metallic • optical fibre • underground.

Tools and safety equipment may include:	• personal protective equipment
	• safety equipment
	• test equipment:
	  • cable tester
	  • continuity tester
	  • local area network (LAN) Cat tester
	  • optical time domain reflectometer (OTDR)
	  • passive optical network (PON) meter
	  • RF meter
	• tools:
	  • crimping tool
	  • fibre cleaning kit
	  • fibre splicer
	  • labeller
	  • screw drivers
	  • spanners

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	• tagging tool • terminating tool.

Cable tests may include:	• for coaxial cable:
	  • insulation
	  • loss
	• for optical cable:
	  • dispersion
	  • frequency response
	  • loss
	  • polarisation
	  • spectrum test
	• for metallic cable:
	  • continuity
	  • cross talk
	  • insertion loss
	  • return loss.

OHS and environmental requirements may include:	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management
	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• safe working practices, such as the safe use and handling of:

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	• chemicals • materials • tools and equipment • special access requirements.
Other services may include:	• availability and suitability of existing cabling trays and fixing systems • electricity supply • fire sprinkler systems • gas and water mains • high voltage (HV) cables.
Cable parameters may include:	• age of cable • cable length • cable type • number of joints • splices • coax joints • terminations • performance characteristics.
Performance tests may include:	• insertion loss (total end-to-end loss with cable and connectors) • link loss (cable loss without connectors) • return loss which measures signal reflected of an incident or point end-to-end.

Unit Sector(s)

Telecommunications - Cabling

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ICTCBL4099A Remotely locate and identify cable network faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to remotely locate and identify cable network faults. This unit applies to voice, video and data telecommunications applications using metallic and optical fibre cables. All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar.

Application of the Unit

Application of the unit	Technicians who work remotely locating and identifying telecommunications cable faults in access networks apply the skills and knowledge in this unit. It may be done at a centralised testing office and make use of computer test routines and databases.

Licensing/Regulatory Information

Not Applicable

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Verify fault report	1.1. Locate source of fault using ***available information*** and contacts to verify ***nature of fault*** as reported 1.2. Perform preliminary ***operational testing*** according to ***type of fault*** presentation, ***fault environment*** and enterprise guidelines to verify nature of fault 1.3. Analyse ***historical data*** to identify possible causes and solutions
2. Conduct remote testing to diagnose network fault	2.1. Evaluate cable fault details and plan strategy to conduct remote testing 2.2. Conduct appropriate remote diagnostic test to isolate and diagnose the network fault 2.3. Determine the urgency and ***impact of fault*** and

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ELEMENT	PERFORMANCE CRITERIA
	identify the required response time frame 2.4. Evaluate the diagnostic tests to determine the type, location and nature of network fault
3. Dispatch fault-finding field personnel	3.1. Prepare a fault report and forward to appropriate staff according to enterprise guidelines 3.2. Notify fault centre and arrange for the dispatch of technician to rectify fault 3.3. Notify customer of fault progress and arrange for fault clearance time

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use hand and power tools

Required knowledge

- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific occupational health and safety (OHS) requirements relating to the activity

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REQUIRED SKILLS AND KNOWLEDGE
and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview o f assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • methodically approach fault identification • conduct tests appropriate to the type of fault identified • interpret test results • provide instructions to staff engaged in on site repair.
Context of, and specific resources for assessment	Assessment must ensure: • sites where remote investigation of cable network faults may be conducted • use of fault-finding equipment currently used in industry • relevant documentation that impact on cable network and fault-finding activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report, including test results and fault-finding methodologies • direct observation of the candidate remotely locating and identifying cable system faults.
Guidance information for	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
assessment	for example: • ICTCBL4057A Test cable bearers • ICTTEN4087A Undertake remote diagnosis and repair of network faults. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Available information may be	• customer reporting • maintenance team

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RANGE STATEMENT	
provided by:	• network fault centre • network management printout • site installation and maintenance records.
Nature of fault may include:	• cable or equipment • customer or service provider • static or intermittent • urgent or non-urgent.
Operational testing may include:	• data transfer performance • electrical performance • frequency response performance • signal processing.

Type of fault may include:	• cable:
	  • metallic
	  • optical fibre
	• equipment:
	  • access network
	  • customer
	  • Ethernet
	  • transmission
	• network:
	  • access
	  • core
	  • data network
	  • wavelength division multiplexing (WDM)
	  • Ethernet
	• system:
	  • customer
	  • service provider
	  • vendor.

Fault environment may include:	• access • core • customer • service provider • vendor.
Historical data may refer to:	• customer interaction • equipment type • fault records • fault statistics

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RANGE STATEMENT	
	• name of previously involved staff • service records.

Impact of fault may refer to:	• urgent:
	  • congestion on emergency services route
	  • loss of connectivity
	  • loss of service
	• non-urgent:
	  • loss of billing or toll
	  • poor performance
	  • poor quality of service (QoS)
	  • poor service.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Cabling

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ICTCMP2022B Organise and monitor cabling to ensure compliance with regulatory and industry standards

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to organise and monitor teams undertaking cabling work on all cable types, and to ensure compliance with regulatory and industry standards.

Assessment by a TITAB registered assessor is recommended.

The six unit competency set ICTCBL2005B, ICTCBL2006B, ICTCBL2008B, ICTCBL2012B, ICTCBL2017B and ICTCMP2022B, that meets the Australian Communications and Media Authority's (ACMA) requirements for Cabling Provider Registration (CPR), is generally used as part of a more specialised customer cabling qualification. This set is usually regarded as more suitable for new entrants where limited industry experience has been obtained and forms the major part of specialised qualifications, such as ICT20313 Certificate II in Telecommunications Cabling. When these six units are selected as a set within state and territory funding approved programs, the two benchmark CPR units (ICTCBL2136B and ICTCBL2137B) are not required.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA accredited registrar.

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Application of the Unit

Technical staff apply the skills and knowledge in this unit for supervising teams within a customer premises and ensuring compliance with ACMA and industry standards. They may make use of formal documentation, such as accurate completion of a telecommunications cabling advice (TCA) form (TCA1 form), test routines and databases.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Organise cabling work activity	1.1 Arrange access to the site according to required procedure 1.2 Make worksite safe by identifying existing and potential ***hazards*** 1.3 Review ***site plans and documentation*** 1.4 Organise supply of ***cable***, equipment, tools and materials in line with manufacturer's specifications 1.5 ***Schedule and allocate work*** 1.6 Establish communication protocols and processes
2. Monitor work	2.1 ***Manage remote power feed*** following occupational health

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activity	and safety ***(OHS) and environmental requirements*** 2.2 Monitor work activity to ensure it meets site specifications, and ***enterprise requirements***, and ***relevant legislation, codes, regulations and standards*** 2.3 Reallocate work as needed
3. Complete records and obtain sign off	3.1 Complete required records 3.2 Ensure installation waste and debris is removed from worksite and disposed of according to environmental requirements to maintain safe worksite conditions 3.3 Ensure site is reinstated according to customer and company requirements 3.4 Notify customer and obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as:
  - equipment manuals and specifications
  - ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use hand and power tools.
  -

Required knowledge

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- ACMA Competency Requirements for Telecommunications Cabling Provider Rules 2000, legislation, codes of practice and other formal agreements that impact on the work activity
- basic telephony
- cable installations
- features and operating requirements of test equipment
- information required to operate equipment according to a test specification
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- test methods and performance requirements
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • organise, schedule and communicate work • monitor work activity and reallocate as required to meet specifications, OHS and ensure compliance with relevant regulations and standards.
Context of, and specific resources for assessment	Assessment must ensure: • sites where monitoring may be conducted • use of tools, materials and equipment currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a project supervised by the candidate • review of an oral and written report with completed documentation, such as TCA1 form • direct observation of the candidate organising and

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	monitoring a cabling project.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2005B Install customer cable support systems • ICTCBL2006B Place and secure customer cable • ICTCBL2008B Terminate metallic conductor customer cable • ICTCBL2012B Install functional and protective telecommunications earthing system • ICTCBL2017B Alter services to existing cable system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Hazards may include:	• building debris • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.

Site plans and documentation may include:	• information on:
	  • access location
	  • cable coding system and identifiers
	  • cable plan.

Cable may include:	• aerial
	• Category 5, 6, 6A, 7, or 7A
	• copper twisted pair including:
	  • aerial
	  • external
	  • indoor
	  • underground cabling
	• underground
	• unshielded twisted pairs (UTP).

Schedule and allocate work may refer to:	• competency and capacity to complete work determined from: • observations

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	• discussion • training records • demonstrations • estimates for time duration of work based on: • an assessment of condition • past experience with similar methods and sites.
Manage Remote Power Feed may relate to:	• telecommunications services which operate at above TNV • need for identifying: • risks posed by contact with remote power feeding services • remote power feeding services in a range of commonly encountered circumstances inside customer premises.
OHS and environmental requirements may relate to:	• identifying other services, including power and gas • need for decommissioning and isolating worksite and lines prior to commencement • personal protective clothing: • earmuffs • gloves: • plastic • rubber • leather • head protection • kneepads • masks • protective suits • safety boots • safety glasses • safety harness • safety line • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers

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	• trench guards • warning signs and tapes • witches hats • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Enterprise requirements may refer to:	• budgets defining discretionary levels in relation to expenditure areas • specifications and other project documentation including: • building plans and area charts • client correspondence • copy of contract documentation • derived schedules or checklists.
Relevant legislation, codes, regulations and standards includes:	• Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • enterprise operating policy and procedures • OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Unit Sector(s)

Telecommunications - Compliance

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ICTCMP2239B Perform restricted customer premises broadband cabling work: ACMA Restricted Rule

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install simple point to point broadband cabling.

Customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. Cablers are required to register with a registrar accredited by the Australian Communications and Media Authority (ACMA).

Application of the Unit

The unit applies to technical staff who install and terminate customer premises' cable on new installations or upgrades, or maintain existing networks in domestic premises, including small office home office (SOHO) and small commercial premises that do not have a main distribution frame (MDF) or jumperable distributor as the network boundary point.

Broadband cabling involves the range of high performance twisted pair data cables that include Category 5, Category 5e, Category 6 and Category 6A.

Licensing/Regulatory Information

Refer to Unit Descriptor.

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Pre-Requisites

ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule

Or equivalent industry experience.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for installation	1.1 Arrange access to site and organise ***tools and equipment*** for specialised broadband ***cabling*** for ***restricted cabling work*** 1.2 Review site according to ***work health and safety (WHS) and environmental requirements*** and assess ***hazards*** 1.3 Determine that cable route and ***cabling environment*** meet ***manufacturer specifications, industry standards and regulatory requirements***
2. Install broadband cable	2.1 Place and secure correct cable type according to accepted industry practice and ***relevant regulations and standards*** 2.2 Maintain cable and services ***separations*** in runs and crossovers to meet manufacturer specifications and relevant legislation, codes, regulations and standards 2.3 Fit ***over-voltage protection devices*** to cables and metallic components where required
3. Terminate and test broadband cable	3.1 ***Terminate*** the cable according to accepted industry practice and relevant legislation, codes, regulations and

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	standards 3.2 Maintain correct twist ratio to optimise system performance at rated level 3.3 Conduct ***compliance testing*** of the cable installation and termination with suitable tester and record compliance 3.4 Supply system performance documents to client and complete cabling ***records***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with supervisors, team members and clients
- literacy skills to interpret:
  - related regulations and standards
  - technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - check that environmental conditions are suitable for termination
  - make sites safe and secure for cable installation
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task-management skills to:
  - apply work practices without damaging cable
  - conform to work specifications and relevant industry standards
- technical skills to:
  - check cable route for obstructions and clear route using suitable methods
  - handle cable according to manufacturer specifications so that conductors, sheath and insulation are not damaged during installation
  - select cabling system to meet customer performance needs
  - read and interpret drawings related to:
    - cable layouts
    - outlet location
  - terminate internal copper twisted pair and data cables

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- use applicable testing equipment
- use hand and power tools.
-

Required knowledge

- ACMA cabling provider rules, cabler registration rules, regulations and standards
- cable test methods and system performance requirements
- features and operating requirements of applicable test equipment
- information required to operate equipment according to a test specification
- key components of codes of practice and other formal agreements that impact on the work activity
- manufacturer requirements for safe operation of equipment
- specific WHS requirements relating to the activity and site conditions
- techniques for terminating data cable
- typical installation issues and challenges that may occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install and terminate fixed broadband cable to industry standards and manufacturer specifications • conduct a successful wire map and data rate qualification test and record test results • provide report to client documenting the installation and test results • comply with all related WHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure access to: • sites where installation and termination of cabling may be conducted • use of industry-current tools, testing equipment and personal protective equipment

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	• relevant regulatory and equipment documentation that impacts on installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation, including test results • direct observation of the candidate installing and terminating coaxial cable.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2136B Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule • ICTCBL2139B Apply safe technical work practices for cabling registration when configuring an ASDL circuit. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Tools and equipment may include:	• tools:
	  • cable ties
	  • coring tool
	  • crimping tool
	  • drills
	  • hammers
	  • labeller
	  • ladders
	  • saws
	  • stripping and preparation tool
	  • terminating tool
	  • torque spanner
	• equipment:
	  • multimeter
	  • LAN cable qualification tester
	  • LAN cable certification tester
	  • wire map tester.

Cabling may include:	• aerial customer • external customer • indoor customer • underground customer.
Restricted cabling work refers to:	• aerial and underground cabling work on private property • cabling work that is performed only in relation to a customer's premises • customer cabling that terminates directly at the network boundary on a socket or network termination device.

WHS and environmental requirements may include:	• decommissioning and isolating work site and lines before beginning work
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management

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	• identifying other services, including power and gas
	• personal protective clothing:
	  • earmuffs
	  • gloves (leather, plastic and rubber)
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety harness and line
	• safe work practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment, including:
	  • flashing lights
	  • gas and other hazard-detection equipment
	  • safety barriers
	  • traffic cones
	  • trench guards
	  • warning signs and tapes
	• special access requirements
	• suitable light and ventilation.

Hazards may include:	• general hazards, including:
	  • building debris
	  • earth potential rise (EPR)
	  • live power lines
	  • manual handling
	  • mud and water
	  • natural gas and other gas build-up
	  • radio frequency equipment emitting radiation
	  • remote power feeding services that operate at above telecommunications network voltage (TNV)
	  • slippery surfaces
	  • vermin.

Cabling environment	• indoor environments, including concealed locations:

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may refer to:	• ceilings and false ceilings • internal wall spaces • modular workstations • under floor • outdoor environments, including cable installations: • aerial telecommunications cabling for restricted cabling work that does not include installations on poles shared with low voltage (LV) or high voltage (HV) electrical power cables or terminations • external walls • underground cabling in an exclusive trench or shared trench with electrical LV cables and other utilities.
Manufacturer specifications may include:	• attenuation rate, or absence of attenuation, for a class of cable in a defined cabling application • bend radius not exceeding manufacturer specification • placement of cable with sufficient slack to allow termination • cable lengths not exceeding manufacturer or design specifications • installation of cable safely without damage to cable or client's premises • use of cable ties and brackets that do not damage cable.
Industry standards and regulatory requirements may include:	• accredited registrars and registration • ACMA Cabling Provider Rules • ANSI/TIA-570-B:2004 North American Design Standard • AS/ACIF S008:2006 and AS/ACIF S009:2006 • AS/NZS 3000:2007 • Australian Communications Industry Forum (ACIF) standards and codes maintained by Communications Alliance • Certified Components List (CCL) • Communications Cabling Manual (CCM) – restricted • IEC 61935-3:2008 International Standard • labelling requirements • Telecommunications Act 1997.
Separations refer to:	• correct separations between communications cable and other services: • low voltage • open terminations • separations covered by AS/ACIF S009:2006.
Over-voltage protection device requirements	• ACMA standards • manufacturer specifications

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must comply with:	• organisational or local environmental hazards.
Termination may include:	• 8 pin modular (RJ45 type) connectors terminated at both ends of a fixed broadband cable and tested *Note: Jumperable distributors and patch panels are outside the scope of cabler registration at this level and so are not included in this work.
Compliance testing must include:	• qualification test of cabling at required data rate (e.g. 100MBs or 1GB) • wire map testing.
Records may include:	• cable plans • network termination device record cards • telecommunication cabling advice forms TCA1 and TCA2.

Unit Sector(s)

Telecommunications - Compliance

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ICTCMP5176A Undertake radio communications site audit

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake a radio communications site audit regarding the compliance of radio frequency (RF) transmissions with relevant transmitter licence requirements. Individuals must comply with radio communications transmitter licensing requirements and operator certificates for maritime and aeronautical services and occupational health and safety (OHS) electromagnetic radiation (EMR) licensing requirements as appropriate.

Application of the Unit

Application of the unit	Field officers from regulatory authorities or other private and public organisations apply the skills and knowledge in this unit. They combine technical radio communications skills with broader organisational and administrative skills to conduct audits in a range of commercial and community contexts and environments. They make recommendations for improvement and follow up by monitoring resulting actions. Field officers may be responsible for small projects or parts of larger projects, and for the coordination and direction of small groups working on sites remote from the organisational headquarters.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for radio communications site audit	1.1. Confirm need for site audit through appropriate ***triggers*** and arrange formal approval for site access from ***authorised personnel*** 1.2. Clarify audit requirements according to relevant ***legislation***, ***codes***, ***regulations and standards*** including safety and security arrangements and action required to comply 1.3. Clarify audit requirements with client or project

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ELEMENT	PERFORMANCE CRITERIA
	originator, where appropriate, and incorporate ***broader audit considerations***
	1.4. Prepare a hardcopy of ***site information*** for use as an audit validation list at site
	1.5. Specify staff, ***equipment*** and material resource requirements for the audit based on particular site requirements ensuring equipment has been correctly calibrated and labelled
	1.6. Check industry requirements for site and obtain ***industry licence*** where appropriate
2. Undertake radio communications site audit	2.1. Validate specific site location according to database information
	2.2. Undertake audit tasks according to OHS, enterprise procedures and site specific safety requirements, and meet client or representative on site as required
	2.3. Conduct ***transmission and RF tests*** against approved specifications
	2.4. Conduct check of transmitters for licensing conditions
	2.5. Check transmission radio frequency against database list and obtain permission to check or alter transmission or radio frequency where appropriate
	2.6. Confirm site meets specific ***RF OHS safety requirements*** and licensing requirements where appropriate
	2.7. Confirm defined site equipment labelling comply with Australian Communications and Media Authority (ACMA) technical standards
3. Complete audit administration tasks	3.1. Update or arrange for update of required ***records*** regarding audit findings and action required, including liaison with authorised personnel as agreed
	3.2. Monitor actions that have been recommended to ensure compliance with findings
	3.3. Issue enforcement actions as required
	3.4. Finalise audit administration and return equipment and resources according to organisational procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical, operational and legal site audit matters
- literacy skills to interpret technical documentation and write audit reports in required formats
- numeracy skills to take RF measurements, interpret results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and coordinate the audit process in liaison with others
- problem solving and contingency management skills to adapt testing procedures to requirements of particular sites and modify activities depending on differing operational contingencies, risk situations and environments
- research skills to interrogate databases and investigate different audit requirements
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to select and use appropriate test equipment and practices to suit different RF applications

Required knowledge

- features and operating requirements of test equipment, including:
  - digital radio communications measuring equipment
  - modulation analyser
  - power meter
  - RF termination
  - spectrum analyser
- features of licensing database
- information required to prepare and conduct a telecommunications audit
- legislation, licensing requirements for transmitters, codes of practice and other formal agreements that directly impact on radio communications site audits
- overview of transmission lines, transmitter and receiver architecture and their impact on radio communications audit
- required field measurements including:
  - carrier frequency
  - harmonics
  - intermodulation distortion (IMD) products
  - modulation
  - RF power

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REQUIRED SKILLS AND KNOWLEDGE

• specific issues related to antenna installations and their impact on radio communications interference
• specific OHS requirements that impact on the conduct of radio communications audits, including:
  • use of equipment
  • use of RF protective equipment
  • other personal protective equipment
• types of adjustments that need to be made to audit procedures to meet the requirements of particular sites and environmental conditions
• typical issues and challenges that occur in telecommunications site audit and how these may be addressed

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • conduct radio communications site audit for at least three sites with differing licensing requirements • conduct transmission and RF tests • monitor non compliances to ensure actions completed.
Context of and specific resources for assessment	Assessment must ensure: • sites on which audits may be conducted • use of field measurement equipment currently used in industry • relevant databases, licensing requirements and other site related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking an

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EVIDENCE GUIDE	
	audit • review of audit reports completed by the candidate for differing site types and licence requirements • oral or written questioning to assess knowledge of licensing requirement and specific technical procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment • ICTRFN4095A Conduct radio frequency measurements • ICTRFN4174A Undertake radio communications signals monitoring. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Triggers may relate to:	• business plan targets
	• codes of practice and standards for other services and utilities:
	  • electricity
	  • gas
	  • water
	• decisions to target certain clients
	• decisions to target certain sites:
	  • communal
	  • power level
	• EMR based on site power
	• geographical considerations
	• industry status (targeting of a dynamic industry)
	• interference complaints
	• investigation may be power measurement to ensure correct power
	• legislative requirements
	• licence conditions regarding the operating frequency of transmitters
	• occupancy transmitter still operating
	• power company requirements
	• radcom data purification
	• statutory authority requirements ACMA.

Authorised personnel may include:	• customers • major users • site managers • site owners.
Legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • ARPANSA EMR standard • assignment guidelines

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RANGE STATEMENT	
	• Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • equipment standards • fire regulations • heritage legislation • international standards • intrinsically safe lightning protection, • local government • OHS • Privacy Act • Radcoms Act • site engineering standard • spectrum planning reports • Telecoms Act • Trade Practices Act • WIs, CIs, business operating procedures (BOPs), radiocommunications assignment and licensing instruction (RALI).

Broader audit considerations may relate to:	• commercial
	• cultural:
	  • liaising with traditional land owners
	• environmental:
	  • accessing protected areas
	  • broken ground
	  • location involving working over old underground workings and voids
	  • on natural landscapes
	  • wet conditions
	  • working at heights or on rooftops.

Site information may include:	• address of physical location • frequency output • power of transmitters • site coordinates • technical details of site • user bandwidth.
Equipment may include:	• deviation meter • power meter • spectrum analyser.

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RANGE STATEMENT	
Industry licence may include:	• industry training for particular sites • basic OHS induction training.
Transmission and RF tests may include:	• assessment of EMR levels • power measurement • RF technical measurements.
RF OHS safety requirements may relate to:	• EMR levels • RF measurements • visual checks of towers.
Records may include:	• completion of enterprise manual lists • computer-based documentation • electronic communication.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Compliance

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ICTDRE3156B Install digital reception equipment

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor change to a performance criterion. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install and configure digital reception equipment (DRE) on customer premises as part of a home network.

Home networks integrate many services, such as broadband, digital TV, free to air (FTA), subscription TV (pay TV) and internet protocol TV (IPTV).

Application of the Unit

Technicians who install and maintain DRE in the home network or small business network apply the skills and knowledge in this unit to integrate many services for the customer.

Integrated services include broadband services, FTA, pay TV and IPTV.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for installation	1.1 Review preparation to ensure work complies with requirements of ***relevant legislation, codes, regulations and standards***
	1.2 Notify customer to verify installation order and arrange for site access to comply with security arrangements
	1.3 Notify supervisor of identified ***safety hazards*** at the work site and complete a job safety analysis (JSA) before commencing work
	1.4 Confirm location of ***digital reception*** equipment and fittings with customer
	1.5 Identify ***barriers to installation*** and develop strategies to overcome them within time and budget restrictions
	1.6 Select and obtain ***tools*** and materials appropriate for the work order
2. Install hardware and equipment	2.1 Measure ***signal level*** at wall plate to ensure received signal strength is adequate
	2.2 Test customer's existing equipment for operational condition and reception quality
	2.3 Notify customer of detected problems and record remedial

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	actions if required 2.4 Identify interconnection cabling requirements and prepare cables for job requirements 2.5 Affix wall plate to agreed position on wall and secure cable according to specification 2.6 Connect set top unit to ***customer equipment*** and connect ***cabling*** between wall plate and set top unit following occupational health and safety ***(OHS) and environmental requirements*** 2.7 Power up set top unit and configure it to customer requirements 2.8 Activate customer services to complete hardware installation where required
3. Commission and test installation	3.1 Conduct ***functional test*** to assess transmission signal quality 3.2 Conduct tests to ensure that quality of all ***services*** are being delivered against pre-existing conditions 3.3 Check that all interconnected equipment is functional
4. Finalise installation and handover to customer	4.1 Restore site to original condition and customer satisfaction 4.2 Assess damages that may have occurred during installation and arrange with customer for repair or replacement of damaged components 4.3 Remove waste and debris from site and dispose of in a safe and environmentally appropriate manner 4.4 Conduct customer training appropriate to the equipment, services and vendor literature
5. Complete contract documentation	5.1 Provide ***warranties*** to customer in required format where work and equipment are subject to warranty 5.2 Prepare invoices and other financial documentation, where required, and present to customer 5.3 Obtain authorised signatures on required documentation to confirm acceptance of completed work

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

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Required skills

- communication skills to liaise with customer and colleagues and negotiate with site owner
- literacy skills to interpret technical documentation, specifications and service orders
- numeracy skills to:
  - set up
  - take measurements
  - interpret results
- planning and organising skills to organise and prepare installation resources
- problem-solving skills to respond to typical installation challenges
- task-management skills to:
  - adhere to all safety requirements
  - work systematically with required attention to detail
- technical skills to:
  - perform diagnostic procedures
  - use hand and power tools
  - use test equipment to install equipment.
  -

Required knowledge

- broad knowledge of whole industry product range
- contemporary equipment and connection methods
- customer service principles, particularly dealing with customers face to face
- enterprise or service specific knowledge of products and services supplied
- OHS general principles and enterprise-specific JSA requirements
- overview knowledge of:
  - objectives and methods of training for product use for customer education
  - radio frequency (RF) theory, principles and safety
  - telephony principles to support return path awareness
- pre-installation enterprise-specific requirements
- quality assurance of enterprise requirements
- return path technology.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify installation requirements • install equipment applying OHS requirements and work practices • configure set equipment to customer requirements • conduct functionality tests and interpret results • provide customer training appropriate to the equipment • complete the task and handover to customer.
Context of, and specific resources for assessment	Assessment must ensure: • site for digital reception equipment installation • range of digital reception equipment currently used in industry • range of test equipment required for digital reception equipment installation and testing.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing digital reception equipment • direct observation of the candidate conducting signal measurement • oral or written questioning of the candidate to assess knowledge of digital reception equipment and test methods.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTDRE3165A Install a complex digital reception system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environment Protection Acts • Trades Practices Act • Institute of Electrical and Electronics Engineers (IEEE)

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	standards • ISO Draft 11801 • OHS Acts and relevant codes and standards • regulated or industry codes of practice, including appropriate Australian Communications and Media Authority (ACMA) standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Safety hazards may refer to:	• debris • excessive dust or noise • exposed electrical wiring • exposed machinery • industrial • spilled chemicals • unsafe spatial separation of cables • unsafe structures • wet areas.

Digital reception may include:	• services:
	  • community television
	  • FTA (open broadcast TV)
	  • IPTV
	  • pay TV
	• service provision media:
	  • cable
	  • satellite
	  • terrestrial
	  • wireless.

Barriers to installation may include:	• furniture location • internal walls • personal safety • provision and location of power outlets.
Tools may include:	• crimping tool • hand tools • power tools • stripping tool • terminating tools • tool kit.
Signal level may refer to:	• level of signal required to operate equipment effectively • set by carrier specifications.
Customer equipment	• audiovisual (AV) units

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may include:	• digital TV • IPTV unit • master antenna television (MATV) units.
Cabling may refer to :	• coax • data cable • optical patch cable.

OHS and environmental requirements may relate to:	• identifying other services including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe work practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Functional test may include:	• carrier specific test • noise measurements • qualitative test • signal power level • spectrum analysis • use of test pattern • voltage alignment tests.
Services may include:	• community television • FTA (open broadcast TV) • IPTV • pay TV.

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Warranties may relate to:	• support provided by network service provider • support specified by the equipment manufacturer or supplier.

Unit Sector(s)

Telecommunications - Digital reception technology

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ICTDRE3157B Locate and rectify digital reception equipment faults

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to locate and rectify all types of customer digital reception equipment (DRE) faults on customer premises as part of a home network.

Home networks integrate many services, such as broadband, digital TV, free to air (FTA), subscription TV (pay TV) and internet protocol TV (IPTV).

Application of the Unit

Technicians who install and maintain integrated services in digital reception equipment in the home network or small business network apply the skills and knowledge in this unit to locate and rectify faults of DRE.

Integrated services include broadband services, FTA, pay TV and IPTV.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for DRE fault identification	1.1 Obtain ***relevant legislation, codes, regulations and standards*** for compliance when conducting work 1.2 Notify customer to verify fault report and arrange for site access to comply with security arrangements 1.3 Notify supervisor of identified ***safety hazards*** at the worksite and complete a job safety analysis (JSA) before commencing work 1.4 Identify existing ***warranties***, ***service agreements*** and ***equipment specifications and documentation*** covering ***digital reception*** equipment 1.5 Select and obtain ***tools*** and materials appropriate for the work order
2. Assess likely cause and location of fault	2.1 Verify ***system details*** to assist with fault identification 2.2 Assess ***available data*** and historical trends to determine likelihood of fault being the ***set top fault*** or ***existing customer equipment fault*** 2.3 Rank likely causes of fault in order of probability ensuring a ***methodical approach*** to ***fault-finding*** is used 2.4 Discuss problem fully with the customer and advise of likely charges

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3. Perform tests to diagnose fault	3.1 Conduct visual inspection of system for ***likely damage*** following occupational health and safety ***(OHS) and environmental requirements*** 3.2 Check connections, plugs, terminations and leads for operation 3.3 Measure signal strength at wall plate and beyond to ensure adequate signal level for equipment processing 3.4 Conduct functional test of facilities to identify faulty equipment 3.5 Progressively isolate fault to remove likely variables from assessment using manufacturer's diagnostic chart 3.6 Locate fault with minimal disruption to client activity and in the shortest possible time 3.7 Provide customer with regular progress reports
4. Rectify faults	4.1 Identify faulty parts and equipment and replace or repair according to service agreement 4.2 Advise customer of cost of repair if service agreement does not exist 4.3 Re-program equipment to customer requirements if required 4.4 Complete work in a manner that is safe to repairer and customer
5. Provide replacement service to customer	5.1 Provide customer with temporary replacement equipment similar to existing equipment whilst faulty equipment is being repaired 5.2 Program replacement equipment to customer requirements 5.3 Test replacement service for functionality prior to meet customer satisfaction
6. Clean up worksite and complete documentation	6.1 Remove waste and debris from site and dispose of in a safe and environmentally appropriate manner 6.2 Restore site to original condition and customer satisfaction 6.3 Prepare invoices and other financial documentation, where required, and present to customer 6.4 Obtain authorised signatures on required documentation to confirm acceptance of completed work

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customer and colleagues and negotiate with site owner
- literacy skills to interpret technical documentation, specifications and service orders
- numeracy skills to:
  - setup
  - take measurements
  - interpret results
- planning and organisational skills to organise and prepare installation resources
- problem solving skills to respond to typical installation challenges
- task management skills to:
  - adhere to all safety requirements
  - work systematically with required attention to detail
- technical skills to:
  - perform diagnostic procedures
  - problem solving and fault-finding techniques:
    - enterprise methods
    - escalation level
    - halving technique
  - use hand and power tools.
  -

Required knowledge

- broad knowledge of whole industry product range
- customer service principles, particularly dealing with customers face to face
- enterprise diagnosis methods for test analysis and diagnosis
- enterprise or service specific knowledge of products and services supplied
- OHS general principles and enterprise specific JSA requirements
- overview knowledge of:
  - objectives and methods of training for product use for customer education
  - radio frequency (RF) theory, principles and safety
  - telephony principles to support return path awareness
- pre-installation enterprise-specific requirements
- quality assurance of enterprise requirements
- return path technology
- signal measurement and other enterprise-specific tools

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- understanding of contemporary equipment and connection methods
- use test equipment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • demonstrate methodical approach to fault identification • interpret test results • repair fault and test to verify outcomes • document fault, including nature, location, likely causes and repair methodology.
Context of, and specific resources for assessment	Assessment must ensure: • site for locating and rectifying DRE faults • range of DRE currently used in industry • range of test equipment required for DRE testing.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing diagnostic tests • direct observation of the candidate locating and rectifying DRE faults • oral or written questioning of the candidate to assess knowledge of DRE and test methods and repair methodology.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTDRE3156B Install digital reception equipment. Aboriginal people and other people from a non-English speaking background may have second language issues.

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	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations

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	• Environmental Protection Acts • Trades Practices Act • ISO Draft 11801 • OHS • regulated or industry codes of practice including appropriate Australian Communications and Media Authority (ACMA) standards • relevant Institute of Electrical and Electronics Engineers (IEEE) standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Safety hazards may refer to:	• debris • excessive dust or noise • exposed electrical wiring • exposed machinery • industrial • spilled chemicals • unsafe spatial separation of cables • unsafe structures • wet areas.
Warranties may refer to:	• support as specified by the equipment manufacturer or supplier • support by network provider.
Service agreements may refer to:	• agreements between customer and third party • maintenance agreements between communication companies and their clients.
Equipment specifications and documentation may be found in:	• contract documents • specification schedules • system configuration diagrams and manuals.

Digital reception may include:	• services:
	  • community television
	  • FTA (open broadcast TV)
	  • IPTV
	  • pay TV
	• service provision media:
	  • cable
	  • satellite
	  • terrestrial
	  • wireless.

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Tools may include:	• crimping • fold covering sack • general electrical • general hand • stripping • terminating.
System details may include:	• functions • product • product model • type of system.
Available data may include:	• customer questioning details • customer records • details of system checks • equipment and product manuals and guides • test data.
Set top fault may include:	• aerial problems • equipment failure • faulty circuit board • faulty parts • power and TV terminations • program errors.
Existing customer equipment fault may include:	• colour variation • customer TV and video • distorted sound quality • ghosting • picture not filling the screen • poor reception • pre-made fly leads • rolling picture • use of non-approved peripheral equipment connected to pay TV equipment.

Methodical approach may include:	• fault-finding methodology described in system, equipment and product manuals and guides
	• methods for fault finding and repair:
	  • equipment reprogram
	  • functionality tests
	  • replacement repair or modification
	  • visual inspections.

Fault-finding may be done:	• as part of a service agreement • on a fee for service basis as agreed with client.

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Likely damage may include:	• broken display • broken remote control • damaged cable • damaged connectors • excessive dust • heat damage • spillage • water damage.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Unit Sector(s)

Telecommunications - Digital reception technology

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ICTDRE3165A Install a complex digital reception system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design, install, test and commission a complex digital reception system. Depending on the particular installation, organisational requirements, and state or territory legislation, specific licences may be required in areas such as: • working at heights • confined spaces • working on construction worksites. Some cabling and installation work may fall within the definition of construction work. If so, people entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007). Achievement of the unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction and Plumbing Services Integrated Framework Training Package fulfils this requirement. Users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Technicians working on large scale, complex radio frequency (RF) and digital distribution systems, such as master antenna television (MATV), and satellite master antenna television (SMATV) in commercial or multi-dwelling unit (MDU) environment apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan the installation of a complex digital reception system	1.1. Notify ***customer*** to arrange access to site and identify ***customer equipment*** 1.2. Select type of ***complex digital systems*** and consequent constraints on installation according to client specifications 1.3. Complete a job safety analysis (JSA) identifying occupational health and safety (OHS) issues 1.4. Prepare for installation according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.5. Verify ***design requirements*** are suitable for site application and required system performance
2. Assemble complex digital reception system	2.1. Select and obtain materials, ***tools and equipment*** for installation 2.2. Select suitable ***headend*** location and cable access 2.3. Build headend according to design requirements and manufacturer's specifications 2.4. Configure headend and distribution devices to operate according to design and manufacturer's specifications 2.5. Run ***cables*** along identified runs 2.6. Terminate cables according to both design and manufacturer's specifications
3. Test and commission system	3.1. Conduct ***performance test*** operation of headend and distribution ***devices*** 3.2. Activate system and conduct signal measurement using test equipment 3.3. Record and analyse initial test results for quality of service according to design specifications 3.4. Rectify identified faults and adjust system to optimal operation 3.5. Conduct final signal measurement using test equipment to ***optimise performance*** 3.6. Update design plans to 'as built' status
4. Complete administrative tasks	4.1. Record final commissioning test results and settings in line with client requirements 4.2. Complete appropriate records and test results, and store according to policy 4.3. Completion of all financial and other documentation 4.4. ***Handover to customer*** and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - negotiate with site owner and organisations or individuals who may be affected by an outage
  - provide advice and guidance to others or to seek assistance
- literacy skills to interpret technical documentation, specifications and service orders
- numeracy skills to:
  - set up
  - check that equipment is calibrated
  - take RF measurements
  - interpret results
  - evaluate different types of technical data
- planning and organisational skills to organise and prepare installation resources
- problem solving skills to respond to typical antenna installation challenges
- task management skills to:
  - work systematically with required attention to detail
  - adhere to all safety requirements
- technical skills to:
  - use hand and power tools
  - operate a range of specialised radio communications equipment
  - perform diagnostic procedures.

Required knowledge

- detailed knowledge of procedures and equipment required for measurement of:
  - forward and reflected RF power
  - feedline insertion loss
  - distance to fault
  - modulation error rate (MER) and bit error rate (BER) for the purpose of signal integrity
- features of instruments, test equipment and performance requirements
- performance of adjustments (tuning, balancing and replacing components)

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REQUIRED SKILLS AND KNOWLEDGE
• legislation, codes of practice and other formal agreements that directly impact on operation and testing of radio communications antennas and equipment • MATV and SMATV • overview knowledge of RF spectrum • RF awareness, electromagnetic radiation (EMR) standards and specific OHS requirements that impact on the use and testing of radio communications instruments and equipment • typical issues and challenges that occur in telecommunications antenna installations

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan, assemble and install a complex digital reception system • conduct functionality tests and interpret results • perform handover to customer • apply related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • site for complex digital reception system installation • range of complex digital reception systems currently used in industry • range of test equipment required for digital reception system installation and testing.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing a complex digital reception system • direct observation of the candidate conducting signal

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EVIDENCE GUIDE	
	measurement and adjusting for optimal performance • oral or written questioning of the candidate to assess knowledge of complex digital reception systems • oral or written questioning of the candidate to assess knowledge of test methods and performance requirements.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTDRE4166A Integrate customer digital reception equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different

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RANGE STATEMENT	
work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Customer may include:	• consultant • individual client • project manager • site manager • site supervisor.
Customer equipment may include:	• digital free to air (FTA) • hard disk recorder • high definition (HD) TV • home automation • MATV • media centre • SMATV • video player • video and audio distribution systems.
Complex digital systems may include:	• MATV • SMATV.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authoruty (ACMA) technical standards • ARPANSA EMR standard • Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • equipment standards, intrinsically safe lightning protection, site engineering standard • fire regulations • heritage legislation • international standards • local government • OHS • Radcoms Act • Telecoms Act.

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RANGE STATEMENT	

Design requirements may include:	• equipment performance
	• symbols:
	  • audiovisual (AV) system features
	  • common electrical circuit features.

Tools and equipment may include:	• hand and power tools
	• test equipment:
	  • antenna analyser
	  • directional RF power meter
	  • multimeter
	  • return loss measuring equipment
	  • RF termination
	  • spectrum analyser.

Headend may include:	• RF • optical.
Cables may include:	• flexible coaxial • interconnected cable harness • optical • rigid or semi-rigid coaxial line.

Performance test may include:	• antenna sweep:
	  • antenna analyser
	  • return loss bridge and RF sweep generator
	  • scalar network analyser
	  • vector network analyser
	• distance to fault
	• insertion loss
	• reflected power:
	  • antenna analyser
	  • directional power meter at a single frequency only
	  • return loss bridge and RF sweep generator
	  • scalar network analyser
	  • vector network analyser
	• return loss.

Devices may include:	• active:
	  • amplifiers
	  • modulators
	• passive:
	  • couplers

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RANGE STATEMENT	
	• multi-switches • splitters • taps.
Optimise performance may relate to:	• antenna orientation • aspect ratio • contrast • picture quality • signal amplification adjustment.
Handover to customer may include:	• functionality demonstration • provision of appropriate literature • training customers on equipment use.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Digital reception technology

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ICTDRE3248A Design communications wiring systems for customer premises

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to design a smart cable wiring system for customer premises.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an Australian Communications and Media Authority (ACMA)-accredited registrar. ACMA open registration with appropriate industry endorsements is essential.

Application of the Unit

Cablers installing cabling systems apply the skills and knowledge in this unit.

The unit applies to emerging opportunities in domestic and small to medium enterprise information technology. The digital reception stream in ICT qualifications has related units, such as ICTDRE4166A Integrate customer digital reception equipment.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

ICTCBL2137B Install, maintain and modify customer premises communications cabling: ACMA Open Rule

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to design a wiring system for premises	1.1 Consult customer and visit work site to determine immediate and future ***functional needs*** of the cabling system 1.2 Identify and document immediate and future location of the cabling system ***customer interface elements***, and seek confirmation from ***appropriate persons*** 1.3 Review ***technology*** used to deliver functional needs 1.4 Identify specific ***service provider*** requirements and requirements of ***applicable standards, codes and regulations***
2. Design a wiring system for premises	2.1 Follow ***work health and safety*** procedures when carrying out the work 2.2 Transfer functional needs of customer to architectural plans 2.3 Determine size and location of home distributor, security system, carrier and carriage service facilities, antennas and switch boards 2.4 Identify cable pathways and ***cable support systems*** 2.5 Select appropriate ***cable types*** to meet functional needs 2.6 Develop cable identification method to aid the installation
3. Document the cable wiring system design	3.1 Document by room the customer interface elements 3.2 Document requirements for the home distributor, security system, carrier and carriage service facilities, antennas and switch boards 3.3 Document ***testing and commissioning requirements*** 3.4 Specify ***user documentation*** required after the completion of the installation 3.5 Provide customer quote that includes a bill of materials and

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	a project schedule

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret customer requirements
- communication skills to liaise with customer to ensure requirements are identified
- literacy skills to interpret technical standards, regulations and codes
- numeracy skills to provide costings
- planning and organising skills to:
  - develop a cabling design
  - develop an installation schedule
- workplace safety awareness skills, with particular attention to accessing work sites safely
- writing and drafting skills to document specifications and record plans.
-

Required knowledge

- cabling standards, regulations and codes:
  - building regulations that apply to the installation of cabling systems
  - code of practice for home wiring
  - standard called on by the code of practice for home wiring
  - standards mandated by ACMA
- carrier network delivery systems used in single dwelling and multi-dwelling units for:
  - fibre
  - fixed wireless
  - satellite
  - twisted copper pair
  - subscription TV
- cabling requirements of home technologies:
  - age and assisted living
  - communications
  - digital home health
  - energy management
  - entertainment

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  - intelligent light and power
  - security and safety
- test methods and performance requirements.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • capture customer functional needs for cabling system • apply industry standards, regulations and codes when designing the wiring system for customer premises • develop a detailed design in compliance with industry practices, including signal losses and/or expected measurements that need to be achieved at wallplates • document the design, including a bill of materials, schedule of work and associated costs.
Context of and specific resources for assessment	Assessment must ensure: • candidate is provided with a contemporary dwelling design, which covers all functional requirements of a modern home • candidate has access to all current standards, codes and regulations.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate communicating with the customer • review of the planning sheets used by the candidate in developing the design • oral and written questioning to assess candidate skills and knowledge.
Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, for example: • ICTTEN4229B Design, install and configure a customer smart technology network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Functional needs may include:	• age and assisted living • communications • digital home health • energy management • entertainment

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	• intelligent light and power • security and safety.

Customer interface elements may include:	• audio visual systems:
	  • speakers
	  • screens
	  • remote control
	• entertainment outlets: F connectors
	• intercom:
	  • internal station
	  • outdoor station
	• light fittings
	• power points
	• security:
	  • passive infra-red (PIR) sensors
	  • smoke detectors
	  • code pads
	• telecommunications outlets RJ45.

Appropriate persons may include:	• architect • builder • consultant • customer.
Service provider may include:	• age and assisted service providers • content providers, such as subscription TV providers • home health providers • internet/broadband service providers • security service providers • telecommunications carriers.

Applicable standards, codes and regulations may include:	• AS/ACIF S009
	• AS/NZS 1367
	• AS/NZS 3000
	• AS/NZS ISO/IEC 15018
	• AS 4755.3.1
	• AS 4755.3.2
	• AS 4755.3.3
	• code of practice for home wiring series:
	  • Quick Guide to Smart Wired®
	  • code of practice for home wiring
	  • installer handbook for home wiring
	• digital taskforce handbooks
	• HB252

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	• ISO/IEC TR 15067-4
	• subscription TV standards:
	  • domestic installation manual
	  • manuals for multi-dwelling units, multi-residential estates and commercial installations
	  • installer product list
	  • installer handbook for satellite feed into multi-dwelling units and commercial installations
	• vendor- and equipment-specific handbooks.

Work health and safety may include:	• identifying hazards:
	  • installation site
	  • earth potential rise (EPR)
	• personal protective clothing:
	  • head protection
	  • safety boots.

Cable support systems may include:	• cable tray • catenary • duct and conduit.

Cable types may include:	• coaxial cable RG6, RG11 or better
	• intelligent light and power:
	  • data bus twisted pair
	  • tough plastic sheath (TPS)
	• security cable:
	  • four core multi-strand
	  • six core multi-strand
	• unshielded twisted pair (UTP) Category 5, 6, 7 and beyond.

Testing and commissioning requirements may include:	• certification testing:
	  • attenuation-to-crosstalk ratio (ACR)
	  • attenuation
	  • crosstalk
	  • equal level far end crosstalk (ELFEXT)
	  • far end crosstalk (FAXT)
	  • length
	  • power sum near end crosstalk PS (NEXT)
	  • wire map
	• continuity and pair integrity testing
	• delay skew
	• return loss
	• radio frequency (RF) signal tests:
	  • bit error ratio (BER)

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	• modulation error ratio (MER) • teflection • testing to AS/NZS3017.
User documentation may include:	• as-built plans • cable losses • certificate of compliance of electrical testing • code compliance label • copy of test results • device losses • telecommunications cabling advice form.

Unit Sector(s)

Telecommunications - Digital reception technology

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ICTDRE3249A Develop integrated digital reception systems

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to develop integrated digital reception system applications, topologies, devices and capabilities, and system programming methods. The unit also covers the use of diagnostic tools and documentation of developed systems.

The skills and knowledge described in this unit do not require a licence to practice in the workplace. Practice in the workplace and during training are subject to work health and safety (WHS) regulations and codes of practice.

Application of the Unit

This unit applies to cablers who install digital reception equipment and cabling systems. It applies to emerging opportunities in domestic and small to medium enterprise information technology.

The digital reception stream in ICT qualifications has related units, such as ICTDRE3248A Design communications wiring systems for customer premises.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to develop an integrated system	1.1 Determine types and location of loads and control devices from project specifications and ***customer*** requirements 1.2 Determine number of control bus networks and current requirements from load calculations for devices on the system 1.3 Determine appropriate placement of system devices to optimise bus network power and load parameters, and to maintain system stability 1.4 Develop an integrated system to comply with regulator, safety and manufacturer requirements 1.5 Document take-off of the number of devices and accessories required for the system using manufacturer's title and ID for each 1.6 Download required programming and diagnostic tools to a compatible PC and check for correct operation and safety
2. Program integrated system devices	2.1 Follow WHS risk control measures and procedures 2.2 Apply correct modes of programming to develop integrated system according to manufacturer's programming software instructions 2.3 Follow manufacturer's instructions and recommendations when programming system devices to project requirements 2.4 Program the parameters for operation of loads to project requirements and within manufacturer's designated range 2.5 Save and back up the programmed system database according to manufacturer instructions
3. Load and test integrated system	3.1 Follow WHS risk control work measures and procedures 3.2 Transfer database of integrated system program to the

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	network 3.3 Test all functions of the integrated system for compliance with project requirements and manufacturer specifications 3.4 Use diagnostic tools to locate system faults, defects and anomalies 3.5 Correct defects and anomalies to comply with project requirements and manufacturer specifications 3.6 Provide copy of documentation of integrated system at ***handover to customer***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - negotiate with site owner and organisations or individuals who may be affected by an outage
  - provide advice and guidance to others or seek assistance
- literacy skills to interpret technical documentation, specifications and service orders
- numeracy skills to:
  - check that equipment is calibrated
  - interpret results of system testing
  - evaluate different types of technical data
- planning and organising skills to organise and prepare installation resources
- problem-solving skills to respond to programming challenges
- task-management skills to:
  - work systematically with required attention to detail
  - adhere to safety requirements
- technical skills to:
  - operate computer equipment
  - perform diagnostic procedures
  - undertake fault-finding activities, including the use of multimeters, oscilloscopes, system analysers and diagnostic software.
  -

Required knowledge

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- applications and advantages of integrated systems
- bus system cable type, polarity, length and acceptable topologies
- controlling digital system integration (DSI) and communicating with digital addressable lighting interface (DALI) electronic ballasts
- factors that affect control bus stability, including number of units on a network, and current drawn by devices in relation to current output of power supplies
- operating parameters of integrated systems and programming to an extent indicated by the following aspects:
  - importance of project documentation and backup
  - importance of the location of output and input devices and control bus power supplies
- lighting dimmer capabilities and selection
- low voltage (LV) supply overcurrent and surge protection
- multiple network connectivity
- software for system and device programming, monitoring and control
- system and device programming, encompassing:
  - addressing conventions for networks, devices, applications, output groups, types of control and outputs, which include ‘on’, ‘off’, a specific level, and over a specific time
  - PC programming tools and methods (programming includes configuring network database using addressing tools and objects, function objects, editing, altering and transferring the data base to network)
- system fault-finding processes
- system components, encompassing:
  - support devices for control bus supply and control
  - support devices for programming, interconnection between networks and integration with third party systems
- types and capabilities of output devices
- types and capabilities of input devices.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement WHS procedures and practices when developing an integrated system • apply sustainable energy principles and practices when

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	developing an integrated system
	• determine the types and location of loads and control devices
	• use load calculations to correctly determine the number of network and current requirements
	• place system devices appropriately in the system scheme
	• check programming and diagnostic tools
	• apply appropriate modes of programming to develop the integrated system
	• follow manufacturer instructions and recommendations in programming devices and setting load operating parameters
	• develop an integrated system to comply with regulator, safety and project requirements
	• download program to network successfully
	• use diagnostic tools to locate and correct system defects, faults and anomalies
	• document and back up an integrated system during the following stages of the project:
	  • at preparation
	  • at programming
	  • at completion.

Context of and specific resources for assessment	Assessment must ensure: • a typical contemporary dwelling into which a digital system will be developed • availability of all functional requirements of a modern home • access to contemporary digital equipment • access to all current standards, codes and regulations.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing a digital reception system • direct observation of the candidate conducting signal measurement and adjusting for optimal performance • oral or written questioning of the candidate to assess knowledge of complex digital reception systems • oral or written questioning of the candidate to assess knowledge of test methods and performance requirements.
Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, for example: • ICTTEN4229B Design, install and configure a customer smart technology network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Customer may include:	• consultant • individual customer • project manager • site manager • site supervisor.

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Handover to customer may include:	• demonstrating functionality • providing appropriate literature • training customer on equipment use.

Unit Sector(s)

Telecommunications - Digital reception technology

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ICTDRE4166A Integrate customer digital reception equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to integrate emerging audiovisual technology equipment in a customer home network. Home networks integrate many services such as broadband, digital TV, free to air (FTA), subscription TV (pay TV) and Internet protocol TV (IPTV). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to an installer working with a wide range of customer equipment types, in a variety of customer premises requiring current knowledge of equipment capabilities and connection types. The unit is contextually limited to radio frequency (RF) signal services.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate existing customer equipment	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Notify customer to verify installation order and arrange for site access to comply with security arrangements 1.3. Notify supervisor of identified ***safety hazards*** at the worksite and complete a job safety analysis (JSA) before commencing work 1.4. Use ***test equipment*** to verify that ***customer equipment*** is operational prior to installation 1.5. Assess equipment capabilities and connection types against customer requirements for suitability

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ELEMENT	PERFORMANCE CRITERIA
	1.6. Assess ***customer premises*** against installation plan according to ***client specifications*** and ***by-laws***, ***standards and regulations*** 1.7. Produce an installation diagram using appropriate ***drawing symbols*** to indicate connection details of customer system
2. Design and build the system	2.1. Determine connection pathways for ***optimal performance*** of system equipment 2.2. Confirm compatibility for proposed connections to existing system 2.3. Produce a final design with block diagrams and specifications 2.4. Select and connect ***cables*** to suit connectivity using appropriate ***materials*** 2.5. Activate equipment to check for operation of the network
3. Provide enterprise equipment	3.1. Determine best method of connection to service source according to ***client*** specifications 3.2. Connect service to system following occupational health and safety (***OHS***) ***and environmental requirements*** and test to verify status of the connection 3.3. Notify ***service provider*** if identified problems cannot be rectified at the local level
4. Configure services and optimise customer system	4.1. Conduct client specific and ***customer*** set-up operations 4.2. Test performance of enterprise and customer equipment across a range of settings 4.3. Record and evaluate test results to satisfy manufacturer's operational margins 4.4. Tune customer equipment for optimal performance 4.5. Restore site to original condition and customer satisfaction
5. Train customer and complete contract documentation	5.1. Conduct ***customer training*** appropriate to the equipment, services and vendor literature 5.2. Complete ***appropriate records*** and update administration systems according to enterprise policy 5.3. Record and store test results in the appropriate database, leaving copies on site according to enterprise policy 5.4. Provide ***warranties*** to customer in required format

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ELEMENT	PERFORMANCE CRITERIA
	where work and equipment are subject to warranty 5.5. Prepare invoices and other financial documentation, where required ,and present to customer 5.6. Obtain authorised signatures on required documentation to confirm acceptance of completed work

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customer and colleagues and negotiate with site owner
- literacy skills to interpret technical documentation, specifications and service orders
- numeracy skills to take measurements and interpret results
- planning and organisational skills to provide enterprise equipment
- problem solving skills to respond to typical integration challenges
- task management skills to:
  - adhere to all safety requirements
  - work systematically with required attention to detail
- technical skills to:
  - configure services
  - design and build system
  - perform diagnostic procedures
  - use hand and power tools
  - use test equipment for signal measurement and other enterprise-specific tools

Required knowledge

- analog and digital connectors
- contemporary equipment and connection methods
- continuity, ingress, egress, signal level and signal quality performance tests
- customer service principles, particularly dealing with customers face-to-face
- enterprise or service specific knowledge of products and services supplied
- equipment types:

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REQUIRED SKILLS AND KNOWLEDGE
• amplifiers • couplers • splitters • taps • modulation techniques • objectives and methods of training for product use for customer education • OHS general principles and enterprise-specific JSA requirements • performance adjustments for tuning, balancing and replacing components • quality assurance of enterprise requirements • test analysis and diagnosis (enterprise diagnosis methods) • video and audio fundamentals

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify the modulation and other signal characteristics of a range of contemporary products • design and build system • install three types of equipment and services applying all related OHS requirements and work practices • configure services and optimise customer system • conduct functionality tests and interpret results • provide customer training appropriate to the equipment • complete the task and handover to customer.
Context of, and specific resources for assessment	Assessment must ensure: • site for DRE integration • DRE currently used in industry • test equipment required for DRE integration.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples

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EVIDENCE GUIDE	
	are appropriate for this unit: • direct observation of the candidate installing three types of equipment and services applying all related OHS requirements and work practices • direct observation of the candidate configuring services and optimising customer system • oral or written questioning of the candidate to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTDRE4167A Integrate data delivery modes. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT

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RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • Trades Practices Act • Institute of Electrical and Electronics Engineers (IEEE) standards • ISO Draft 11801 • OHS • regulated or industry codes of practice including appropriate Australian Communications and Media Authority (ACMA) standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Safety hazards may refer to:	• debris • excessive dust or noise • exposed electrical wiring • exposed machinery • industrial • spilled chemicals • unsafe spatial separation of cables • unsafe structures • wet areas.

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RANGE STATEMENT	
Test equipment may include:	• multimeter • signal level meter • spectrum analyser.

Customer equipment may include:	• devices:
	  • antennas
	  • audio equipment (amplifiers and equalisers)
	  • recorders (disk and hard drive)
	  • speaker systems
	  • TV receivers
	• digital FTA
	• hard disk recorder
	• high definition (HD) TV
	• home automation
	• LCD TV
	• media centre
	• plasma TV
	• security systems
	• simulation consoles
	• video player
	• video and audio distribution systems.

Customer premises may include:	• alternative construction types, such as mud brick • concrete construction • domestic brick or timber dwelling • multi-level construction.
Client specifications may include:	• equipment types • policy, procedures and practices • service level agreements (SLAs) • standards and quality requirements.
By-laws, ***standards and regulations*** may include:	• Australian and New Zealand standards and cabling regulations • council by-laws for siting equipment and cables • electrical safety factors.
Drawing symbols may include:	• audiovisual (AV) system features • common electrical circuit features.
Optimal performance may include:	• antenna orientation • aspect ratio

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RANGE STATEMENT	
	• contrast • picture quality • signal amplification adjustment.
Cables may include:	• coaxial • optical fibre.
Materials may include:	• antennas • cables • joiners • plugs and other connectors • support fittings.
Client may be:	• the organisation contracting the work • the organisation providing services.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Service provider may be:	• an internet service provider (ISP) or a

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RANGE STATEMENT	
	delegated organisation acting on their behalf • a registered telecommunications carrier.
Customer may include:	• an individual • entity who is the final recipient of the service.
Customer training may include:	• customer to operate equipment functions • demonstration to customer • explanation of operating functions as provided in vendor product literature • explanation of relevant equipment functions • feedback to customer on their operation of equipment functions.
Appropriate records may include:	• connection records • equipment user guides • invoices.
Warranties may include:	• support provided by network service provider • support specified by the equipment manufacturer or supplier.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Digital reception technology

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ICTDRE4167A Integrate data delivery modes

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to connect and configure a media centre that integrates signal for distribution. Received signals from radio frequency (RF) sources are combined with voice and data signals from other sources and the composite signal is distributed to a range of devices. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to an installer working in a digital reception sector integrating services from multiple sources and in multiple formats (RF, digital, data, and voice) for both inward and outbound signals into complex customer systems. Note: This unit builds on ICTDRE4166A Integrate customer digital reception equipment, and extends the concept of system integration by adding a new dimension - multiple services and multiple delivery modes.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate existing customer equipment	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Notify customer to verify installation order and arrange for site access to comply with security arrangements 1.3. Notify supervisor of identified ***safety hazards*** at the

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ELEMENT	PERFORMANCE CRITERIA
	worksite and complete a job safety analysis (JSA) before commencing work 1.4. Use ***test equipment*** to verify that ***customer equipment*** is operational prior to installation 1.5. Assess equipment capabilities and connection types against customer requirements for suitability 1.6. Assess ***customer premises*** against installation plan according to ***client specifications*** and ***by-laws***, ***standards and regulations*** 1.7. Produce an installation diagram using appropriate ***drawing symbols*** to indicate connection details of customer system
2. Design and build a multiple service customer system solution	2.1. Determine connection requirements and pathways for each ***service*** to be connected and locate a signal source for each service 2.2. Confirm compatibility for proposed pathway options connections to existing system and for ***optimal performance*** 2.3. Produce a preliminary connection plan with block diagrams and specifications to optimise system performance 2.4. Evaluate connection plan design to determine any ***local spectrum management issues*** arising from multiple service 2.5. Produce a final connection design with amendments to eliminate local spectrum management contentions if required 2.6. Select and connect ***cables*** according to connection plan using appropriate ***materials*** 2.7. Activate equipment to check for operation of the network 2.8. Resolve connection issues that arise during the build phase and modify connection plan
3. Provide enterprise equipment with multiple services	3.1. Determine optimal method of connection to each service source according to ***client*** specifications 3.2. Connect service to system following occupational health and safety (***OHS***) ***and environmental requirements*** and test to identify and rectify connection issues 3.3. Notify ***service provider*** if problems cannot be rectified at the local level and escalate unresolvable connection issues accordingly

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ELEMENT	PERFORMANCE CRITERIA
4. Configure services and optimise customer system across multiple services	4.1. Conduct client specific and ***customer*** set-up operations for each service 4.2. Test performance of enterprise and customer equipment across a range of settings 4.3. Test integrated performance of system across multiple services 4.4. Record and evaluate test results to satisfy manufacturer's operational margins 4.5. Tune customer equipment for optimal integrated performance across multiple services 4.6. Restore site to original condition and customer satisfaction
5. Train customer and complete contract documentation	5.1. Conduct ***customer training*** appropriate to the equipment, services and vendor literature 5.2. Complete ***appropriate records*** and update administration systems according to enterprise policy 5.3. Record and store test results in the appropriate database, leaving copies on site according to enterprise policy 5.4. Provide ***warranties*** to customer in required format where work and equipment are subject to warranty 5.5. Prepare invoices and other financial documentation where required and present to customer 5.6. Obtain authorised signatures on required documentation to confirm acceptance of completed work

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with customer and colleagues and negotiate with site owner • literacy skills to interpret technical documentation, specifications and service orders • negotiation skills to interact with site owner

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REQUIRED SKILLS AND KNOWLEDGE

- numeracy skills to take measurements and interpret results
- planning and organisational skills to provide enterprise equipment
- problem solving skills to respond to typical integration challenges
- task management skills to:
  - adhere to all safety requirements
  - work systematically with required attention to detail
- technical skills to:
  - adjust performance by tuning, balancing and replacing components
  - configure network
  - perform digital home technology integration (DHTI) and troubleshooting
  - perform tests for continuity, ingress, egress, signal level and signal quality
  - use hand and power tools
  - use test equipment for signal measurement and other enterprise-specific tools

Required knowledge

- contemporary equipment and connection methods
- customer service principles, particularly dealing with customers face to face
- enterprise or service specific knowledge of products and services supplied
- equipment types:
  - amplifiers
  - couplers
  - taps
  - splitters
- home automation
- home theatre systems
- modulation techniques
- OHS general principles and enterprise specific JSA requirements
- performance adjustments for tuning, balancing and replacing components
- quality assurance of enterprise requirements
- security systems
- telephone service
- test analysis and diagnosis (enterprise diagnosis methods)
- test equipment and signal measurement and other enterprise-specific tools
- video and audio fundamentals
- wireless local area networks (WLANs)
- wireless technology

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify service requirements of a range of contemporary products • design and build a multiple service customer system solution • install and integrate at least two services to a customer system comprised of at least three equipment components applying all related OHS requirements and work practices • activate and optimise customer equipment using two or more signal sources • configure services and optimise customer system across multiple services • conduct functionality tests and interpret results • provide customer training appropriate to the equipment.
Context of, and specific resources for assessment	Assessment must ensure: • site for data delivery modes integration • range of equipment currently used in industry • range of test equipment required for data delivery integration.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and integrating at least two services to a customer system comprised of at least three equipment components • direct observation of the candidate configuring services and optimising customer system across multiple services • oral or written questioning of the candidate to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

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EVIDENCE GUIDE	
	• ICTDRE4166A Integrate customer digital reception equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1

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RANGE STATEMENT	
	• AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • Trades Practices Act • ISO Draft 11801 • OHS • regulated or industry codes of practice including appropriate Australian Communications and Media Authority (ACMA) standards • Institute of Electrical and Electronics Engineers (IEEE) standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Safety hazards may refer to:	• debris • excessive dust or noise • exposed electrical wiring • exposed machinery • industrial • spilled chemicals • unsafe spatial separation of cables • unsafe structures • wet areas.
Test equipment may include:	• multimeter • signal level meter • spectrum analyser.

Customer equipment may include:	• devices:
	  • antennas
	  • audio equipment (amplifiers and equalisers)
	  • recorders (disk and hard drive)
	  • speaker systems

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RANGE STATEMENT	
	• TV receivers • digital free to air (FTA) • hard disk recorder • high definition (HD) TV • home automation • LCD TV • media centre • plasma TV • security systems • simulation consoles • video player • video and audio distribution systems.
Customer premises are building types including:	• alternative construction types, such as mud brick • concrete construction • domestic brick or timber dwelling • multi-level construction.
Client specifications may include:	• equipment types • policy, procedures and practices • service level agreements (SLAs) • standards and quality requirements.
By-laws, ***standards and regulations*** may include:	• Australian and New Zealand standards and cabling regulations • council by-laws for siting equipment and cables • electrical safety factors.
Drawing symbols may include:	• audiovisual system features • common electrical circuit features.

Service may include:	• data services cable:
	  • ADSL
	  • ADSL2
	  • ADSL2+
	• Internet protocol TV (IPTV)
	• other service delivery modes as they emerge
	• satellite telephony and data services
	• telephone services via cable
	• wireless services.

Optimal performance may include:	• antenna orientation • aspect ratio

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RANGE STATEMENT	
	• contrast • picture quality • signal amplification adjustment.
Local spectrum management issues may include:	• bandwidth overlap for local wireless communication devices • bandwidth overlap for remote control devices.
Cables may include:	• coaxial • optical fibre.
Materials may include:	• antennas • cables • joiners • plugs and other connectors • support fittings.
Client may be:	• the organisation contracting the work • the organisation providing services.

OHS and environmental requirements may include:	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• environmental considerations include:
	  • clean-up protection

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RANGE STATEMENT	
	• stormwater protection • waste management.
Service provider may be:	• an internet service provider (ISP) or a delegated organisation acting on their behalf • a registered telecommunications carrier.
Customer may include:	• an individual • entity who is the final recipient of the service.
Customer training may include:	• customer to operate equipment functions • demonstration to customer • explanation of operating functions as provided in vendor product literature • explanation of relevant equipment functions • feedback to customer on their operation of equipment functions.
Appropriate records may include:	• connection records • equipment user guides • invoices.
Warranties may include:	• support provided by network service provider • support specified by the equipment manufacturer or supplier.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Digital reception technology

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ICTEDU3053A Train customers in new technology

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to conduct training for customers on telecommunications equipment. It involves assessing the type of training suitable for the product and customer, delivering and checking the training. The equipment may be a new installation or technology or an upgrade for an existing network or subsystem deploying Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Customer premises equipment (CPE) installation staff or dedicated trainers involved in very large installations apply the skills and knowledge in this unit. The unit applies to convergent technology applications, such as internet protocol TV (IPTV), digital TV and internet protocol (IP) based customer equipment.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify training required	1.1. Confirm ***training to be provided*** with the installation quote 1.2. Assess customer's expertise and actual ***training details*** 1.3. Identify and prepare for specialised training needs 1.4. Provide quotes for enhanced training and confirm with the customer
2. Conduct training	2.1. Demonstrate and explain relevant ***equipment***, ***functions and network facilities*** 2.2. Provide customers with hands-on experience operating the equipment 2.3. Provide feedback to customers on their operational

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ELEMENT	PERFORMANCE CRITERIA
	ability 2.4. Provide customers with relevant ***product literature*** 2.5. Provide enhanced training as agreed
3. Check training	3.1. ***Measure*** customer's skill in the use of the equipment 3.2. Review training delivery and note improvements 3.3. Update and store records according to organisational requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical sills to use information to ascertain training needs
- communication skills to:
  - communicate with customers, employer, supervisors, work associates, team members and other contractors
  - give constructive feedback
  - organise and give demonstrations
  - provide clear information
- literacy skills to complete and maintain documentation
- numeracy skills to cost training
- planning and organisational skills to manage training program

Required knowledge

- content of learning to be provided
- learner characteristics and needs
- sources and availability of technical training information
- training techniques:
  - demonstration
  - individual and group activities
  - instruction
  - questioning

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• identify training needs required for CPE installation
	• conduct customer training on a CPE installation including:
	  • demonstration
	  • hands-on experience
	  • feedback on performance
	• complete training documentation.

Context of, and specific resources for assessment	Assessment must ensure: • training resources • CPE product information • training rooms.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of training plans prepared by the candidate • direct observation of the candidate conducting a training program session • oral or written questioning of the candidate on the training process and review.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTEDU5025A Develop and deliver training associated with new and modified products. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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EVIDENCE GUIDE	
	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Training to be provided may be:	• general • specific to particular products.
Training details may include:	• enhanced with specific price structure • language, literacy and numeracy levels • learning styles • product specifications • past learning and work experiences • specific needs.
Equipment, functions and	• NGN:

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RANGE STATEMENT	
network facilities may include:	• broadband access • data transfer • home networks • IP based systems • IP PBX • IP security networks • IPTV • mobile data • mobile telephony • multimedia • remote telemetry • video • voice over internet protocol (VoIP).
Product literature may include:	• configuration • equipment plans • explanatory booklets • manuals • training aids • user guides.
Measure may include:	• informal review or discussion • learner evaluations • learner feedback • observation.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Education

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ICTEDU5025A Develop and deliver training associated with new and modified products

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop and deliver effective training to users, operators of telecommunications equipment and to other interested parties. This competency encompasses training for information and operational purposes. It does not qualify a candidate to deliver training within a Registered Training Organisation (RTO) for national competencies or qualifications unless otherwise qualified. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical personnel may apply the skills and knowledge in this unit in customer support activities for the purpose of training technical support or maintenance staff. It may apply to communications applications whether digital or analog, including telephony, data, video, including digital broadcasting, computer networks, including local area networks (LAN), wide area networks (WAN) and multimedia. This unit may be applied to domestic, commercial or

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	industrial installations.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to develop a training program	1.1. Confirm the ***training specifications*** required for a specific product with ***client***
	1.2. Research available and relevant material and prepare

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ELEMENT	PERFORMANCE CRITERIA
	an outline for proposed training 1.3. Present and confirm suitability of proposed outline with client 1.4. Determine ***training schedule*** parameters 1.5. Establish criteria for post-training evaluation
2. Design training program and support material	2.1. Develop a training program that follows a logical sequence and builds on the existing knowledge of recipients 2.2. Create training material that meets up-to-date ***product and technical information*** and all related occupational health and safety (OHS) issues and work practices 2.3. Develop ***training delivery*** style to suit the skills of the recipient 2.4. Review and amend training material prior to product, equipment or facility changes being introduced by the company 2.5. Develop training schedule to meet needs and schedules of recipients
3. Deliver training to sales and technical staff	3.1. Deliver training sessions in a systematic fashion and in a format suitable to client's needs 3.2. Monitor student performance against pre-determined criteria 3.3. Provide feedback on student performance against pre-determined criteria 3.4. Evaluate training session against pre-determined criteria on completion and identify potential improvements
4. Complete documentation	4.1. Record session evaluation and feedback from recipients 4.2. Present report to client on effectiveness of training sessions and recommendations for improvements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE
Required skills

• communication skills to:
  • demonstrate procedures and features of products to others
  • liaise with customers to ensure requirements are known
• interpersonal skills to relate to customers, employer, work associates, team members and individuals
• literacy skills to:
  • interpret technical specifications and related documentation
  • enterprise policy and documentation
• planning and organisation skills to prepare for training, including agendas and logistical requirements
• problem solving skills to present information appropriate for a range of clients
• research skills to gain and maintain relevant and current technical knowledge

Required knowledge

• common customer telecommunications applications and related equipment
• features of specific products
• high level knowledge of the specific technical content of training and its application
• sources of:
  • reference documents available relevant to training
  • support available after training is complete

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop, deliver and report on a training program for operational and technical knowledge related to new or modified CPE product that meets customer needs • establish criteria to measure training program

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EVIDENCE GUIDE	
	effectiveness.
Context of and specific resources for assessment	Assessment must ensure: • training resources • PC rooms • training rooms • product information.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of training materials prepared by the candidate outlining design and delivery process undertaken • written training plan and lesson plan for a proposed or hypothetical training session • direct observation of the candidate conducting a training program session.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTEDU3053A Train customers in new technology. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Training specifications may include:	• cost, timeline and audience expectations • enterprise specific products • generic training products • vendor specific products.
Client may include:	• government organisation • individual • interested group • private organisation • vendor.

Product and technical information relates to:	• customer premises equipment (CPE) product
	• equipment:
	  • LAN or WAN equipment
	  • modems
	  • private branch exchange (PBX)
	  • related cabling and management systems
	  • transmission equipment
	• facilities including network facilities and system features
	• peripherals
	• product models and equipment types
	• vendor product.

Training delivery can be:	• e-learning • formal or informal • multimedia type

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RANGE STATEMENT	
	• on the job or in a simulated environment • self-paced • structured • undertaken in a classroom • vendor specific.
Training schedule includes:	• agenda • locations • times.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Education

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ICTITU5144A Test telecommunications network using virtual instruments

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to apply simulation techniques to telecommunication systems. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who work with optical communication systems apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan simulation of hardware instruments	1.1. Arrange access to the site according to required procedure 1.2. Determine the specific ***applications*** for virtual instruments in telecommunication systems 1.3. Determine the ***features*** of virtual instruments applicable to telecommunication systems, including limitations of virtual instruments 1.4. Select a ***range*** of simple and complex virtual instruments applicable to telecommunication systems
2. Perform simulation techniques	2.1. Perform measurements on telecommunication systems using simple virtual instruments 2.2. Simulate and display the properties of a modulated signal with software generated instruments following enterprise occupational health and safety (OHS) processes and procedures 2.3. Simulate and display a data signal transmitted through a band-limited channel 2.4. Control virtual instruments using data bus operation
3. Analyse simulation measurements	3.1. Determine the ***conversion processes*** used in virtual instruments 3.2. Document the potential effect of a simulation

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ELEMENT	PERFORMANCE CRITERIA
	algorithm on the readings taken 3.3. Analyse measurements in context of conversion process and simulation algorithm
4. Report measurement results	4.1. Prepare report on measurement results 4.2. Submit report to supervisor

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- research skills to source information on simulation techniques
- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to:
  - interpret technical documentation such as equipment manuals, specifications and service orders
  - write reports using standard formats
- technical skills to use:
  - simulation techniques for measurements on telecommunication systems
  - software generated instruments to display basic communication signals
  - word processing and desktop research

Required knowledge

- applications of virtual instruments
- current and emerging developments in relation to virtual instruments
- familiarity with workplace and industry environment
- instrumentation principles and practices
- internet support services
- modulation methods, AM, FM and digital formats
- organisational policy and procedures
- sampling and data conversion processes
- virtual instrument features and benefits

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • interpret and use equipment and system manuals and specifications • use latest virtual instrument test equipment • simulate signals and systems using complex virtual instruments • analyse results of simulation.
Context of and specific resources for assessment	Assessment must ensure: • internet access to virtual instrument sites • Electronic Workbench or similar software • virtual instrument applications and media • a workplace conducting operations that involve virtual instruments with support from a competent supervisor or mentor • telecommunications equipment suitable for integrating projects.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning of the candidate • direct observation of the candidate carrying out measurements using virtual instruments • evaluation of written report prepared by the candidate outlining conversion processes and analysis of test results.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTOPN5122A Test the performance of specialised optical devices

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EVIDENCE GUIDE	
	• ICTOPN5123A Analyse and integrate specialised optical devices in the network • ICTRFN5148A Test and measure cellular phone and network equipment performance. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Applications may include:	• automation systems • complex electronic design

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RANGE STATEMENT	
	• development • process control • total systems simulation.
Features may include:	• accuracy • adaptability • aliasing • bandwidth • cost • data control • portability • processing speed • resolution • sampling rates • size.
Range may include:	• optical time domain reflectometer • oscilloscope • simple multimeter • spectrum analyser.
Conversion processes may include:	• analog to digital • digital to analog.
Algorithm may include:	• calibration • Fast Fourier Transforms (FFT) • filtering • Laplace transforms.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	IT use

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ICTITU7106B Manage automated ICT system applications using unix

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to apply the Unix operating system to system automation in a distributed computing environment as used in telecommunications applications.

Application of the Unit

Telecommunication engineers apply the skills and knowledge in this unit to manage a range of automated systems within a telecommunications network.

This includes responsibility for managing databases, files systems and user administration.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Operate a Unix based system	1.1 Modify boot options by operating a Unix system 1.2 Shutdown a Unix system using system commands with ***qualifiers*** 1.3 Manage files using file management commands and wildcards and creating disk partitions and other media file systems 1.4 Mount and unmount file systems using system commands 1.5 Verify the integrity of file systems using ***system utilities*** 1.6 Configure ***telecommunication applications*** by using system commands with special ***permission modes*** 1.7 Analyse, evaluate and apply Unix features to a given telecommunications multi-user application using distributed computing
2. Apply system functions	2.1 Use the command line interface to interact with shells and commands to the telecommunications application on distributed computing 2.2 Manage files by applying ***regular expressions*** with system functions 2.3 Send text files and output streams through ***text utilities*** using commands 2.4 Evaluate and apply Unix system functions to a telecommunications application on distributed computing to create menu options

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3. Manage user login environment and customisation	3.1 Manage user and group accounts to the telecommunications application on distributed computing 3.2 Change user and group ***profiles*** to allowed security access level using commands 3.3 Scan log files for activity using commands 3.4 Configure the user environment for setting user and global profiles 3.5 Record the configuration settings
4. Manage system level functions	4.1 Automate scheduling using the system ‘cron’ command 4.2 Analyse the need for backup strategy in a telecommunications network application 4.3 Plan a backup strategy to maintain redundancy of the system 4.4 Configure the system to perform scheduled backing up the file system to various media 4.5 Verify integrity of backup operations by restoring system using backup files 4.6 Configure system log files for administration and security needs 4.7 Manage a print server and print files to provide customer service 4.8 Document the configuration backup schedules and system logs
5. Complete evaluation and configuration documentation	5.1 Produce a project evaluation report on the application of Unix features to a given telecommunications multi-user application using distributed computing with recommendations on improvements to the system 5.2 Produce a report on the management and configuration of user applications and system level functions

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

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- communication skills to:
  - present technical information
  - liaise with customers and internal team members
- literacy skills to prepare reports
- planning and organising skills to direct and manage own work
- problem solving skills to address operational issues
- research skills to gather data and information from ICT systems
- technical skills to use automated systems in distributed computing.
-

Required knowledge

- automated systems
- communication systems
- distributed computing
- encoding and programming techniques
- network security
- networking of infrastructure
- realisation of software simulation
- Unix commands.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use Unix operating system to manage ICT system functions • analyse system functions based on data • produce a report on the system with recommendations for improvement.
Context of and specific resources for assessment	Assessment must ensure: • a telecommunications operations site with Unix based system to manage automated functions.

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Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning to assess required knowledge • review of evaluation and configuration reports • direct observation of the candidate performing operational procedures on a Unix based system to manage telecommunications network functions.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG7145B Undertake a telecommunications project • ICTPMG8143B Manage a telecommunications project. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Qualifiers may refer to:	• current applications • notifications to users on future applications.
System utilities may include:	• df • du • fsck.
Telecommunication applications may include:	• directories and network files • network mountable file systems • set permissions on files.
Permission modes may include:	• sticky bit • suid.
Regular expressions may include:	• grep • sed.
Text utilities may include:	• cut • expand • fmt • head • join • nl • paste • pr • sed • sort • split.
Profiles may include:	• addresses • level of user login • passwords • type of user login.

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Unit Sector(s)

Telecommunications - IT use

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ICTNPL4107A Apply business acumen to network planning

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to consider business drivers in a decision-making process for network planning. The business processes and strategies form part of the model to justify investment in planning projects. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technicians or technical officers from private and public organisations apply the skills and knowledge in this unit to plan developments in Core or Access networks. They combine technical design skills with organisational and business skills to apply business acumen to network planning for service providers and asset owners.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Analyse forecasts using customer demand	1.1. Gather and organise information concerning customer service and usage data to determine customer demand 1.2. Determine ***trends in customer demands*** in specific customer operating environment and markets 1.3. Assess ***key measures of capacity*** and customer demand for forecast
2. Build models to develop business cases	2.1. Construct a model to represent key options to formulate strategic proposals in network planning 2.2. Access the ***legislation*** that govern carriers in Australia to determine the rights of carriers and service providers in installing facilities under

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ELEMENT	PERFORMANCE CRITERIA
	Commonwealth legislation 2.3. Produce a strategic network plan using ***key variables*** and communicate them to ***intended audience*** 2.4. Apply business case methodology to determine ***key economic measures*** and risks to business success 2.5. Evaluate business value and options to recommend appropriate planning strategy
3. Apply financial analysis	3.1. Use a ***financial investment tool*** relevant to the business environment to determine financial viability of the planning project 3.2. Apply key economic measures in an analysis process and develop business strategy 3.3. Determine relevant level of financial analysis required to optimise network planning
4. Analyse demographic trends for strategy development	4.1. Gather demographic data and determine impact of ***demographic diversity*** on planning strategies 4.2. Analyse data and produce ***demographic trends*** for use in strategy developments in network planning
5. Assess technology implementation	5.1. Determine unit costs associated with technologies and products by using lifecycle of technologies 5.2. Research what different technology bases can deliver and the circumstances and locations in which they should be successfully deployed
6. Evaluate network deployment architecture	6.1. Evaluate network deployment architecture using network deployment rules and reasoning behind architecture rules 6.2. Produce a business model of network planning applying ***commercial considerations*** and ***exemption process***

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to:

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REQUIRED SKILLS AND KNOWLEDGE

- evaluate technical and financial models
- interpret, analyse and evaluate data
- communications skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to read and interpret technical and financial information from a range of sources
- planning and organisational skills to prioritise and monitor own work
- research skills to gather information on a range of network planning issues
- technical skills to:
  - carry out financial analyses
  - use emerging technologies in network planning

Required knowledge

- business modelling
- commercial considerations:
  - capital expenditure (CAPEX)
  - operational expenditure (OPEX)
  - product revenue and demand versus network cost
  - return on investment (RoI)
  - time to market
- demographics
- emerging technologies of telecommunications
- financial investment tools:
  - cost-benefit analysis
  - investment management system
  - net present value (NPV)
- financial models
- forecasting of trends
- legislation:
  - Australian Competition and Consumer Commission (ACCC)
  - Telecommunications Industry Regulatory Accounting Framework (RAF)
  - Universal Service Obligation (USO)
- network planning processes

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse forecasts using customer demand • build models to develop business cases • apply financial analysis • analyse demographic trends for strategy development • assess technology implementation • evaluate network deployment architecture.
Context of and specific resources for assessment	Assessment must ensure: • access to network planning data, relevant databases, business and financial models • systems and deployment rules • relevant legislations, planning processes and Telecommunications Industry Regulatory Accounting Framework (RAF).
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of business models and strategic network plans completed by the candidate • oral or written questioning to assess required knowledge that applies to the business acumen for network planning • review of demographic data and research collected by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4108A Plan the deployment of access network architectures • ICTNPL4113A Plan the deployment of core network • ICTNPL4151A Plan the telecommunications access network for an estate.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Trends in customer demands may include:	• demands for new services • demographic trends • growth in customer demand • service level forecast • technology upgrade.

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RANGE STATEMENT	
Key measures of capacity may include:	• available bandwidth • available headroom in infrastructure • available outlets or ports • spare channels.
Legislation may include:	• ACCC • ACMA legislations • Telecommunications Act 1997 • RAF • telecommunications ombudsman • Trade Practices Act • USO.
Key variables may include:	• deployment rate • growth rate • high output sensitivity • time to market.
Intended audience may include:	• customers • decision makers • financial managers • planners.
Key economic measures may include:	• macro-economic environment • market trends.
Financial investment tools may include:	• cost-benefit analysis • investment management system • NPV.
Demographic diversity may include:	• cultural diversity • non-homogenous customer demand • socioeconomic diversity.
Demographic trends may include:	• ageing population • forecast non-homogenous demand • increase in cultural groups • technology poor.
Commercial considerations may include:	• CAPEX • OPEX • product revenue and demand versus network cost • RoI • time to market.
Exemption process may include:	• financial impediments

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RANGE STATEMENT	
	• network deployment rules • reasoning behind architecture rules.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4108A Plan the deployment of access network architectures

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan the deployment of network architecture when conducting access network telecommunications work. It includes use and consideration of access network deployment data, technology, equipment, capacity management and network management information sources. The plan may be for a new installation or upgrade of capacity or technology for existing network or subsystem for convergence to Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff and their sub-contractors from private and public organisations apply the skills and knowledge in this unit. They combine technical design skills with broader organisational skills to plan and deploy access network technologies for a service provider such as a major carrier or a rail service provider. Technical officers or engineers may be responsible for small projects or parts of larger projects on NGN in the deployment of copper, wireless, hybrid fibre coaxial (HFC), fibre to the x (FTTx) and fibre networks.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the project	1.1. Prepare for work according to site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures 1.2. Determine the type of ***access network*** by accessing and using ***network information sources***

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ELEMENT	PERFORMANCE CRITERIA
	1.3. Produce a brief on how ***access network architecture components*** relate to the larger network and their impact on the work 1.4. Evaluate the ***equipment type*** and ***technologies*** to be considered to determine availability and compatibility with existing network equipment 1.5. Obtain ***resources*** and equipment needed for the work according to ***enterprise procedures*** and check for correct operation and safety 1.6. Assess the capacity limitation of various platforms in the context of the work to ensure maximum network performance 1.7. Determine product capability and calculate allowable capacity of the Access Network to allow for network growth
2. Produce deployment plan for an Access Network	2.1. Conduct planning work using current ***equipment components*** and complying with ***access network deployment rules*** and exemption process criteria 2.2. Produce a preliminary plan on the deployment of the network that maintains integrity of the access network 2.3. Discuss unexpected situations with appropriate personnel, with consideration to job specifications, safety and enterprise procedures to establish a solution 2.4. Review plan to ensure that it complies with all standards and codes required when working on network access and where appropriate make adjustments
3. Complete work and report its impact on network access	3.1. Produce final deployment plan including recommendations agreed with the customer 3.2. Provide a report on ***network monitoring techniques*** used to manage the network to ensure the network is performing at optimum level

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE
Required skills

• analytical skills to:
  • interpret data results and evaluate different types of technical data
  • interpret technical and non-technical documentation and write summary reports in required formats
  • select and compare benefits and limitations of access equipment
• communications skills to liaise with internal and external personnel on technical and operational matters
• planning and organisational skills to prioritise and monitor own work
• technical skills to:
  • identify the various technologies that constitute an access network
  • interrogate databases and evaluate equipment types and technologies

Required knowledge

• Access Network:
  • architectures and geographical categorisation
  • information sources
  • technology and equipment
• capacity and capability management
• capacity limitation of various platforms
• commercial considerations of access network deployment
• compatibility issues of technology and equipment
• currency of technology and equipment use
• enterprise deployment rules and rational
• exemption process criteria
• major equipment components of a modern access architecture
• monitoring techniques to manage the access network
• network topologies
• product capability and availability that are allowable within an access network
• telecommunications access networks issues and challenges

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • gather data appropriately within information sources and evaluate how the data relates to the access architecture • source major equipment and technologies used in an access network and detail their compatibilities • plan the deployment of an access network architecture, including deployment rules, capacity and capability management and monitoring techniques • complete work within a timeframe typically expected of the discipline, work function and industrial environment.
Context of and specific resources for assessment	Assessment must ensure: • network design documentation and other site related documentation • equipment specifications • live network or training facilities • organisational guidelines • networked computers • networked telecommunications components.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate planning the deployment of an access network architecture • review of reports completed by the candidate for differing access network examples • review of final deployment plan prepared by the candidate outlining recommendations for the customer • oral or written questioning to assess knowledge of equipment and technologies as used within the access network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

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EVIDENCE GUIDE	
	• ICTNPL4109A Evaluate the capability of access networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Access network may refer to:	• broadband:
	  • wireless fidelity (WiFi)
	  • world interoperability for microwave access (WiMAX)

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RANGE STATEMENT	

	• copper:
	  • coaxial
	  • HFC
	  • twisted pair
	• digital services:
	  • asymmetrical digital subscriber lines (ADSL)
	  • digital subscriber lines (DSL)
	• NGN:
	  • broadband access
	  • data transfer
	  • internet protocol (IP) based systems
	  • internet protocol private branch exchange (IP PBX)
	  • Internet protocol TV (IPTV)
	  • mobile data
	  • mobile telephony
	  • multimedia
	  • video
	  • voice over internet protocol (VoIP)
	• optical:
	  • FTTN
	  • FTTP
	  • FTTx
	  • HFC
	• wireless networks:
	  • cellular
	  • microwave
	  • radio
	  • satellite.

Network information sources may include:	• network management databases for:
	  • capacity assessment data
	  • network performance data
	  • traffic dimensioning data
	• network management tools.

Access network architecture components may include:	• copper network:
	  • copper cable
	  • lead-in

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RANGE STATEMENT	
	• lightning protection • line power supply • loading coils • main distribution frame • pair gain system • Ethernet broadband remote access server (EBRAS) • HFC network • IP edge • optical: • add/drop multiplexer • broadband passive optical network (BPON) • cross connect unit • distribution/lead-in multi-port (DLM/LM) • fibre access points • fibre distribution hub (FDH) • gigabit passive optical network (GPON) • high density/optical fibre distribution frame (HD/OFDF) • home optical network terminal • optical distribution network • optical fibre • optical receiver • packet optical line terminal (P-OLT) • video optical line terminal (V-OLT) • wave division multiplexer (WDM) • wireless network: • antennae • dish • headend • hubs and nodes • radio towers and huts • radio frequency (RF) amplifier • RF transmitters and receivers • satellite • tap • waveguide • video service centre.

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RANGE STATEMENT	

Equipment type may include:	• digital
	• IP based
	• optical:
	  • add/drop multiplexers
	  • amplifiers
	  • filters
	  • receivers
	  • splitters/combiners
	  • switches
	  • transmitters
	• wireless:
	  • amplifiers
	  • filters
	  • microwave
	  • receivers
	  • RF broadband
	  • satellite
	  • transmitters.

Technologies may include:	• digital subscriber lines:
	  • ADSL
	  • DSL
	• IP broadband:
	  • IPTV
	  • VoIP
	  • WiFI
	  • WiMAX
	• mobile radio
	• optical transmission systems:
	  • DWDM systems
	  • WDM systems.

Resources may include:	• equipment • hardware • installation platforms • ladders • manpower • materials • safety equipment • software

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RANGE STATEMENT	
	• tools.
Enterprise procedures may include:	• asset registration • compliance • preferred suppliers • preferred vendors • procurement agreements • purchase requisition • service level agreements (SLA).

Equipment components may include:	• IP based network elements:
	  • gateways
	  • routers
	  • switches
	• optical devices:
	  • amplifiers
	  • multiplexers
	  • routers
	  • switches
	• virtual equipment:
	  • networks
	  • private branch exchange (PBX)
	  • simulations
	  • servers.

Access Network deployment rules may relate to:	• exemption process criteria
	• restricted site access:
	  • financial institutions
	  • government offices
	  • rail corridor
	  • research establishments
	• separation from other services:
	  • electricity
	  • fire equipment
	  • gas
	  • other telecommunications service providers
	  • water.

Monitoring techniques may include use of :	• databases:
	  • capacity assessment data
	  • traffic dimensioning data
	  • network performance data

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RANGE STATEMENT	
	• network management system • network management tools.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4109A Evaluate the capability of access networks

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to gather information on the types of access networks and evaluate their capability to meet present and future demands. It involves the evaluation and comparison of competing access network technologies. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical design skills with broader organisational skills to assess planning requirements of various access network technologies within a telecommunications network to meet future customer demands. Technical officers or engineers may be responsible for small projects or parts of larger projects and for the operation and engineering work in the deployment or conversion to internet protocol (IP) based technologies of the telecommunications network in general.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the project	1.1. Prepare for given work according to site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures 1.2. Determine the ***types of access networks*** currently deployed by accessing and using ***network information sources*** 1.3. Determine the nature, quantity, architecture and condition of existing network equipment and their

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ELEMENT	PERFORMANCE CRITERIA
	attributes 1.4. Produce a brief on the deployment scope of current access networks, including geographical limitations and their contribution to the larger network
2. Assess capability and technologies of current and future access networks	2.1. Produce the layout of the topology of the identified types of Access Networks with the ***network elements*** clearly indicated 2.2. Evaluate the ***equipment type*** and ***technologies*** of the access network to determine compatibility with existing network equipment and interoperability with other networks 2.3. Assess the current and future capability and limitations of the network to ensure potential growth of the network 2.4. Determine future offerings of product and services outlining the product offerings allowable over each network
3. Document capability evaluation	3.1. Assess the capability of current access networks to deliver products and services to customers 3.2. Recommend preferred solutions for network growth with future capabilities

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to outline the product offerings allowable across all competing Access Network technologies
• communication skills to liaise with internal and external personnel on technical and non-technical matters
• literacy skills to:
  • interpret technical and non-technical documentation
  • write summary reports in required formats
• numeracy skills to interpret data results and evaluate different types of technical data
• planning and organisational skills to plan, prioritise and monitor own work

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REQUIRED SKILLS AND KNOWLEDGE

• research skills to:
  • assess the elements and architectures of the various access network technologies
  • assess the capability and limitations of the various Access Network technologies (present and future needs)
  • explain the key technologies that make up the access network
  • interrogate databases and investigate different audit requirements
  • source the equipment that will be used across the spectrum of access network technologies
• technical skills to select and compare benefits and limitations of access network technologies

Required knowledge

• detailed knowledge of:
  • typical access network technologies
  • the elements and architecture of the various access networks
• typical problems and challenges that describe the capabilities of the various access networks

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate the capability and limitations of the various access network technologies for present and future needs • source the equipment that will be used across the spectrum of access network technologies • outline the product offerings allowable across all competing access network technologies.
Context of and specific resources for	Assessment must ensure:

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EVIDENCE GUIDE	
assessment	• network design documentation and other site related documentation • equipment specifications • live network or training facilities • organisational guidelines • networked computers • networked telecommunications components.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate evaluating the capability of an access network • review of reports completed by the candidate for differing access network equipment and technologies • oral or written questioning to assess knowledge of equipment, technologies and the various product offerings as used within the access network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4108A Plan the deployment of access network architectures. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Types of access networks may include:	• access fibre network • copper • fibre to the premises (FTTP) • hybrid fibre coaxial (HFC) • Next Generation Networks (NGN) • wireless networks.

Network information sources may include:	• network management databases for :
	  • capacity assessment data
	  • network performance data
	  • traffic dimensioning data
	• network management tools.

Attributes may include:	• capacity • condition • layout • limitations • occupancy • performance • type.

Network elements may include:	• for the current copper network:
	  • copper cable
	  • cross connect unit
	  • exchange
	  • lead-in cable

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RANGE STATEMENT	
	• lightning protection • loading coils • main distribution frame (MDF) • manhole • pair gain system • pits • for the current fibre network: • exchange • fibre access points • high density/optical fibre distribution frame (HD/OFDF) • joint enclosure • manhole • optical fibre • pits • transmission hub • for the FTTP network: • broadband passive optical network (BPON) • conduit • distribution/lead in multi-port (DLM/LM) • Ethernet broadband remote access server (EBRAS) • exchange • fibre distribution hub (FDH) • gigabit passive optical network (GPON) • head end • HD/OFDF • home optical network terminal • lead in • manhole • optical distribution network • optical fibre • packet optical line terminal (P-OLT) • pits • video optical line terminal (V-OLT) • wave division multiplexer (WDM) • for the HFC network: • coaxial cable

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RANGE STATEMENT	
	• exchange • headend • hub • IP edge • line power supply • node • optical fibre • optical receiver • radio frequency (RF) amplifier • tap • video service centre • for the wireless network: • access points • antennas • dish • exchange • RFamplifiers • radio towers and huts • RF receivers • RF transmitters • satellite • waveguide.
Equipment type may include:	• digital • IP based • optical: • add/drop multiplexers • amplifiers • filters • receivers • splitters/combiners • switches • transmitters • wireless: • amplifiers • filters • microwave • receivers • RF broadband

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RANGE STATEMENT	
	• satellite • transmitters.

Technologies may include:	• DSL:
	  • ADSL, ADSL2+
	  • xDSL
	• IP broadband:
	  • IPTV
	  • VoIP
	  • WiFI
	  • WiMAX
	• optical transmission systems:
	  • WDM systems
	  • DWDM systems
	• mobile radio.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4110A Evaluate the planning requirements for provisioning a telecommunications building facility

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to evaluate building service capability to meet present and future demands for a building facility housing telecommunications equipment. It involves gathering information and evaluating allowable types of building services, power systems, air conditioning, fire safety services, energy use and alarm systems within each technology. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical design skills with organisational skills to assess the planning requirements of the various building projects and technologies within a telecommunications network to meet future customer demands. Technical officers or engineers may be responsible for small projects or parts of larger projects, and for the operation and engineering of the telecommunications network.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the project	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** including occupational health and safety (OHS) processes and procedures 1.2. Obtain building plans and specifications from

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ELEMENT	PERFORMANCE CRITERIA
	planning section 1.3. Determine the type of ***facility*** and ***building services*** required to house telecommunications network equipment and plant to efficiently support the network 1.4. Determine the purpose of the main areas or rooms in the network building and note special requirements to support the safe operation of the facility 1.5. Verify who is responsible for the planning, provisioning, maintaining and operation of a facility
2. Evaluate the power requirements	2.1. Assess how the functions of the main power and building services support network equipment and the impact if building services are not provided correctly or fail 2.2. Produce a schematic diagram of the relationship of ***electrical components*** in an end-to-end power and building services system 2.3. Assess the different ***types of power sources*** likely to supply network equipment and determine the benefits or deficiencies 2.4. Determine how resiliency is built into the provisioning of a reliable power supply and how different levels of reliability can be achieved 2.5. Evaluate the impact of energy use and ***energy loads*** in the facility and determine how energy use can be minimised
3. Evaluate the requirements of air conditioning services	3.1. Assess the main ***types of air conditioning*** components or plant available and their suitability to the building requirements and draw a schematic diagram of the proposed layout 3.2. Determine how different equipment rack heat dissipation and size of a load can affect the cooling needs 3.3. Evaluate how the deployment of network equipment and other supporting infrastructure can affect the performance and loading of the installed air conditioner
4. Evaluate the requirements of fire safety services	4.1. Assess the type, functions and components of ***fire service protection systems*** for fire and smoke required in a network facility for the safety and protection of people and assets 4.2. Use the building plan to locate fire systems to be

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ELEMENT	PERFORMANCE CRITERIA
	deployed to comply with fire regulations 4.3. Evaluate the effect equipment deployments may have on fire services and its ability to protect the site and maintain regulatory obligations
5. Evaluate requirements of alarm systems	5.1. Determine the level of alarming requirements from the building plan and specifications 5.2. Assess if basic monitoring is to be used with system or plant interrogation capabilities to produce an integrated alarm system for the facility 5.3. Determine where ***alarm systems*** are monitored and actioned and the personnel responsible 5.4. Evaluate what systems are used to connect power and building services output alarms and the software requirements needed to allow interrogation
6. Produce evaluation document	6.1. Assess the requirements for each of the building services needed to support the facility allowing for projection of future growth of the network and building expansion 6.2. Produce an evaluation document on the planning requirements for the proposed provisioning including identified services to support the building facility

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical and operational matters • literacy skills to interpret technical documentation and write reports in required formats • planning and organisational skills to plan, prioritise and monitor own work • problem solving and contingency management skills to adapt requirements to particular building facilities • research skills to interrogate databases and investigate different building services • technical skills to evaluate: • air conditioning systems

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REQUIRED SKILLS AND KNOWLEDGE
• alarm systems • fire safety services • general energy use • impact of energy use in a facility • power supplies
Required knowledge

• detailed knowledge of:
  • alarm monitoring and hierarchy of responsibility
  • capacity of air conditioning system on a given load
  • different building services that are supported at a network site
• basic monitoring and plant interrogation capabilities
• complexities of various levels of alarming as applied to building facilities
• general types of facilities within building housing network equipment
• overview knowledge of:
  • different types of air conditioning components
  • different types of fire safety services
  • different types of power sources
  • equipment deployments on fire safety services
  • main energy loads associated in a facility
• regulatory obligations in relation to fire safety services
• software systems needed to allow alarm interrogation (outputs)

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate facilities used for housing network equipment and how they may be used for provisioning • provide documentation that correctly associates

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EVIDENCE GUIDE	

	responsibilities to planning, provisioning, maintenance and operation of a building facility
	• evaluate planning requirements for telecommunications building facilities including:
	  • correct provisioning of equipment for air conditioning systems and power supplies into building facilities
	  • energy use, alarm and fire safety services.

Context of and specific resources for assessment	Assessment must ensure: • building facilities where planning requirements for provisioning may be conducted • relevant regulatory, organisational procedures and documentation, and equipment documentation that impact on work.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking an evaluation of a telecommunications building facility • review of evaluation report prepared by the candidate outlining the planning requirements for the proposed provisioning of identified services • oral or written questioning to assess knowledge of key building facilities, such as power supplies, fire safety, alarm and air conditioning systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4111A Develop provisioning of telecommunications building works project. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication

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EVIDENCE GUIDE	
	skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • acts on noise and dust pollution • ARPANSA electromagnetic radiation (EMR) standard • Australian building codes and regulations • Australian standards • electricity supply codes • enterprise standards • environmental protection • equipment standards, intrinsically safe lightning protection, site engineering standard • fire regulations • hazardous situation

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RANGE STATEMENT	
	• heritage legislation • international standards • local government building codes • OHS • Radcoms Act • Telecoms Act • traffic authorities.

Facility may relate to:	• buildings or shelters used to house:
	  • people:
	  • administration
	  • billing centres
	  • call centres
	  • engineering offices
	  • human resources
	  • network facility for equipment or plant:
	  • air conditioning plant
	  • cabling room and main frame
	  • computer facility
	  • exchange equipment (switching and transmission)
	  • power, no-break power plant and battery room
	• (Note: does not include towers, pipes and conduits).

Building services may relate to:	• air conditioning • alarm systems • fire safety • power sources.
Electrical components may include:	• battery load monitoring panel • busbars • diesel generator • exchange battery • exchange earth • fuses • mains converter • no-break power plant • power distribution cables • power monitoring panel • rectifier unit

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RANGE STATEMENT	
	• solar panels • wind generators.

Types of power sources may relate to:	• electrical energy sources:
	  • diesel generator
	  • exchange battery
	  • mains converter
	  • mains power
	  • no-break power plant
	  • solar panels
	  • wind generators
	• (Note: does not include a power utility company's external generation supply).

Energy loads may relate to:	• air conditioning • battery charger • cooling fans • lift motors • lighting • power outlets • pump motors • rectifier unit.
Types of air conditioning may include:	• air cooled • ducted • electric • freestanding • gas • water cooled.

Fire service protection systems may refer to:	• components:
	  • automatic notification system to fire authorities
	  • control panel
	  • fire alarm
	  • infra-red detectors
	  • smoke sensors
	  • sprinkler system
	  • warning activation system
	• functions:
	  • control
	  • detect
	  • manage

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RANGE STATEMENT	

	• suppress fire and smoke
	• system type:
	  • active
	  • passive.

Alarm systems may refer to:	• air conditioning alarm
	• components:
	  • air conditioning alarm panel
	  • biometric system
	  • digital code
	  • fire alarm panel
	  • personal badge
	  • radio frequency identification (RFID)
	  • security alarm panel
	• fire exit alarms
	• intruder alarms
	• lift failure
	• power loading.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Network planning

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ICTNPL4111A Develop provisioning of telecommunications building works project

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop provisioning of building services. It involves gathering information on the role of power and building services, equipment and infrastructure deployments, building standards, building services capacity and building works programs to evaluate allowable types of building services. Building services may be power systems, air conditioning, fire safety services, energy use and alarm systems within each technology. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical design skills with organisational skills to apply planning principles for provisioning of the various building projects and technologies within a telecommunications network to meet future customer demands. Technical officers or engineers may be responsible for small projects or parts of larger projects, and for the operational and engineering of the telecommunications

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	network in general.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the project	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards***, including occupational health and safety (OHS)

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ELEMENT	PERFORMANCE CRITERIA
	processes and procedures 1.2. Determine the main role power and ***building services*** perform in a ***network facility*** and note their effect on the ***reliability*** and ***performance*** of the network performance 1.3. Assess the ***provisioning*** process required to identify, plan and implement power and building services for equipment deployment plans
2. Assess equipment and infrastructure deployments	2.1. Evaluate the available capacity from power and cooling plant to support the effect on floor loading, power and heat load from equipment deployments 2.2. Determine the different levels of reliability performance standards applicable to the specific equipment deployment needs 2.3. Develop a process to plan or implement a power and building services upgrade that is compatible to the network equipment requirements 2.4. Assess the options available to manage capacity growth in a facility and the effect of potential single points of failure in an end-to-end power and building services system
3. Develop building works programs	3.1. Develop short and long term works programs for building projects that include minor upgrades to large installations 3.2. Determine triggers that may require a power and building services capacity or reliability upgrade 3.3. Prioritise ***projects*** based on customer demand and business needs
4. Assess provisioning of building services	4.1. Assess the possible effect on the current and future use of a building or space when provisioning power and building services 4.2. Produce ***cost estimates*** including ***constraints*** for the provisioning of a power and building services upgrade

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to read and interpret technical documentation and write technical reports in required formats
- numeracy skills to:
  - calculate floor loading, power and heat load data
  - interpret results
  - evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work
- problem solving and contingency management skills to adapt requirements to particular building facilities
- research skills to interrogate databases and investigate different building services
- technical skills to:
  - apply precautions and required action to minimise, control or eliminate single points of failure in an end-to-end power and building services system
  - estimate floor loading, power and heat loads
  - select and manage capacity growth in a facility

Required knowledge

- detailed knowledge and information required to assess the capacity and suitability of available power and building services
- overview knowledge of:
  - correlation between building service systems to network equipment requirements
  - different levels of reliability performance standards, applicable to the specific equipment deployment needs
  - information required to assess the effect on floor loading, power and heat load from equipment deployments
  - main regulatory standards
  - role of power and building services, capacity and standards
  - source budget cost estimates
  - specific short and long term works programs
- typical issues and challenges that occur in telecommunications building service systems and how these may be addressed
- upgrade knowledge of both power and building services

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • assess the capacity and suitability of available power and building services for telecommunications building works • develop a process to implement a power and building services upgrade • develop short and long term works projects for equipment and infrastructure deployments • produce cost estimates for provisioning.
Context of and specific resources for assessment	Assessment must ensure: • building facilities where a telecommunications network project may be conducted • relevant regulatory, organisational procedures and documentation, and equipment documentation that impact on work.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate developing short and long term works programs for building projects • review of cost estimates prepared by the candidate • review of report prepared by the candidate outlining constraints of provisioning power and building services upgrade • oral or written questioning to assess knowledge of power and building services and equipment and infrastructure deployments.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4110A Evaluate the planning requirements for provisioning a telecommunications building

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EVIDENCE GUIDE	
	facility. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • acts on noise and dust pollution

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RANGE STATEMENT	
	• ARPANSA electromagnetic radiation (EMR) standard • Australian building codes and regulations • Australian standards • electricity supply codes • enterprise standards • environmental protection • equipment standards, intrinsically safe lightning protection, site engineering standard • fire regulations • hazardous situation • heritage legislation • international standards • local government building codes • OHS • Radcoms Act • Telecoms Act • traffic authorities.
Building services may relate to:	• air conditioning • alarm systems • fire safety • power sources.

Network facility may include:	• buildings
	• cabinets
	• containers
	• huts
	• network plant and equipment:
	  • air conditioning plant
	  • cabling room and main frame
	  • computer facility
	  • exchange equipment:
	  • switching
	  • transmission
	  • power:
	  • battery room
	  • no-break power plant
	  • power room
	• shelters.

Reliability may include:	• access rate over time

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RANGE STATEMENT	
	• bandwidth over time • end-to-end performance over time • power supply over time.
Performance may include:	• bandwidth • broadband access • fault clearance rate • grade of service (GoS) • quality of service (QoS) • service delivery • upload and download rate.
Provisioning may relate to:	• reliable adequate service • reliable infrastructure • reliable performance.
Projects may include:	• construction works • design work • feasibilities • upgrades.
Cost estimates may include:	• labour • material • refurbishment • service equipment • upgrade work.
Constraints may include:	• external obligations • physical space • timing.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units	

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Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4112A Evaluate core network architectures

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to assess the roles and evaluate the benefits of competing core network architectures. Core networks use convergent internet protocol (IP) based technologies with conventional technologies. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical design skills with organisational skills to evaluate core architectures in a telecommunications network used by service providers such as major carriers or asset owners. Technical officers or engineers may be responsible for small projects or parts of larger projects, and for the operational and engineering of the telecommunications network in general.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements Determine the essential outcomes of a unit of competency.	Performance criteria Determine the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate basic IP network architecture	1.1. Produce a layout of the topology of an ***IP network*** showing the network elements and the application of the 7-layer open system interconnect (OSI) model 1.2. Determine the purpose of routers and switches and the use of routing protocols 1.3. Determine the different types of generic resiliency and redundancy that can be applied in network architectures and when they should be applied 1.4. Evaluate the benefits of IP networks compared to circuit-based networks and the impact on modern telecommunications networks
2. Evaluate	2.1. Produce a layout of the topology of ***SDH transport***

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ELEMENT	PERFORMANCE CRITERIA
synchronous digital hierarchy (SDH) transport architectures	***networks*** showing the structure and the role of rings in the networks 2.2. Determine the purpose of SDH switching and its function within the transport architecture 2.3. Assess key capacity and distance limitations in SDH networks 2.4. Assess resiliency and redundancy techniques that can be used within SDH transport networks 2.5. Evaluate the compatibility of SDH transport architectures with other transport architectures
3. Evaluate broadband architectures	3.1. Produce a layout of the topology structure of the asymmetrical digital subscriber line (ADSL) edge network and the hybrid fibre coaxial (***HFC***) ***cable edge network*** in providing broadband access to the customer 3.2. Determine the purpose of point-to-point protocol (PPP) and the function of the digital subscriber line access multiplexer (DSLAM), broadband remote access server (BRAS) and layer2 network protocol network server (LNS) in the ADSL network 3.3. Assess the arrangement of carrier channels connecting the HFC cable customer 3.4. Determine the function of the CMTS and the purpose of DOCSIS, and the key capabilities of its different versions in the HFC network 3.5. Assess resiliency considerations for ADSL and HFC Cable network architectures 3.6. Evaluate the benefits of providing cable broadband access to wireless broadband from a network security aspect
4. Evaluate data architectures	4.1. Produce a layout of the topology of key structures of a ***data network*** showing the IP network and multiprotocol label switching (MPLS) structures 4.2. Determine the purpose of internal and external routing protocols in an IP network outlining the reasons for the creation of a virtual private network (VPN) 4.3. Determine the purpose of label distribution protocol (LDP) in an MPLS network 4.4. Assess resiliency and redundancy techniques that can be used within data networks 4.5. Evaluate the compatibility of IP and MPLS

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ELEMENT	PERFORMANCE CRITERIA
	networking
5. Evaluate metropolitan ethernet architectures	5.1. Produce a layout of the topology structure of a metropolitan ***ethernet network*** showing the optimum siting of the ethernet switch 5.2. Determine the types and limitations of the varieties of ethernet transmission 5.3. Assess the scaling limitations of ethernet networks 5.4. Assess resiliency and redundancy techniques that can be used within metropolitan ethernet networks 5.5. Evaluate the need for the creation of virtual local area networks (VLAN) in metropolitan Ethernet architecture for improved performance
6. Evaluate voice architectures	6.1. Produce a layout of the topology of a voice over internet protocol (***VoIP***) ***network and a wireless voice network*** showing the network elements 6.2. Determine the function of local exchange and transit exchange switches in the public switched telephone network (PSTN) 6.3. Determine the function of an secure broadband connection (SBC) and the purpose of session initiation protocol (SIP) in wireless networking 6.4. Assess resiliency and redundancy techniques that can be applied in the design of voice networks 6.5. Evaluate the benefits of VoIP networks compared to circuit based networks and the impact on modern telecommunications networks
7. Evaluate media and content architectures	7.1. Determine the structure, elements and purpose of hosting networks in data centres and a content distribution network 7.2. Evaluate the impact of high speed broadband for the wide deployment of ***media and content architectures***
8. Prepare evaluation report	8.1. Assess compatibility and interoperability of competing core network architectures 8.2. Prepare an evaluation report outlining core network solutions using emerging technologies

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section Determines the skills and knowledge required for this unit.

Required skills

- communication skills to analyse, evaluate and present information
- financial modelling skills to specify, analyse and evaluate a range of different solutions
- group facilitation and presentation skills to transfer and collect information and gain consensus on concepts
- problem solving skills to:
  - address a defined range of unpredictable problems, for example, when predicting line traffic and the impact on input and output devices and processors from current and future demand requirements
  - address a predictable range of network problems
- project planning skills to:
  - scope, time and cost work when reviewing client user requirements and network requirements
  - set benchmarks and identified scope
- research skills to specify, analyse and evaluate broad features of current security issues and best practice in security devices, products and procedures
- technical skills to:
  - evaluate and compare a range of complex technical data
  - research and identify, analyse and evaluate features of a particular core network architecture

Required knowledge

- broad knowledge of:
  - client business domain, business function and organisation
  - networking technologies
  - theoretical concepts of three or more current industry network development and design methodologies
  - transmission technologies and protocols
- MPLS and IP architectures across a core network environment
- overview knowledge of current industry-accepted hardware and software products
- protocols, such as routing information protocol (RIP), enhanced interior gateway routing protocol (EIGRP), open shortest path first (OSPF), border gateway protocol (BGP) operations
- VLANs and VPN tunnels and how its is implemented in an ethernet/MPLS environment

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine the first three layers of the OSI model • determine the role of switches and routers in the core network and the different types of routing protocols • evaluate SDH switching and transmission and its ability to create resiliency in the network through various redundant configurations • evaluate the benefits, purpose and structure of ADSL networks and other broadband products • determine and compare data networks with specific reference to IP and MPLS • evaluate the most important routing protocols of internal and external MPLS and the resilience that is built into them • evaluate the limitations of an Ethernet network and how VLAN can be incorporated in them • compare various voice protocols • determine the purpose of various hosting in data centres and media and distribution platforms.
Context of and specific resources for assessment	Assessment must ensure: • network design documentation and other site related documentation • equipment specifications • live network or training facilities • organisational guidelines • networked computers • networked telecommunications components.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing an

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EVIDENCE GUIDE	
	evaluation of core network architectures • review of evaluation report completed by the candidate outlining compatibility and interoperability of competing core network architectures • oral or written questioning to assess knowledge of planning various core networks.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4113A Plan the deployment of core network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised

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RANGE STATEMENT	
wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
IP network may include:	• gateways • routers • servers • switches.
SDH transport networks may include:	• add-drop multiplexers (ADM) • synchronous digital hierarchy (SDH) switch • synchronous transport module - level1 (STM-1).
HFC cable edge network may include:	• ADM • broadband amplifier • cable modems • DSLAMS • fibre network • multiplexer.
Data network may include:	• access • backbone • edge • MPLS protocols • routers • routing protocols • switches.
Routing protocols may include:	• BGP • EIGRP • interior gateway routing protocol (IGRP) • intermediate system-to-intermediate system (IS-IS) • OSPF • RIP.
Ethernet network may include:	• applications • gateways • LAN switch • routers • servers • switches • transmission equipment • VLAN.

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RANGE STATEMENT	
VoIP network and a wireless voice network may include:	• access points • adapters • antennas • gateways • routers • servers • switches • voice managers.
Media and content architectures may include:	• central processing unit (CPU) • media managers • multiplexers • routers • servers.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4113A Plan the deployment of core network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan the deployment of core network for a telecommunications service provider. It includes use and consideration of core network deployment data, technology, equipment, capacity management and network management information sources. Core networks use convergent internet protocol (IP) based technologies with conventional technologies. The plan may be for a new installation or upgrade of capacity or technology for existing network or subsystem for convergence to Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff and their subcontractors from private and public organisations apply the skills and knowledge in this unit. They combine technical design skills with organisational skills to plan and deploy core network technologies for a service provider such as a major carrier or a rail service provider. Technical officers or engineers may be responsible for projects and for operational and engineering work in deployment or conversion to IP based technologies of the telecommunications network in general.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the project	1.1. Prepare for work according to site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures 1.2. Determine the type of ***core network*** by accessing and using network information sources

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ELEMENT	PERFORMANCE CRITERIA
	1.3. Produce a brief showing how ***core network architecture components*** relate to the larger network and their impact on the work 1.4. Evaluate the ***equipment type*** and ***technologies*** to be considered to determine availability and compatibility with existing network equipment 1.5. Obtain ***resources*** and equipment needed for the work according to ***enterprise procedures*** and check for correct operation and safety 1.6. Assess the capacity limitation of platforms in the context of the work to ensure maximum network performance 1.7. Determine product capability and calculate allowable capacity of the core network to allow for network growth
2. Produce deployment plan for a core network	2.1. Assess demand for the core network using key geographic, demographic, forecast and bandwidth data 2.2. Identify key ***parameters of the core network*** to be measured for capacity management 2.3. Produce a preliminary deployment plan for the core network using architectural principles and assessed demand to maintain integrity of the core network 2.4. Assess the additional planning requirements for voice over internet protocol (VoIP) and wireless voice networks from voice networks, and for hosting and content distribution networks from media and content network 2.5. Create a financial business case for the deployment of the core network based on assessed demand to justify a return on investment (RoI) and operational costs 2.6. Discuss unexpected situations with appropriate personnel, with consideration to job specifications, safety and enterprise procedures to establish a solution
3. Complete work and report its impact on network performance	3.1. Produce final deployment plan including recommendations agreed with the customer 3.2. Provide a report on ***network monitoring techniques*** used to manage the network to ensure the network is performing at optimum level

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to analyse, evaluate and present information
- group facilitation and presentation skills to transfer and collect information and gain consensus on concepts
- problem solving skills to:
  - address a defined range of unpredictable problems, for example, when predicting line traffic and the impact on input and output devices and processors from current and future demand requirements
  - address a predictable range of network problems
- project planning skills to:
  - scope, time and cost when reviewing client user requirements and network requirements
  - set benchmarks and identified scope
- research skills to specify, analyse and evaluate broad features of current security issues and best practice in security devices, products and procedures
- technical skills to:
  - evaluate and compare a range of complex technical data
  - research, identify, analyse and evaluate features of core network architecture

Required knowledge

- MPLS and IP architectures across a core network environment
- protocols such routing information protocol (RIP), enhanced interior gateway routing protocol (EIGRP), open shortest path first (OSPF), border gateway protocol (BGP) operations
- virtual local area networks (VLAN) and virtual private network (VPN) tunnels and how it is implemented in an ethernet and multiprotocol label switching (MPLS) environment
- overview knowledge of:
  - client business domain, business function and organisation
  - current industry-accepted hardware and software products
  - networking technologies incorporating substantial depth in some areas
  - transmission technologies and protocols
  - theoretical concepts of three or more current industry network development and design methodologies

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • gather data from information sources and evaluate how the data relates to the core network • source major equipment and technologies used in a core network and detail their compatibilities • plan the deployment of a core network including management and monitoring techniques • produce a deployment plan for a core network with recommendations for the customer.
Context of and specific resources for assessment	Assessment must ensure: • network design documentation and other site related documentation • equipment specifications • live network or training facilities • organisational guidelines • networked computers • networked telecommunications components.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate planning the deployment of a core network • review of reports completed by the candidate for different core networks • review of final deployment plan prepared by the candidate outlining recommendations for the customer • oral or written questioning to assess knowledge of planning various core networks.
Guidance information for	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
assessment	for example: • ICTNPL4112A Evaluate core network architectures. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Core network may include:	• billing • broadband • data • Ethernet

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RANGE STATEMENT	

	• media and content
	• network management
	• NGN delivering multiple services:
	  • broadband access
	  • data transfer
	  • IPTV
	  • mobile data
	  • mobile telephony
	  • multimedia
	  • video
	  • VoIP
	• switching
	• transport - synchronous digital hierarchy (SDH)
	• voice.

Core network architecture components may include:	• Ethernet network:
	  • gateways
	  • LAN switch
	  • layer 3 switches
	  • routers
	  • servers
	  • transmission equipment
	  • VLANS
	• HFC cable edge network:
	  • ADM
	  • broadband amplifier
	  • cable modems
	  • DSLAMS
	  • fibre network
	  • multiplexer
	• IP networks:
	  • gateways
	  • routers
	  • servers
	  • switches
	• media and content network:
	  • central processing unit (CPU)
	  • media managers

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RANGE STATEMENT	

	• multiplexers
	• routers
	• servers
	• MPLS network:
	  • access
	  • backbone
	  • edge routers
	  • L2 and L3 switches
	  • MPLS protocols
	  • routing protocols
	• SDH transport:
	  • add-drop multiplexers (ADM)
	  • SDH switch
	  • STM-1
	• VoIP and wireless voice network:
	  • access points
	  • adapters
	  • antennas
	  • gateways
	  • routers
	  • servers
	  • switches
	  • voice managers.

Equipment type may include:	• IP based • IP networking • multiplexers • network management • optical • protocol analysers • switching • transmission • transport • virtual • wireless.
Technologies may include:	• adaptive • digital • IP technologies • NGN

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RANGE STATEMENT	
	• optical • self healing • wireless.
Resources may include:	• diagnostic tools • equipment • hardware equipment • installation manuals • installation platforms • labour • materials • PC tools • safety equipment • software • test equipment • tools.
Enterprise procedures may include:	• asset registration • compliance • preferred suppliers • preferred vendors • procurement agreements • purchase requisition • service level agreements.

Parameters of the core network may include:	• for an ADSL network:
	  • bandwidth utilisation of broadband remote access server (BRAS)-digital subscriber line access multiplexer (DSLAM) trunks
	  • bandwidth utilisation of BRAS- layer2 network protocol network server (LNS) trunks
	  • BRAS memory and CPU load
	  • number of available BRAS ports
	  • number of IP addresses in use
	  • number of point-to-point protocol (PPP) sessions in use
	• for a HFC cable broadband network:
	  • cable modem termination system (CMTS) memory and CPU load
	  • IP address availability
	  • number of services connected to a segment
	  • upstream and downstream bandwidth

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RANGE STATEMENT	

	utilisation
	• for an IP or MPLS Data network:
	  • available and utilised bandwidth and ports
	  • network latency
	  • packet loss rates
	  • router or switch card slots available
	  • router or switch CPU load
	  • router or switch memory
	• for a media and content hosting and distribution network:
	  • available and utilised bandwidth
	  • available and utilised ports
	  • router CPU load
	  • router memory
	  • router slots available
	• for a metropolitan Ethernet network:
	  • available and utilised bandwidth
	  • available and utilised ports
	  • available and utilised VLANs
	  • packet loss rates
	  • switch card slots available
	  • switch CPU load
	  • switch memory
	• for an SDH network:
	  • bandwidth provisioned
	  • number of ADMS connected to a ring
	  • number of card slots and ports available
	  • number of circuits provisioned
	• for a voice network:
	  • echo cancellation considerations
	  • quality of service (QoS) and measure of service (MOS)
	  • network jitter
	  • network latency
	  • packet loss rate
	  • signalling capacity
	  • traffic:
	  • available and utilised bandwidth

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RANGE STATEMENT	
	• available and utilised ports • number and duration of calls.
Network monitoring techniques may include:	• alarms • customer complaints • databases • fault reports • network management • network operations reports • network performance reports • traffic monitoring.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4114A Produce planning specifications for end to end service delivery

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to gather information on the types of end-to-end services and product delivery and evaluate their capability to meet present and future demands. It involves the evaluation and comparison of competing technologies to produce planning specifications and advice to planning, sales and marketing sections. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers from private and public telecommunications network planning organisations apply the skills and knowledge in this unit to develop planning specifications for the implementation of end-to-end services delivery of access networks and products and make recommendations. They combine technical network skills with organisational skills to evaluate end-to-end services used by telecommunications service providers and asset owners primarily in the access network. Technical officers may be responsible for small projects or parts of larger projects, and for the operational and engineering of the telecommunications network in

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	general.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the project	1.1. Prepare for given work according to site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures

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ELEMENT	PERFORMANCE CRITERIA
	1.2. Determine the types of currently deployed ***end-to-end service delivery networks*** by accessing and using ***network information sources***
	1.3. Produce a brief on how end-to-end service delivery network elements relate to the larger network and their impact on the work
2. Assess the capacity and capability of a specific end-to-end service delivery project and a building facility project	2.1. Determine the nature, quantity, architecture and condition of existing end-to-end service delivery ***network elements*** and ***attributes*** that contribute to determining planning specifications
	2.2. Assess the capacity and capability limitations of an existing end-to-end service delivery network project by accessing network information sources and conducting site visits
	2.3. Assess the capacity and capability ***limitations of a building facility*** project that contribute to determining planning specifications
3. Assess the capacity and capability of product and service delivery	3.1. Determine the types of currently deployed ***products and services*** by accessing sales and marketing information database
	3.2. Produce a brief evaluating the capability and technology of current product and services to meet demands and their relationship to the larger network
	3.3. Evaluate the ***emerging technologies*** that contribute to determining planning specifications for demands of future products and services
4. Produce planning briefs	4.1. Produce a brief on the planning specifications of an end-to-end service delivery network and a building facility project for planning section to determine current and future network demands
	4.2. Produce a brief on products and services planning requirements for sales and marketing to determine provisioning of future demands

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation and write briefs in required formats
- numeracy skills to compare technical data on various network technologies
- planning and organisational skills to plan, prioritise and monitor own work
- research skills to interrogate databases and investigate different equipment requirements
- technical skills to select and describe appropriate end-to-end services models

Required knowledge

- emerging technologies, trends and products that are available overseas and will be in demand in the Australian market
- information required to prepare and review the limits of:
  - broadband networks
  - data networks
  - facilities and environmental issues
  - fixed access transmission network
  - media and content
  - regional and metropolitan network
  - voice networks
  - wireless network
- overview knowledge of:
  - basic network design including routing and redundancy
  - levels of reliability performance standards applicable to specific equipment deployment needs
  - standards and regulations
- specific knowledge on the distribution structure of networks including:
  - access
  - backbone
  - edge
- up to date knowledge of current equipment and product types to meet future service obligations

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • access network information databases to determine the types of end-to-end services and products • conduct site evaluation assessment • evaluate the capacity and capability of end-to-end services to meet current and future demands • assess the limitations of current end-to-end services and produce specifications to meet future demands • assess the limitations of current building facility and services and produce specifications to meet future demands • summarise and produce planning briefs to network, sales and marketing planning sections.
Context of and specific resources for assessment	Assessment must ensure: • an access network planning area, with access to systems and deployment rules and standards • end-to-end services and products databases • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate evaluating competing technologies and producing planning specifications • review of reports completed by the candidate for differing project briefs • oral or written questioning to assess knowledge of the various access methods of providing an end-to-end service in terms of delivery.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
	for example with: • ICTNPL4108A Plan the deployment of access network architectures. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
End-to-end service delivery networks may include:	• fixed access network: • copper : • asymmetrical digital subscriber line

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RANGE STATEMENT	
	(ADSL) and digital subscriber line (DSL) • coaxial • hybrid fibre coaxial (HFC) • twisted pair • optical: • fibre to the node (FTTN) • fibre to the premises (FTTP) • HFC • internet protocol (IP) broadband data network: • email • local area network (LAN) • multiprotocol label switching (MPLS) • web • wide area network (WAN) • Next Generation Networks: • IP based systems using IPv6 addressing • IP private branch exchange (IP PBX) • IPTV • mobile video • multimedia • voice over internet protocol (VoIP) • regional and metropolitan transport network: • asynchronous transfer mode (ATM) • dense wavelength division multiplexing (DWDM) • MPLS • synchronous digital hierarchy (SDH) • wireless access: • Bluetooth • cellular mobile: • 3G/4G • code division multiple access (CDMA) • global system for mobiles (GSM) • microwave • pager • radio • satellite

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RANGE STATEMENT	
	• WiFi (802.11) • WiMAX (802.16) • wireless local loop • wide area networks (WLAN).

Network information sources may include:	• network management databases for:
	  • capacity assessment data
	  • network performance data
	  • traffic dimensioning data
	• network management tools.

Network elements may include:	• IP based:
	  • gateways
	  • layer 2 and layer 3 switches
	  • routers
	• optical devices:
	  • amplifiers
	  • multiplexers
	  • routers
	  • splitters
	  • switches
	• virtual equipment:
	  • networks
	  • PBX
	  • servers
	  • simulations.

Attributes of network elements may include:	• accessibility • capability • capacity • compatibility • convergence • deployability • interoperability • longevity • reliability • return on investment • scalability • security.
Limitations of a building facility may include:	• air conditioning loads • alarms and security

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RANGE STATEMENT	

	• building monitoring and management system
	• equipment racking
	• fire protection
	• floor capacity
	• floor loading capability
	• port capacity
	• power requirements:
	  • battery supply
	  • emergency power supply
	  • energy loads
	  • mains supply.

Products and services may include:	• broadband products:
	  • ADSL
	  • cellular mobile data
	  • FTTP
	  • HFC cable
	  • VDSL
	  • WiFI
	  • WiMAX
	  • wireless data
	• media and content product:
	  • IPTV
	  • mobile video
	  • pay TV
	  • webhosting
	• voice products:
	  • public switched telephone network (PSTN)
	  • VoIP
	  • voice over broadband (VoBB).

Emerging technologies may include:	• IPTV • IPv6 architectures • mesh networks • mobile video • NGN • WiFi enabled phones • WiMAX enabled phones.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4150A Apply knowledge of regulation and legislation for the telecommunications industry

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to assess the impact of deregulation, competition, economic conditions, regulations and legislation on enterprise-specific policies and procedures and its subsequent incorporation into the planning process. Internal and external influences affect all planning decisions regarding the planning and development of the access network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Planning officers from private and public organisations apply the skills and knowledge in this unit to perform the role of a network planner. They combine technical design and planning skills with organisational, economic and regulation skills to be able to plan the access network of service providers. Technical officers may be responsible for small projects or parts of larger projects and for the operational and engineering of the enterprise and telecommunications network in general.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate economic and political influences on the telecommunications industry in Australia	1.1. Research the impact of deregulation and competition in the telecommunications industry on ***planning priorities*** of competing service providers in Australia due to the different federal government policies 1.2. Assess the influence of local and international

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ELEMENT	PERFORMANCE CRITERIA
	economic conditions on the growth of the industry that would impact on the ***planning*** justification for a new network 1.3. Evaluate and produce a report on the economic and political influences upon public and commercial enterprises providing services in a competitive telecommunications market of fast changing technologies
2. Evaluate impact of key regulation and legislation on the telecommunications industry	2.1. Access the ***legislations*** that govern carriers in Australia to determine the rights of carriers and service providers in installing facilities under Commonwealth legislation 2.2. Use the Telecommunications Industry Regulatory Accounting Framework (RAF) to determine the method used by the Australian Competition and Consumer Commission (ACCC) in enforcing competitive provisions between service providers 2.3. Evaluate the impact on planning of services by the obligation placed by Universal Service Obligation (USO) on service providers to ensure that services are reasonably accessible to all people in Australia on an equitable basis 2.4. Produce a summary report evaluating the impact by the legislations on the planning process of Access Networks and plan strategies to facilitate network planning
3. Apply internal financial compliance	3.1. Use an enterprise-specific investment management system (IMS) to create on the spot reports for performance measurement of an existing planning project against the ***business plan*** 3.2. Produce a report of planning work activities incorporating enterprise-specific policies and procedures underpinned by regulatory and compliance obligations

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE
Required skills

• analytical skills to assess impact of economic and political influences on enterprise policies and procedures
• literacy skills to write evaluation reports
• planning skills to review current and new technology, facilities and features when developing options
• problem solving skills to assess current Access Network conditions
• research skills to:
  • analyse impact on planning processes
  • obtain and study information relating to the telecommunications industry
  • study relevant legislation and associated operational codes

Required knowledge
• deregulation of industry • investment management system • legislations • market forces • planning procedures • telecommunications framework • telecommunications industry • telecommunications networks

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce an evaluation report on the economic and political influences on the telecommunications industry in Australia • produce an evaluation report on the impact of key regulation and legislation on the telecommunications industry • produce a summary report evaluating the impact by

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EVIDENCE GUIDE	
	the legislations on the planning process of Access Networks.
Context of, and specific resources for assessment	Assessment must ensure: • relevant legislations, planning processes and Telecommunications Industry Regulatory Accounting Framework (RAF) • planning tools, enterprise-specific investment management system (IMS), relevant databases, licensing requirements and other related procedures.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of evaluation and summary reports completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTNPL4108A Plan the deployment of access network architectures • ICTNPL4151A Plan the telecommunications access network for an estate. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those

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	required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Planning priorities may be driven by:	• customer demand • legislative requirements • marketing initiatives • network conditions • revenue projections.
Planning may refer to:	• network change • network growth • network reduction • sites, buildings and structures.
Legislations may include	• ACCC • Australian Communications and Media Authority (ACMA) legislations • Telecommunications Act 1997 • Telecommunications Industry Regulatory Framework (RAF) • Telecommunications ombudsman • Trade Practices Act • USO.
Business plan may refer to:	• activities • finance • labour • material

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RANGE STATEMENT	
	• planning resource commitment.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4151A Plan the telecommunications access network for an estate

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan access networks delivering voice, data and video services to customers. It involves collation and evaluation of data relating to network shortfalls and projected usage, leading to the development of solutions and ultimately network plans for an estate. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers from private and public organisations apply the skills and knowledge in this unit to perform the role of a network planner. They combine technical design and planning skills with organisational, economic and regulation skills to plan the access network for an estate or green field site. Technical officers may be responsible for small projects or parts of larger projects, and for the operations and engineering of the enterprise and telecommunications network in general.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Gather data on network usage for planning activity	1.1. Determine the type of ***access network*** by accessing and using ***network information sources*** 1.2. Collect ***planning data*** using network information sources to determine ***network trends*** 1.3. Evaluate ***new and emerging technologies*** to determine availability and compatibility with existing network equipment 1.4. Access ***relevant legislation*** and associated

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ELEMENT	PERFORMANCE CRITERIA
	regulatory and operational codes
2. Evaluate need for network growth	2.1. Evaluate capacity of the ***existing network*** to absorb planned growth 2.2. Identify need and likely timing of necessary network increments 2.3. Assess new or alternate technologies to rectify network shortfall 2.4. Identify ***barriers relating to planned network extensions*** that impact on planning the network realisation 2.5. Assess the impact of not meeting network shortfall needs and the long term ramifications on the business
3. Develop solution and network plan to address network shortfall	3.1. Review overall ***planning parameters*** prior to commencement of the planning process to produce forecasts for specific network area and cost-benefit analysis 3.2. Establish the optimum solution to address network shortfall with justification for the proposal 3.3. Determine project details and ascertain preliminary costing and ***resource requirements*** 3.4. Determine the availability of required technology or technology features within the specified timeframe 3.5. Produce a specific ***network plan*** with solution and recommendations for anticipated projects for approval according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to identify details relating to the project from the approved network plan
- communication skills to discuss project brief with the customer
- learning skills to:
  - develop and study planning options, considering present and future needs
  - identify barriers to plan realisation

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REQUIRED SKILLS AND KNOWLEDGE

- literacy skills to write project briefs
- numerical skills to:
  - analyse site survey data
  - cost estimates and operating budgets according to enterprise policy
  - undertake cost-benefit studies to inform the decision making process
- planning skills to review current and new technology, facilities and features when developing options
- problem solving skills to:
  - address and analyse specific customer requirements
  - assess current Access Network conditions
- research skills to:
  - analyse impact on planning processes
  - obtain and study information relating to new technology or technology features
  - obtain geographical information
  - study relevant legislation and associated operational codes
- technical skills to apply the three phases of project management to the project brief

Required knowledge

- awareness of relevant legislation
- detailed knowledge of:
  - cost estimates and operating budgets according to enterprise policy
  - telecommunications industry in Australia
  - theory of project management and associated databases and project management software programs
- overview knowledge of:
  - economic and political influences upon public and commercial enterprises
  - financial authorities and delegations
  - influence of the local and international economic conditions on the telecommunications industry
  - typical challenges and limits facing technology today and the consideration of future needs
- specific knowledge of collating and writing project briefs, reports and project charters

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement planning processes including associated monitoring and control mechanisms • develop solutions to address Access Network shortfalls that satisfy customer and enterprise needs • merge technological development and product implementation into network development plans • produce forecasts for a specific network including cost-benefit analysis.
Context of and specific resources for assessment	Assessment must ensure: • a network planning area, systems and deployment rules and standards • relevant databases, licensing requirements and other site related procedures.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking an assessment of an access network • review of documented network development plan, within specification and within specified timeframes completed by the candidate for differing project briefs • review of solutions developed by the candidate that address network shortfalls • oral or written questioning to assess knowledge of planning the access network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4108A Plan the deployment of access network architectures • ICTNPL4109A Evaluate the capability of access

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EVIDENCE GUIDE	
	networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Access network may refer to:	• copper:
	  • coaxial
	  • hybrid fibre coaxial (HFC)
	  • twisted pair
	• broadband:

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RANGE STATEMENT	

	• wireless fidelity (WiFi)
	• world interoperability for microwave access (WiMAX)
	• digital services:
	  • asymmetrical digital subscriber line (ADSL)
	  • digital subscriber line (DSL)
	• internet protocol (IP) network:
	  • computer
	  • IP private branck exchange (IP PBX)
	  • Internet protocol TV (IPTV)
	  • Voice over internet protocol (VoIP)
	• optical:
	  • fibre to the x (FTTx)
	  • fibre to the premises (FTTP)
	  • fibre to the node (FTTN)
	  • HFC
	• point-to-point network
	• point-to-multipoint network
	• wireless networks:
	  • cellular
	  • microwave
	  • radio
	  • satellite.

Network information sources may include:	• network management databases for:
	  • capacity assessment data
	  • network performance data
	  • traffic dimensioning data
	• network management tools.

Planning data may relate to:	• current and proposed network growth • demographic growth • traffic quantity and flow.
Network trends may include:	• current network capacity • demographic trends • forecasts service demand • forecasts traffic demand • projected network capacity.
New and emerging technologies	• digital subscriber lines:

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RANGE STATEMENT	

may include:	• ADSL
	• DSL
	• IP broadband converging technologies:
	  • IPTV
	  • VoIP
	  • WiFI
	  • WiMAX
	• optical transmission systems:
	  • dense wavelength division multiplexing (DWDM) systems
	  • wavelength division multiplexing (WDM) systems
	• mobile radio.

Relevant legislation may include:	• Australian Communications and Media Authority (ACMA) standards TS 14 • Australian standards applying to radiation hazards • heritage legislation • industrial awards and conditions • International Standards ISO 9000 9001 • International Telecommunications Union (ITU) recommendations • National Parks Act • OHS • Privacy Act • State/Territory and Federal Environment Acts • Telecommunications Act and relevant codes.

Existing network may include:	• boundaries between:
	  • access and inter-exchange networks
	  • Access Network technology and exchange switching and transmission systems.

Barriers relating to planned network extensions may include:	• building availability • environmental considerations • financial constraints • government policy • heritage legislation restrictions • land acquisition problems • material availability • planning approvals • technology availability.

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RANGE STATEMENT	

Planning parameters may relate to:	• network criteria:
	  • cover sites, buildings and structures
	  • network change
	  • network growth
	  • network reduction
	• organisational policies, procedures and guidelines
	• planning priorities driven by:
	  • customer demand
	  • legislative requirements
	  • marketing initiatives
	  • network conditions
	  • revenue projections
	• planning processes:
	  • documented within enterprise process manuals
	  • enterprise specific.

Resource requirements may refer to:	• external to the enterprise • internal to the enterprise.
Network plan may include:	• activities • finance • labour • material.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL4247A Apply compliance requirements to telecommunications work

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to apply legislation, regulations, codes of practice and standards when designing and installing telecommunications equipment and infrastructure in access networks.

Application of the Unit

Planning and design persons from private and carrier organisations apply the skills and knowledge in this unit to perform the role of a network planner or designer.

They combine technical design and planning skills with skills in observing legislation, regulations, codes of practice and standards to be able to plan and design the access network infrastructure of private and/or carrier service providers.

Technical officers may be responsible for small projects or parts of larger projects and for the operation and engineering of enterprise and telecommunications networks in general.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Evaluate project brief for activities that are subject to legislation, regulations, codes of practice and standards	1.1 Identify and document ***project*** activities and outcomes that are subject to legislation, regulations, codes of practice and standards 1.2 Examine organisational procedures that have been developed to deal with these requirements 1.3 Use knowledge bases, authorities' and other external records for information relevant to these project activities and outcomes, and identify their regulatory requirements 1.4 Evaluate and document how these ***regulatory requirements*** may impact on the design and construction of the telecommunications project
2. Evaluate design of telecommunications project for activities that require approval to enter land or premises	2.1 Determine project activities to be undertaken during survey and construction that require access to land or premises 2.2 Determine rights of entry and required notifications to enter property for the purpose of designing and executing a telecommunications project 2.3 Examine courses of action available in case of dispute 2.4 Access ***legislation*** that governs carriers and service providers to determine the rights of carriers and service providers in installing facilities under Commonwealth legislation 2.5 Document procedures for obtaining the required access to land or premises
3. Examine the	3.1 Review studies and information gathered to develop a

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processes necessary to facilitate the completion of a design to meet relevant regulatory requirements	design that complies with requirements 3.2 Discuss with expert stakeholders the steps necessary to meet the legislative requirements of network infrastructure design 3.3 Compare the solutions to regulatory requirements with financial plans to ensure budgetary requirements for the design project are met 3.4 Produce a report on project activities incorporating enterprise-specific policies and regulatory compliance requirements
4. Document compliance procedures and execute legally binding agreements	4.1 Gather reports and studies that support the design and construction activities, and incorporate into final design documentation 4.2 Document all activities for evidence of compliance with requirements in case of future actions 4.3 Ensure legally binding documentation that fulfils obligations with regard to land or premises access is signed by relevant parties as required 4.4 Identify alternative courses of action to be used in case of dispute prior to or after an agreement is signed by all parties

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to assess impact of economic and political influences on enterprise policies and procedures
- literacy skills to write evaluation reports
- planning skills to review current and ***emerging technology***, facilities and features when developing options
- problem-solving skills to assess current ***access network*** conditions
- research skills to:
  - analyse impact of regulatory requirements on ***planning processes***
  - obtain and evaluate information relating to the telecommunications industry, including ***relevant legislation*** and associated operational codes
  -

Required knowledge

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- earth potential rise (EPR) and low frequency induction (LFI) requirements
- requirements relevant to the telecommunications work being undertaken in the following sources of legislation, regulations, codes of practice and standards:
  - Environmental Protection Authority
  - National Parks and Wildlife
  - Ports Authorities
  - Power Distribution Authorities
  - Rail Authorities requirements
  - Roads Authorities
  - Dial Before You Dig and electronic underground locators
  - Telecommunications Authorities
  - Waterway Authorities.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce a detailed report for a telecommunications design project identifying the regulatory requirements for each aspect of the project • produce a report detailing practices to mitigate the impact of a design project and the regulatory requirements addressed • produce a summary report detailing a designer's and contractor's obligations to access land under the Telecommunications Act and code of practice.
Context of, and specific resources for assessment	Assessment must ensure access to: • relevant legislation and planning processes • telecommunications industry Regulatory Accounting Framework (RAF) • planning tools, enterprise-specific investment management system (IMS), relevant databases, licensing requirements and other related procedures.
Methods of assessment	A range of assessment methods should be used to assess

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	practical skills and knowledge. The following examples are appropriate for this unit: • review of evaluation and summary reports completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTNPL4108A Plan the deployment of access network architectures • ICTNPL4151A Plan the telecommunications access network for an estate. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Projects may refer to:	• network change • network growth • network reduction.
Regulatory requirements may include:	• registration of sacred sites • heritage listings • special usage sites • national or state-owned land • environmental restrictions • agricultural restrictions • mining restrictions • water management restrictions • roads and vehicle restrictions • sites, buildings and structures.
Legislation may include:	media and communications legislation overseen by Australian Communications and Media Authority (ACMA) • Australian Competition and Consumer Commission (ACCC) • Telecommunications Act • telecommunications industry Regulatory Accounting Framework (RAF) • Telecommunications ombudsman • Trade Practices Act • Universal Service Obligation (USO).

Unit Sector(s)

Telecommunications - Network planning

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ICTNPL5071A Develop planning strategies for core network design

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop specifications for core networks to be used by network designers. It involves gathering information on anticipated demand and business requirements for the core network to determine design criteria to meet current and future needs. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical skills with broader organisational skills to plan the various core network technologies within a telecommunications network. As a member of a network planning team, their job titles would include network planner, project manager and core network planner. This unit may apply to various core network technologies such as data, ethernet, Next Generation Networks (NGN), fixed and wireless broadband, core and edge networks, media and content required for the deployment of core network infrastructure.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate the core network requirements and infrastructure capability	1.1. Estimate likely growth in ***core network*** use by analysing forecasting ***market intelligence data*** on customer demand 1.2. Analyse current traffic and growth trends in edge and backbone networks to forecast the traffic growth

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ELEMENT	PERFORMANCE CRITERIA
	and capacity demand for the core network 1.3. Compare available ***capacity***, ***capability*** and ***parameters*** of current ***core infrastructure*** deployment against the researched demand data to identify infrastructure shortfalls 1.4. Quantify the ***network requirements*** for any upgrades or network augmentation 1.5. Determine relevant ***standards and regulatory requirements*** to be considered in core network planning 1.6. Formulate justification to proceed by analysing the ***business requirements*** and benefits to the business
2. Prepare a strategic plan and scoping document	2.1. Determine appropriate ***technologies*** and ***network elements*** for core nnetwork deployment, including new or alternative solutions to meet business requirements 2.2. Select commercially viable technology compatible with the existing network to deploy with existing and future network 2.3. Prepare a planning document and ***supporting documentation*** with recommendations that complies with deployment standards and regulatory requirements 2.4. Provide ***estimated costs*** and schedule for a planning solution
3. Produce the project brief	3.1. Evaluate and summarise ***project scope*** into the required briefing format with supporting documentation that complies with ***core network deployment rules*** 3.2. Plan project delivery to suit business requirements and ***practical limitations*** 3.3. Produce the core networks specifications with ***approvals*** and present to the design section to produce detailed design specifications

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate the equipment and product offerings allowable across the competing core network technologies
- communication skills to liaise with internal and external personnel on technical and non- technical matters
- learning skills to keep up to date with equipment to meet future service obligations
- literacy skills to interpret technical and non-technical documentation and the writing of summary reports in required formats
- numeracy skills to interpret data results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and coordinate the planning process in liaison with others
- problem solving and contingency management skills to adapt planning procedures to requirements of particular sites and modify activities depending on differing operational contingencies, risk situations and environments
- research skills to interrogate databases and investigate different network requirements
- technical skills to select and compare benefits and limitations of core network technologies

Required knowledge

- capability and limitations of the various core network technologies for present and future needs
- detailed knowledge of:
  - elements and architecture of core networks
  - limits of a core network
  - typical core network technologies
- elements and architectures of the various core technologies
- key technologies that make up the core network
- overview knowledge of:
  - distribution structure of networks including backbone, core and edge
  - levels of reliability performance standards applicable to the specific equipment deployment needs
  - network design including routing and redundancy
  - standards and regulations

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use data to interpret growth patterns and develop options for core network design which satisfy customer and enterprise financial goals • develop a clearly documented network plan within specification and including merging technological developments and product implementation.
Context of and specific resources for assessment	Assessment must ensure: • computer assisted design (CAD) • computer networks • data for network planning • network equipment deployment plans • planning models • standards and regulations.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking core network evaluation and planning • review of reports completed by the candidate for planning the development and growth of the ore network • oral or written questioning to assess knowledge of the various aspects of planning for a core telecommunications network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4112A Evaluate core network architectures • ICTNPL4113A Plan the deployment of Core Network • ICTNPL5096A Develop planning strategies for Access Network design

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EVIDENCE GUIDE	
	• ICTNPL5154A Develop planning strategies for building environment design. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Core network may include:	• billing • broadband • data • Ethernet

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RANGE STATEMENT	
	• media and content • network management • NGN • switching • transport (synchronous digital hierarchy (SDH) optical networking) • voice.

Market intelligence data may refer to:	• customer request
	• development area plans
	• development triggers
	• market research:
	  • external triggers may include:
	  • government initiatives
	  • local councils
	  • local government planning
	  • property developers
	• market surveys
	• planning approvals
	• planning commission
	• service delivery
	• telecommunication databases:
	  • capacity assessment
	  • network performance
	  • traffic dimensioning
	  • zoning.

Capacity may refer to:	• available ports • ability to augment • technical limitations of port provision.
Capability may refer to:	• ability to deliver desired products • meeting design specifications • meeting technical limitations.

Parameters may include:	• asymmetrical digital subscriber line (ADSL) network:
	  • bandwidth utilisation of broadband remote access server (BRAS)-digital subscriber line access multiplexer (DSLAM) trunks
	  • bandwidth utilisation of BRAS- layer 2 network protocol network server (LNS) trunks
	  • BRAS memory and central processing unit

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RANGE STATEMENT	
	(CPU) load • number of available BRAS ports • number of internet protocol (IP) addresses in use • number of point-to-point protocol (PPP) sessions in use • hybrid fibre coaxial (HFC) cable broadband network: • cable modem termination system (CMTS) memory and CPU load • IP address availability • number of services connected to a segment • upstream/downstream bandwidth utilisation • IP or multiprotocol label switching (MPLS) data network: • available and utilised bandwidth and ports • network latency • packet loss rates • router or switch card slots available • router or switch CPU load • router or switch memory • media and content hosting and distribution network: • available and utilised bandwidth • available and utilised ports • router CPU load • router memory • router slots available • metropolitan Ethernet network: • available and utilised bandwidth • available and utilised ports • available and utilised virtual local area networks (VLAN) • packet loss rates • switch card slots available • switch CPU load • switch memory • SDH network: • bandwidth provisioned

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RANGE STATEMENT	
	• number of add-drop multiplexers (ADM) connected to a ring • number of card slots and ports available • number of circuits provisioned • voice network: • available and utilised bandwidth • available and utilised ports • echo cancellation considerations • network jitter • network latency • number and duration of calls • packet loss rate • quality of service (QoS) • signalling capacity • traffic.
Core infrastructure may refer to:	• building facilities and services • equipment: • billing • cable • customer • data networking • network management • network operations centre • optical • switching • test and monitoring • transmission • wireless • power requirements.
Network requirements may refer to:	• appropriate equipment • compatibility • interoperability • scalable network • suitable technology • upgradeable network.
Standards and regulatory requirements may include:	• company specific policy and standards • design standards • deployment rules

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RANGE STATEMENT	

	• regulatory body requirements:
	  • Australian Competition and Consumer Commission (ACCC)
	  • Telecommunications Act.

Business requirements may refer to:	• complying with standards and regulations • deployment of infrastructure in a commercially viable way • meeting customer demands on the network.
Technologies may include:	• carrier Ethernet • dense wavelength division multiplexing (DWDM) systems • IP core • IP private branch exchange (IP PBX) • IPTV • IPv6 networks • MPLS networks • optical routing • optical switching • optical transmission systems • virtual networks.

Network elements may include:	• access points
	• adapters
	• antennas
	• CPU
	• data network:
	  • backbone
	  • edge
	  • MPLS
	  • routers
	  • switches
	• Ethernet network:
	  • applications
	  • gateways
	  • LAN switch
	  • routers
	  • servers
	  • switches
	  • transmission equipment
	  • VLAN

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RANGE STATEMENT	

	• HFC cable:
	  • ADM
	  • broadband amplifier
	  • cable modems
	  • DSLAMs
	  • fibre network
	  • multiplexer
	• IP network:
	  • gateways
	  • routers
	  • servers
	  • switches
	• media and content network
	• media managers
	• routers
	• servers
	• SDH transport:
	  • add/drop multiplexer (ADM)
	  • SDH switch
	  • STM-1
	• VoIP and wireless voice network:
	  • gateways
	  • routers
	  • servers
	  • switches
	• voice managers.

Supporting documentation may include:	• briefing documents • business justifications • demand data • government initiatives • market surveys.
Estimated costs may refer to:	• comparable past project costs • costing models • unit rates.
Project scope may include:	• costing • details of requirements to build • justification • materials

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RANGE STATEMENT	
	• resource allocation • timing.
Core network deployment rules may refer:	• compatibility with other Core Networks • interoperability with other Core Networks • maintain network integrity • minimal impact on network disruption • scalable technology • upgradeable technology.
Practical limitations may include:	• accessibility of project site • material delivery and installation times • resource availability • resource skill set.
Approvals may include:	• compliance • contract delivery • financial delegation • governance • quality assurance.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Network planning

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ICTNPL5096A Develop planning strategies for access network design

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop specifications for access networks to be used by network designers. It involves gathering information on anticipated demand and business requirements for the access network to determine design criteria to meet current and future needs. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical skills with broader organisational skills to plan the various access network technologies within a telecommunications network. As a member of a network planning team, their job titles include network planner, project manager and access network planner. This unit may apply to various technologies and transmission mediums such as fibre to the x (FTTx), hybrid fibre coaxial (HFC), convergent Next Generation Networks (NGN), copper, optical fibre and wireless required to support the deployment of Access Network Infrastructure.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate the access network requirements and infrastructure capability	1.1. Estimate likely growth in ***access network*** use by analysing forecasting ***market intelligence data*** on customer demand 1.2. Compare available ***capacity*** and ***capability*** of current ***access infrastructure*** deployment against the

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ELEMENT	PERFORMANCE CRITERIA
	researched demand data to identify infrastructure and product shortfalls 1.3. Quantify ***network requirements*** for upgrades or network augmentation to increase capacity and capability of existing network 1.4. Determine relevant ***standards***, ***business and regulatory requirements*** to be considered in access network planning 1.5. Formulate justification to proceed by analysing the ***business requirements*** and benefits to the business
2. Prepare a strategic plan and scoping document	2.1. Determine appropriate ***technologies***, ***network elements*** and ***equipment*** for access network deployment, including new or alternative solutions to meet business requirements 2.2. Select commercially viable technology compatible with the existing network to deploy with existing and future network 2.3. Prepare a planning document and ***supporting documentation*** with recommendations that complies with deployment standards and regulatory requirements 2.4. Provide ***estimated costs*** and schedule for a planning solution
3. Produce the project brief	3.1. Evaluate and summarise ***project scope*** into the required briefing format with relevant supporting documentation for a project brief that complies with ***access network deployment rules*** 3.2. Plan project delivery to suit business requirements and ***practical limitations*** 3.3. Produce the access networks specifications with ***approvals*** and present to the design section to produce detailed design specifications

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

- analytical skills to:
  - determine the equipment that will be used across the spectrum of access network technologies
  - outline the product offerings allowable across all competing access network technologies
- communication skills to liaise with internal and external personnel on technical and non-technical matters
- learning skills to keep up to date with technological changes
- literacy skills to interpret technical and non-technical documentation and the writing of summary reports in required formats
- numeracy skills to interpret data results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and coordinate the planning process in liaison with others
- problem solving and contingency management skills to adapt to requirements of particular access networks and modify activities depending on differing operational contingencies, risk situations and environments
- research skills to interrogate databases and investigate different network requirements
- technical skills to select and compare benefits and limitations of access network technologies

Required knowledge

- capability and limitations of the various access network technologies
- current equipment to meet future service obligations
- detailed knowledge of:
  - broadband networks
  - data networks
  - elements and architecture of the various access networks
  - elements and architectures of the various access network technologies
  - facilities and environmental issues
  - limits of a fixed access transmission network
  - media and content
  - regional and metropolitan network
  - typical access network technologies
  - voice networks
  - wireless network
- distribution structure of networks, including backbone, access and edge
- key technologies that make up the access network
- overview knowledge of:
  - levels of reliability performance standards, applicable to the specific equipment

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REQUIRED SKILLS AND KNOWLEDGE
deployment needs • network design including routing and redundancy • standards and regulations • typical problems and challenges that describe the capability and limitations of the various access networks

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use data to interpret growth patterns and develop options for access network design which satisfy customer and enterprise financial goals • develop a clearly documented network plan, within specification and including merging technological development and product implementation.
Context of and specific resources for assessment	Assessment must ensure: • computer assisted design (CAD) • computer networks • data for network planning • network equipment deployment plans • planning models • standards and regulations.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking network evaluation and planning • review of reports completed by the candidate for planning the development and growth of the telecommunications network

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EVIDENCE GUIDE	
	• oral or written questioning to assess knowledge of the various aspects of planning for an access telecommunications network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL5071A Develop planning strategies for core network design • ICTNPL5154A Develop planning strategies for building environment design. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised

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RANGE STATEMENT	
wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Access network may refer to:	• access fibre network
	• broadband network
	• copper:
	  • asymmetrical digital subscriber line (ADSL)
	  • digital subscriber line (DSL)
	  • twisted pair
	• fibre to the premises (FTTP)
	• hybrid fibre coaxial (HFC)
	• wireless networks:
	  • wireless fidelity (WiF)i
	  • world interoperability for microwave access (WiMAX)
	  • wide local area networks (WLAN).

Market intelligence data may refer to:	• customer request
	• development area plans
	• development triggers
	• external triggers may include:
	  • government initiatives
	  • local councils
	  • local government planning
	  • property developers
	• market research
	• market surveys
	• planning approvals
	• planning commission
	• service delivery
	• telecommunication databases:
	  • capacity assessment
	  • network performance
	  • traffic dimensioning
	• zoning.

Capacity may refer to:	• ability to augment • available ports • technical limitations of port provision.

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RANGE STATEMENT	
Capability may refer to:	• ability to deliver desired products • meeting design specifications • meeting technical limitations.

Access infrastructure may refer to:	• building facilities and services
	• equipment:
	  • cable
	  • customer
	  • data networking
	  • network management
	  • optical
	  • switching
	  • test and monitoring
	  • transmission
	  • wireless
	• power requirements.

Network requirements may refer to:	• appropriate equipment • compatibility • interoperability • scalable network • suitable technology • upgradeable network.

Standards, business and regulatory requirements may include:	• company specific policy and standards
	• council requirements
	• deployment rules
	• design standards
	• regulatory body requirements:
	  • Australian Competition and Consumer Commission (ACCC)
	  • Telecommunications Act.

Business requirements may refer to:	• complying with standards and regulations • deployment of infrastructure in a commercially viable way • meeting customer demands on the network.

Technologies may include:	• digital subscriber lines:
	  • ADSL
	  • DSL
	• mobile radio
	• NGN:

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RANGE STATEMENT	
	• broadband access • data transfer • internet protocol (IP) based systems • IP private branch exchange (IP PBX) • internet protocol TV (IPTV) • mobile data • mobile telephony • multimedia • video • voice over internet protocol (VoIP) • optical transmission systems: • dense wavelength division multiplexing (DWDM) systems • wavelength division multiplexing (WDM) systems.
Network elements may include:	• current copper network: • copper cable • exchange • lead in cable • lightning protection • loading coils • main distribution frame, cross connect unit • manhole • pair gain system • pits • current fibre network: • exchange • fibre access points • high density/optical fibre distribution frame (HD/OFDF) • joint enclosure • manhole • optical fibre • pits • FTTP network: • broadband passive optical network (BPON) • conduit • distribution/lead in multi-port (DLM/LM)

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RANGE STATEMENT	
	• ethernet broadband remote access server (EBRAS) • exchange • fibre distribution hub (FDH) • gigabit passive optical network (GPON) • headend • high density/optical fibre distribution frame (HD/OFDF) • home optical network terminal • lead-in • manhole • optical distribution network • optical fibre • packet optical line terminal (P-OLT) • pits • video optical line terminal (V-OLT) • wave division multiplexer (WDM) • HFC network: • coaxial cable • exchange • headend • hub • IP edge • line power supply • node • optical fibre • optical receiver • radio frequency (RF) amplifier • tap • video service centre • transmission hub • wireless network: • access points • antennas • dish • exchange • RF amplifiers • radio towers and huts

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RANGE STATEMENT	
	• RF receivers • RF transmitters • satellite • waveguide.

Equipment may include:	• digital
	• IP based
	• optical:
	  • add/drop multiplexers
	  • amplifiers
	  • filters
	  • receivers
	  • splitters/combiners
	  • switches
	  • transmitters
	• wireless:
	  • amplifiers
	  • filters
	  • microwave
	  • receivers
	  • RF broadband
	  • satellite
	  • transmitters.

Supporting documentation may include:	• area plans • briefing documents • business justifications • demand data • maps.
Estimated costs may refer to:	• comparable past project costs • costing models • unit rates.
Project scope may include:	• costing • details of requirements to build • justification • materials • resource allocation • timing.
Access network deployment rules may refer to:	• separation from other services: • electricity

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RANGE STATEMENT	

	• fire equipment
	• gas
	• other telecommunications service providers
	• water
	• restricted site access:
	  • financial institutions
	  • government offices
	  • rail corridor
	  • research establishments.

Practical limitations may include:	• accessibility of project site • material delivery and installation times • resource availability • resource skill set.
Approvals may include:	• compliance • contract delivery • financial delegation • governance • quality assurance.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Network planning

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ICTNPL5101A Apply service measures and demand forecasting to products and services planning

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse customer bases and market demands and use forecasting tools to predict customer demands for new products and services. Accurate forecasting helps service providers make key investment decisions relating to product development and introduction, advertising and pricing, well in advance of product launch. This helps to ensure that the company will make a profit on a new venture and that capital is invested wisely. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical planners, designers and supporting administration staff apply the skills and knowledge in this unit. It may also apply to technical staff moving into planning and management positions. Planners may be responsible for small projects, parts of larger projects and for the delivery of telecommunications products and services to customers.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Analyse customer base	1.1. Establish the ***reasons for forecasting*** in network planning and ***factors that influence forecasting*** 1.2. Collate ***data*** from appropriate organisations involved in ***planning initiatives*** for planning delivery of products and services 1.3. Establish ***market segmentation*** to improve marketing effectiveness on new technology adoption 1.4. Analyse the market segments of customers based on

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ELEMENT	PERFORMANCE CRITERIA
	geography and ***demographics*** for a new service or product and predict the adoption of a new product
2. Evaluate current utilisation	2.1. Evaluate current service usage of the network and determine current traffic load 2.2. Evaluate current network occupancy and determine any spare capacity
3. Predict future customer base	3.1. Evaluate the expected customer growth and segment mix in a defined geographical area and assess impact on network planning 3.2. Use a ***forecasting model*** and predict the customer demand for new technology products and services
4. Use property market and development data to produce plans	4.1. Develop strategic plans on infrastructure planning using ***planning authority*** data for development and redevelopments 4.2. Produce a plan for future development projects using property market data
5. Predict future service requirements	5.1. Create a customer service plan to maintain valuable customer relationships and strengthen business 5.2. Measure customer service results using ***key factors*** that provide an indicator for customer service quality 5.3. Use ***forecasting tools*** to predict future service demand and requirements for emerging technology ***services of Next Generation Networks*** (***NGN***)
6. Produce network forecast and documentation	6.1. Produce geographically-based network growth forecasts utilising the change in customer base, changes to property market and future service predications 6.2. Produce and present ***documentation***

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to examine market segments of customers based on geography and demographics

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REQUIRED SKILLS AND KNOWLEDGE

• communication skills to liaise with internal and external personnel on technical and operational matters maintaining customer focus and consideration of customer needs
• literacy skills to interpret technical documentation and write analytical reports in required formats
• numeracy skills to be able to compare technical data on various network topologies
• planning and organisational skills to plan, prioritise and monitor own work
• research skills to interrogate databases and investigate different customer requirements
• technical skills to:
  • evaluate current service usage of the network
  • select and use forecasting tools and forecasting models to make planning predictions

Required knowledge
• different levels of reliability performance standards applicable to the specific equipment deployment needs • emerging technologies • factors affecting forecasting • forecasting models • forecasting tools • market segmentations • network designs • new products and services • NGN services • planning authorities • planning initiatives • prepare and review customer bases • service measures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • interpret growth patterns and develop options which satisfy customer and enterprise financial goals • predict future customer base and service requirements • produce network growth forecasts utilising changes to customer base, property market and future service predictions.
Context of and specific resources for assessment	Assessment must ensure: • data from organisations involved in planning initiatives • range of software currently used in industry • relevant regulations, specifications that impact on service measures and forecasting activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking a practical forecasting exercise • review of network growth forecast completed by the candidate for forecasting growth of the telecommunications network • oral or written questioning to assess knowledge of planning the development of the telecommunications network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL5071A Develop planning strategies for core network design • ICTNPL5096A Develop planning strategies for access network design • ICTNPL5154A Develop planning strategies for building environment design. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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EVIDENCE GUIDE	
	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Reasons for forecasting may include:	• evaluation of management decisions • planning and budgeting for equipment purchase • verification to confirm prediction.

Factors that influence forecasting may include:	• demographics
	• economics:
	  • global
	  • macroeconomics:
	  • exchange rates
	  • imports
	  • inflation
	  • stimulus package

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RANGE STATEMENT	

	• sectoral:
	  • emerging technologies
	  • growth rate
	  • industry
	• technology:
	  • application:
	  • internet
	  • internet protocol TV (IPTV)
	  • local area networks (LAN)
	  • voice over internet protocol (VoIP)
	  • wide area networks (WAN)
	  • subscriber access:
	  • cellular
	  • optical fibre
	  • wireless
	  • technology:
	  • broadband
	  • fibre to the premises (FTTP)
	  • IP services
	  • multiprotocol label switching (MPLS)
	  • national broadband network (NBN)
	  • world interoperability for microwave access (WiMAX).

Data may be:	• changing customer use patterns
	• collected by:
	  • directories
	  • examining plans
	  • interviews
	  • maps
	  • network management tools
	  • reports
	• collected from:
	  • customers:
	  • actual
	  • prospective
	  • economic planners
	  • internal organisational groups
	  • local

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RANGE STATEMENT	
	• marketing organisations • real estate agents • sales organisations • state and federal governments • statutory bodies • traffic management systems • customer access planning • demographic changes • economic forecasts • historical usage data • industry trends • influence of technology on traffic demand • land developments • local industry • market conditions • marketing programs • marketing requirements • population trends • possible environmental impacts • power • re-zoning • sales forecasts • shire planning • telecommunications history in the area • traffic patterns.
Planning initiatives may include:	• capacity upgrade • equipment upgrade • new product line: • media centres • new services: • IP services • IPTV • new technology: • FTTP • NBN.
Market segmentation may depend on:	• behaviour: • brand loyalty • product usage rate • readiness to buy stage

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RANGE STATEMENT	

	• demographics
	• geography
	• psychographics:
	  • attitude
	  • ethics
	  • lifestyle
	  • personality
	• technological segmentation variables:
	  • attitude about technology
	  • early adopters
	  • usage patterns.

Geography may refer to:	• climate:
	  • cold
	  • hot
	  • humid
	  • snowy
	• size:
	  • large city
	  • small town
	• density of area:
	  • rural
	  • urban
	• region of world or country:
	  • Asia Pacific or Europe
	  • coastal or inland.

Demographics may refer to:	• age • employment • habits • income • occupation • people's lifestyles • population movements • socioeconomic status • spending.

Forecasting model may include:	• analogous method:
	  • qualitative (symbolical) model
	  • quantitative (numeric) model
	• judgemental method:

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RANGE STATEMENT	
	• Delphi method • surveys • technology forecasting • prediction market • probabilistic forecasting • simulation • time series forecast: • exponential smoothing • extrapolation • growth curve • linear prediction • moving average • trend estimation.
Planning authority may refer to:	• local: • developers • entertainment venues • parks • roads • state: • educational institutions • hospitals • housing estates • industrial areas • new shopping centres • new suburbs.
Key factors may include:	• customer attrition ratio • customer complaints • customer survey results • sales growth.
Forecasting tools may include:	• specialist forecasting software • spreadsheets • statistical tools: • graphical estimation • moving averages: • simple • weighted • Poisson distribution • probability

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RANGE STATEMENT	
	• queuing theory • regression analysis • trend analysis.
Services of Next Generation Networks (***NGN***) may include:	• interactive TV • IP based home networks • IPTV • video on demand (VoD) • virtual networks • VoIP services • web applications.
Documentation may include:	• customer demand figures • customer service plan • network growth forecasts • recommendations • strategic plans.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL5154A Develop planning strategies for building environment design

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop planning strategies for the design phase to meet present and future demands. It involves gathering information on network capability, anticipated network deployment demand and scoping design requirements to produce building planning specifications. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical skills with broader organisational skills to plan the network building requirements within a telecommunications network. As a member of a network planning team, their job titles include network planner, project manager and buildings infrastructure planner. This unit applies to the building environment required to support the deployment of network infrastructure and equipment, such as power, air conditioning and spatial

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	needs.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate the building environment requirements	1.1. Utilise ***network equipment*** deployment plans to convert network equipment specifications into ***building requirements data***

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ELEMENT	PERFORMANCE CRITERIA
	1.2. Determine the planned and forecast network equipment deployment locations and quantities to prioritise tasks 1.3. Formulate justification to proceed by analysing the ***business requirements*** and benefits to the business 1.4. Analyse the current building ***capacities*** or ***capabilities*** against the planned deployment data to determine building environment shortfalls or additional needs 1.5. Determine the minimum needs required to address identified building services shortfalls, upgrades or changes 1.6. Identify ***relevant standards***, business and ***regulatory requirements*** that are essential for building plan compliance
2. Scope the buildings design requirements	2.1. Quantify the building's requirements from known needs to determine if any standard deliverables can be used 2.2. Assess if requirements can be met using new or alternative solutions 2.3. Provide ***estimated costs*** and schedule to determine a planning solution 2.4. Prepare a scoping document and ***supporting documentation*** with recommendations that complies with deployment standards and regulatory requirements
3. Produce the project brief	3.1. Prepare a ***project scope*** in required briefing format to present to the design section 3.2. Plan project delivery to meet any business timing and ***funding constraints*** 3.3. Produce the building planning specifications with ***approvals*** and present to the building design section to be used for detailed design or construction specifications

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate technical requirements and produce building specifications
- communication skills to liaise with internal and external personnel on technical and non-technical matters
- learning skills to keep up to date with technological changes
- literacy skills to interpret technical and non-technical documentation and the writing of summary reports in required formats
- numeracy skills to interpret data results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work
- problem solving and contingency management skills to adapt technology to requirements of particular sites and modify activities depending on differing operational contingencies, risk situations and environments
- research skills to interrogate databases and investigate different audit requirements
- technical skills to select and compare benefits and limitations of building technologies to offer alternatives

Required knowledge

- capability and limitations of the various network technologies to meet present and future needs
- costing and funding models
- detailed knowledge required to prepare and review the limits of a buildings facilities and services
- network equipment requirements to derive buildings specifications
- overview knowledge of:
  - network building design
  - regulations
  - standards
- typical problems and challenges that describe the limitations of the various buildings project work
- upgrade knowledge of current building requirements to meet future service obligations

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to : • assess building environment requirements to provide network capability for current demands, including consideration of merging technological development and product implementation • prepare a scoping document with solutions, costing and scheduling recommendations to meet network capability needs and regulatory requirements.
Context of and specific resources for assessment	Assessment must ensure: • computer assisted design (CAD) • computer networks • data for network planning • network equipment deployment plans • planning models • standards and regulations.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate implementing planning processes • review of reports completed by the candidate for planning the development and growth of the telecommunications network • oral or written questioning to assess knowledge of the various aspects of the planning for the access telecommunications network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL5096A Develop planning strategies for Access Network design • ICTNPL5071A Develop planning strategies for core network design.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Network equipment may include:	• billing centre • broadband • broadcasting • call centre • internet protocol (IP) networking • network alarm

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RANGE STATEMENT	
	• network operations centre • radio • switching • transmission.
Building requirements data may include:	• alarms • cooling • fire protection • power usage • security protection • spatial.
Business requirements may refer to:	• complying with standards and regulations • deployment of infrastructure in a commercially viable way • meeting customer demands on the network.
Capacities may refer to:	• ability to extend building area • adequate fire and security protection • available adequate cooling power • available adequate power feed from electricity supply authority • available floor space for use • vehicular access.
Capabilities may refer to:	• ability to deliver desired products • building design specifications • building limitations on facility and services • future needs.

Relevant standards may include:	• accepted industry design standards and codes
	• Australian or international standards
	• company design standards
	• company specific policy and standards
	• deployment rules
	• environmental codes
	• fire authority codes
	• heritage codes
	• local council building codes
	• regulatory body requirements:
	  • Australian Competition and Consumer Commission (ACCC)
	  • Telecommunications Act.

Regulatory requirements may	• community

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RANGE STATEMENT	
include:	• environmental • legal • statuary.
Estimated costs may include:	• comparable past project costs • costing models • funding model • unit rates.
Supporting documentation may include:	• area plans • briefing documents • business justifications • cost-benefit analysis • customer demands.
Project scope may include:	• costing • details of requirements to build • justification • materials • provisions • resource allocation • timing.
Funding constraints may include:	• delay in funding • lack of budget or funding • low priority • project deferment.
Approvals may include:	• compliance • contract delivery • financial delegation • governance • quality assurance.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL6029A Plan the development and growth of the telecommunications network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse and evaluate forecast data to plan the development and growth of the telecommunications network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit to plan access networks. It may also apply to technical staff moving into planning and management positions with responsibility for small projects or parts of larger projects, and for the operational and engineering of the telecommunications network in general.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Gather data related to existing and projected network usage	1.1. Access ***market intelligence*** for information on customer demand on the network and likely growth in network use 1.2. Obtain ***demand data*** to plan for potential network traffic quantity and flow 1.3. Access information relating to ***new and emerging technologies***, facilities and features and their specific applications 1.4. Access ***relevant legislation*** and associated operational codes and analyse impact on ***planning*** processes
2. Assess need for	2.1. Evaluate capacity of existing network to absorb

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ELEMENT	PERFORMANCE CRITERIA
network growth	planned growth using network capacity usage and traffic measurements 2.2. Plan likely timing of necessary network increments to minimise impact on the network 2.3. Assess use of new or alternate technologies to meet forecast growth
3. Develop network plans	3.1. Assess overall planning parameters including approved business plan prior to commencement of planning process 3.2. Analyse gathered information and produce a project plan with ***specifications*** to meet network growth 3.3. Conduct appropriate investment study including cost benefit analysis where required with consideration of ***barriers*** that may affect project plan 3.4. Produce a network plan with detailed specifications and seek approval according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to identify details relating to the project from the approved network plan
- communication skills to discuss project brief with enterprise personnel, customers and other contractors
- literacy skills to write project briefs
- numeracy skills to:
  - analyse site survey data
  - cost estimates and operate budgets according to enterprise policy
  - undertake cost and benefit studies as a guide to the decision making process
- planning and organisational skills to consider current, new technology, facilities and features when developing options
- problem solving skills to:
  - address and analyse specific customer requirements

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REQUIRED SKILLS AND KNOWLEDGE

• assess current access network conditions
• research skills to:
  • analyse impacts on planning processes
  • obtain and study information relating to new technology or technology features
  • obtain geographical information
  • study relevant legislation and associated operational codes
• technical skills to:
  • apply the three phases of project management to complete the project brief
  • develop and study planning options considering present and future needs
  • identify barriers to plan realisation

Required knowledge

• detailed knowledge of:
  • cost estimates and operating budgets according to enterprise policy
  • project management theory, associated databases and project management software programs
  • telecommunications industry in Australia
• overview knowledge of:
  • economic and political influences on public and commercial enterprises
  • financial authorities and delegations
  • influence of the local and international economic conditions on the telecommunications industry
  • typical challenges and limits facing technology today and the consideration of future needs
• relevant legislation
• specific knowledge of collating and writing project briefs, reports and project charters

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • gather data related to existing and projected network usage • assess need for network growth • develop network plans.
Context of and specific resources for assessment	Assessment must ensure: • data from organisations involved in planning initiatives • a range of software currently used in industry • relevant regulations, specifications that impact on forecasting activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking network planning tasks • review of data gathered, reports and project plans prepared by the candidate for planning the development and growth of telecommunication networks • oral or written questioning to assess knowledge of planning the development telecommunications networks.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL6030A Forecast service demand. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Market intelligence may include:	• customer demand • customer feedback • customer projections • customer specific technology needs • new technology impact.

Demand data may be:	• collected from:
	  • customers:
	  • actual
	  • prospective
	  • economic planners
	  • internal organisational groups
	  • local
	  • marketing organisations
	  • real estate agents
	  • sales organisations
	  • state and federal governments
	  • statutory bodies

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RANGE STATEMENT	

	• traffic management systems
	• in relation to:
	  • access transport planning
	  • changing customer use patterns
	  • demographic changes
	  • economic forecasts
	  • industry trends
	  • influence of technology on traffic demand
	  • land developments
	  • local industry
	  • market conditions
	  • marketing programs
	  • population trends
	  • possible environmental impacts
	  • power re-zoning
	  • sales forecasts
	  • shire planning
	  • traffic patterns.

New and emerging technologies may be obtained from:	• marketing groups • specific technology planning groups • vendor and enterprise forward planning groups.
Relevant legislation may include:	• Australian Communications and Media Authority (ACMA) standards TS 14 • International Standards ISO 9000/9001 • International Telecommunication Union (ITU) recommendations • OHS • Privacy Act • State/Territory and Federal Environment Acts • Telecommunications Act and relevant codes.

Planning can relate to:	• buildings
	• network change
	• network growth and network reduction
	• priorities which are driven by:
	  • customer demand
	  • legislative requirements
	  • marketing initiatives
	  • revenue projections

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RANGE STATEMENT	
	• sites • structures.
Specifications may include:	• availability of equipment • availability of resources • costing • funding • infrastructure developments • priority • risk assessment • technology requirements • timeframe.
Barriers may include:	• building availability • environmental considerations • financial constraints • government policy • heritage legislation restrictions • land acquisition problems • material availability • planning approvals • technology availability.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Network planning

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ICTNPL6030A Forecast service demand

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop forecasts for demand for telecommunications services. It includes assessing activities that may change service demand and capacity requirements. All telecommunications service providers perform forecasting to assist in network planning. Accurate forecast helps operators make key investment decisions relating to product development and network growth No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical planners, designers and supporting administration staff apply the skills and knowledge in this unit. It may also apply to technical staff moving into planning and management positions. This unit may apply to new installation or upgrades to existing telecommunications services.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Gather forecast intelligence	1.1. Access ***market intelligence*** for information on customer demand on the network and likely growth in network use 1.2. Obtain ***demand data*** to assess the potential network traffic quantity and flow 1.3. Access information relating to ***new and emerging technologies***, facilities and features and their specific applications to evaluate the market trends in new

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ELEMENT	PERFORMANCE CRITERIA
	technology implementation 1.4. Obtain data from network analysis to determine the state of the existing network using customer complaint reports and network fault incidence rate
2. Produce forecast service demand information	2.1. Analyse and process all collated data and prepare to the format required for forecasting activity 2.2. Select and configure a suitable ***software forecasting tool*** to process the collated data 2.3. Evaluate forecast results to generate ***forecasts*** of service demand using information in reference to new developments 2.4. Compile forecast figures and report according to enterprise policy
3. Review forecasts and update systems records	3.1. Review forecasts according to enterprise policy 3.2. Ensure forecasts consider ***new developments*** in the area and technological changes where appropriate 3.3. Maintain updated ***systems records*** with information received from each installation amendment activity

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to assess technical demand requirements based on technical and non-technical input data
- literacy skills to:
  - document technical requirements
  - read and interpret equipment, system manuals, specifications and relevant enterprise policy
- numeracy skills to:
  - apply forecasting techniques
  - assess channel capacities and overall dimensioning requirements
  - work with statistical data
- problem solving skills to account for unexpected changes in demand requirements
- technical skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• compile reports and record activities of enterprise systems • work with data and statistical techniques
Required knowledge

• broad knowledge of:
  • common telecommunications measurements quantities
  • network and transmission equipment and capabilities
  • network topologies and common access and transmission hierarchies
• configure and use software forecasting tools
• detailed knowledge of:
  • forecasting techniques
  • sources of data to aid forecasting
• market intelligence
• new and emerging technologies
• typical customer applications and usage levels

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • collect data vital to the development of traffic and service variation • generate forecasts in relation to traffic and service variation using appropriate forecasting techniques • review forecasts relevant to specific planning periods.
Context of and specific resources for assessment	Assessment must ensure: • data from organisations involved in planning initiatives • a range of software currently used in industry • relevant regulations, specifications that impact on

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EVIDENCE GUIDE	
	forecasting activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking practical forecasting • review of reports and demand forecasts completed by the candidate • oral or written questioning to assess knowledge of dimensioning issues, types of systems and applications.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL6029A Plan the development and growth of the telecommunications network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Market intelligence may include:	• customer request data
	• development area plans
	• development triggers
	• market research:
	  • external triggers may include:
	  • government initiatives
	  • local councils
	  • local government planning
	  • property developers
	• market surveys
	• planning approvals
	• planning commission data
	• service delivery data
	• zoning data
	• telecommunication databases:
	  • capacity assessment data
	  • traffic dimensioning data.

Demand data may be:	• collected from:
	  • customers:
	  • actual
	  • prospective
	  • economic planners
	  • internal organisational groups
	  • local
	  • marketing organisations
	  • real estate agents
	  • sales organisations
	  • state and federal governments
	  • statutory bodies
	  • traffic management systems
	• in relation to:

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RANGE STATEMENT	
	• access transport planning • changing customer use patterns • demographic changes • economic forecasts • industry trends • influence of technology on traffic demand • land developments • local industry • market conditions • marketing programs • population trends • possible environmental impacts • power re-zoning • sales forecasts • shire planning • traffic patterns.
New and emerging technologies may be obtained from:	• marketing groups • specific technology planning groups • vendor and enterprise forward planning groups.

Software forecasting tool may include:	• specialist forecasting software
	• spreadsheets
	• statistical tools:
	  • graphical estimation
	  • moving averages:
	  • simple
	  • weighted
	  • Poisson distribution
	  • probability
	  • queuing theory
	  • regression analysis
	  • trend analysis.

Forecasts may include:	• bandwidth • call or data traffic demand • circuit dimensioning • congestion levels • demand for telecommunications services • growth expectations in number of services required

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RANGE STATEMENT	
	• quality of service (QoS) targets • transmission capacity in Erlangs.
New developments may include:	• commercial • communications construction be occurring directly or concurrently with primary activity • domestic • industrial.

Systems records may include:	• databases
	• network management
	• records:
	  • equipment
	  • operational
	  • planning.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Network planning

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ICTNPL6046A Undertake network performance analysis

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake and manage the monitoring, analysis and improvement of network performance. It involves analysing problems and organising repairs as well as coordinating software and hardware upgrades. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from telecommunications carriers, contractors or other service providers apply the skills and knowledge in this unit. They conduct network performance analysis routinely to monitor the health of the network and also following network upgrades and new installations. This unit applies to switching, transmission, wireless and optical telecommunications networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Analyse network performance to determine service levels	1.1. Establish ***network type*** and ***quality of service*** (***QoS***) standards levels required, in conjunction with equipment suppliers and ***customer*** opinion, to determine the benchmark for network performance standards 1.2. Analyse trend analysis data and statistical data to assess the level and type of ***network degradation*** 1.3. Conduct ***performance tests*** according to established ***performance checklist*** to systematically evaluate the level of QoS using appropriate ***performance analysis tools*** 1.4. Analyse test results and determine the QoS levels

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ELEMENT	PERFORMANCE CRITERIA
	and network problems 1.5. Establish restoration times in the event of service breakdown 1.6. Determine, organise and allocate resources necessary to monitor service levels
2. Monitor the integrity of the network	2.1. Monitor alarm panels and verify message retrieval system on an ongoing basis to maintain network integrity 2.2. Undertake real time analysis of data from all sources to determine network health
3. Manage the delivery of quality service	3.1. Conduct ***monitoring activities*** to maintain the quality of service level and integrity of the network 3.2. Analyse trouble reports and performance data including customer feedback on a regular basis as an indicator of network performance 3.3. Analyse drive test data as an input to performance and optimise the network to improve network level of service
4. Analyse problems and organise repair	4.1. Analyse performance results regularly and initiate investigations when performance levels are below specified standards and recommend network changes 4.2. Analyse causes of problems by testing specific network components 4.3. Isolate problems where possible and escalate repair according to enterprise policy 4.4. Undertake evaluation testing after repair to ensure that the problem has been rectified
5. Coordinate upgrade of software and hardware	5.1. Develop strategies to affect changes according to recommendations and produce a plan to coordinate activities 5.2. Produce a cost estimate of proposed change and submit a cost-benefit study for approval 5.3. Confirm shortcomings in hardware and software and negotiate with planners for network modifications 5.4. Evaluate the modifications to ensure network compatibility and use of appropriate ***protocols providing QoS*** in the network 5.5. Produce a plan for software and hardware changes to be initiated with minimum network downtime and customer impact 5.6. Undertake tests following upgrade to ensure the

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ELEMENT	PERFORMANCE CRITERIA
	level of performance planned as a result of the upgrade has been achieved 5.7. Produce documentation including configuration details and tests results and submit to network planner

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to interpret performance tests and make recommendations • communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes • literacy skills to interpret technical specifications and related documentation • numeracy skills to make calculations on test data for evaluation of network performance • planning and organisation skills to develop activity plans and strategies to monitor, repair or upgrade equipment, systems or software • problem solving skills to account for unexpected faults or equipment configuration anomalies • technical skills to correctly analyse network performance service levels and provide solutions
Required knowledge

• cost estimation
• customer:
  • customer policies
  • expectancies
  • service level agreements
• network:
  • alarms
  • compatibility and interoperability
  • operations
  • performance analysis methodologies

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REQUIRED SKILLS AND KNOWLEDGE
• performance analysis tools • performance tests • planning and design principles • protocols providing QoS • QoS standard levels • software and hardware upgrades • technologies and architectures of: • switching network • transmission network • technologies of customer network

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • interpret current network performance data • monitor the integrity of the network • manage the delivery of quality service • conduct performance tests using appropriate performance analysis tools • analyse problems and organise repair applying escalation procedures, if required, within service assurance guidelines • coordinate upgrade of software and hardware.
Context of and specific resources for assessment	Assessment must ensure: • site where network performance analysis may be conducted • data from organisations involved in planning initiatives • range of software currently used in industry • relevant regulations, specifications that impact on

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EVIDENCE GUIDE	
	service measures and forecasting activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of proposed upgrade strategy prepared by the candidate, outlining cost-benefit analysis, equipment compatibility study and proposed testing routine • direct observation of the candidate undertaking a practical monitoring, testing or planning exercise • oral or written questioning to assess knowledge of monitoring and testing procedures and types of systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTTEN6043A Undertake network traffic management • ICTTEN6045A Implement planned network changes with minimal impact to the customer • ICTTEN6047A Manage a common channel signalling network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Network type may refer to:	• internet protocol (IP) networks:
	  • internet protocol TV (IPTV)
	  • mesh
	  • multiprotocol label switching (MPLS)
	  • online games
	  • video teleconferencing (VTC)
	  • voice over internet protocol (VoIP)
	  • web
	• packet switched networks
	• frame relay(FR)
	• asynchronous transfer mode (ATM)
	• optical networks:
	  • dense wavelength division multiplexing (DWDM) networks
	  • optical Ethernet
	• wireless networks:
	  • world interoperability for microwave access (WiMAX)
	  • cellular mobile
	  • general packet radio service (GPRS)
	  • long term evolution (LTE).

Quality of service (***QoS***) is a measurement of:	• customer satisfaction • level of performance

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RANGE STATEMENT	
	• level of quality of service • quality of service by the network • service response times.
Customer may include:	• communications consultant • contractor to a major supplier • end users • other divisions of the company • small, medium or large organisations • wholesale service providers.
Network degradation may refer to:	• blockages • call drop out • congestion • connection drop out • latency • lockouts • packet loss • poor data transfer rate • poor quality of service • server performance.

Performance tests may include:	• grade of service (GoS)
	• IP systems:
	  • bit rate
	  • data throughput
	  • delay
	  • error probability
	  • jitter
	  • out of order packet delivery
	  • packet dropping
	• mean opinion score (MOS)
	• mean time between failures (MTBF)
	• packet switched network:
	  • cross-talk
	  • echo
	  • frequency response
	  • interrupts
	  • loss
	  • loudness levels
	  • service response time
	  • signal-to-noise ratio

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RANGE STATEMENT	
	• quality of experience (QoE).

Performance check list may include:	• compression:
	  • disable
	• firewalls:
	  • disable software types
	• hardware:
	  • central processing unit (CPU)
	  • modems
	  • routers
	• network service provider:
	  • port blocking
	  • compression
	• software:
	  • applications
	  • operating system (OS)
	• test:
	  • use test tools
	• trace:
	  • use commands
	• tunneling:
	  • virtual private network (VPN)
	• verify:
	  • connectivity
	  • data transfer rate
	  • timings.

Performance analysis tools may include:	• network management system
	• protocol analyser
	• software:
	  • Linux advanced routing and traffic control
	  • bandwidth arbitrator
	  • Zeroshell.

Monitoring activities may include:	• customer perception surveys • feedback from marketing personnel • live tests via alarms • network alarms • network repair • performance levels • periodic updates from network management

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RANGE STATEMENT	
	systems • real-time performance indicators • service levels • temporarily connected test equipment • trend data.

Protocols providing QoS may include:	• ATM
	• FR
	• next generation home network (G.hn) standard
	• home phoneline networking alliance (Home PNA) - home networking over coax and phone wires
	• Institute of Electrical and Electronics Engineers (IEEE) standards:
	  • IEEE 802.11e
	  • IEEE 802.11p
	  • IEEE 802.1p
	  • IEEE 802.1Q
	• IP differentiated services (DiffServ)
	• IP integrated services (IntServ)
	• multiprotocol label switching (MPLS)
	• Resource reSerVation Protocol (RSVP)
	• RSVP traffic engineering (RSVP-TE)
	• type of service (TOS) field in the IP header (now superseded by Diffserv).

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Network planning

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ICTOHS2080A Provide telecommunications services safely on roofs

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge to perform safe work practices when installing or repairing telecommunications equipment on roof structures. This unit of competency specifies the outcomes required to safely install or repair telecommunications equipment on roof structures. It includes planning, risk assessment and implementing control measures whilst undertaking telecommunications installation or repairs. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technicians and installers apply the skills and knowledge in this unit. This unit applies to domestic and commercial roof work applications, which may be new or existing structures requiring installation or maintenance of telecommunications equipment. Typical equipment includes antenna or satellite dish, coaxial cable, waveguide and hybrid fibre coaxial (HFC) hardware.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Follow workplace procedures for hazard identification and risk control	1.1. Notify customer and arrange access to the site 1.2. Recognise and report ***hazards*** in the work area to ***designated personnel*** according to workplace procedures 1.3. Follow occupational health and safety (***OHS***) ***legislative requirements***, ***workplace procedures*** and work instructions to ***control risks*** 1.4. Comply with ***safe work practices*** for working

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ELEMENT	PERFORMANCE CRITERIA
	safely on roofs and adhere to workplace ***environmental requirements*** throughout the work 1.5. Implement ***duty of care requirements*** to provide a safe working environment 1.6. Complete ***job safety analysis*** (***JSA***) sheets according to work requirements, including ***hazard identification*** and ***risk assessment*** 1.7. Use and maintain ***personal protective equipment*** and ***personal safety equipment*** according to work requirements and apply fall protection and personal safety requirements according to regulatory requirements
2. Prepare for work on rooftop	2.1. Assess scope of work according to workplace procedures, ***relevant legislation***, ***codes***, ***regulations and standards*** and relevant ***job information details*** 2.2. Inspect site to determine layout and equipment requirements according to work order 2.3. Select materials, ***tools and equipment***, including personal protective equipment and check for serviceability 2.4. Inspect and install fall protection and perimeter protection equipment, ensuring adequacy for work and conformance to regulatory requirements 2.5. Install ***roof safety system*** according to workplace and regulatory requirements 2.6. Select and install appropriate signage and barricades
3. Perform telecommunications work on rooftop	3.1. Inspect access from ground to work area ensuring it is safe and according to regulatory requirements 3.2. Estimate the total weight of material to be raised to rooftop to carry out the work 3.3. Determine and use the safest ***lifting method*** to bring materials and equipment to rooftop according to regulatory requirements. 3.4. Secure test equipment, hardware and tools safely on rooftop and distribute weight to eliminate risk of damage to roof cover 3.5. Inspect safety system periodically for compliance with regulations according to workplace procedures and ***report faults*** 3.6. Monitor risk control measures to ensure that they are effective and appropriate to the task and work

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ELEMENT	PERFORMANCE CRITERIA
	environment 3.7. Reassess risk control measures as required, according to changed work practices or site conditions and make alterations within scope of authority
4. Complete activities and documentations	4.1. Dismantle safety system according to prescribed sequence and remove from worksite 4.2. Clear work area and dispose of materials or recycle according to state and territory legislation and workplace procedures 4.3. Clean, check and maintain tools and equipment according to manufacturer's recommendations and workplace procedures 4.4. Complete ***documentation*** according to workplace requirements and notify customer for sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - access information
  - determine requirements
  - enable clear and direct communication to identify and confirm requirements and share information
  - follow instructions
  - report faults
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication, such as hand signals
- literacy skills to:
  - complete workplace documentation
  - document scope of work and work practices
  - read and interpret:
    - documentation from a variety of sources
    - drawings and specifications

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REQUIRED SKILLS AND KNOWLEDGE

• numeracy skills to estimate and calculate weight of materials
• organisational skills, including the ability to plan and set out work
• providing necessary safety measures, including the installation of a roof safety system
• safety awareness skills to :
  • conduct a safety assessment of a roof worksite
  • identify and accurately reporting to appropriate personnel any faults in tools, equipment or materials
• technical skills to:
  • access and understand site-specific instructions in a variety of media
  • use communications equipment

Required knowledge
• JSA and safe work method statements • nature of work undertaken on roofs • processes of providing for safe working practices • relevant statutory and regulatory authority requirements related to working safely on roofs • roof safety equipment and systems and considerations to facilitate working safely on roofs • SI system of measurement

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • locate, interpret and apply relevant information, standards and specifications for working safely on roofs • apply safety requirements throughout the work sequence, including the use of personal protective equipment

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EVIDENCE GUIDE	

	• provide for erection, maintenance and dismantling of the fall and perimeter protection requirements for the site. As a minimum given the plans and specifications for the roof working area of a corner, extending at least 4 metres in either direction and greater than 1.8 m high, incorporating harnesses and harness fixing points for safe personal and stores access to the roof, stores and equipment locations
	• carry out a risk assessment ensuring:
	  • correct identification of risks and safety requirements
	  • correct selection and use of appropriate processes, tools and equipment
	  • completing all work to specification
	  • compliance with regulations, standards and organisational quality procedures and processes
	  • communicating and working effectively and safely with others.

Context of and specific resources for assessment	Assessment must ensure: • site on roof where operations may be conducted • induction procedure and requirements • relevant specifications and work instructions • tools and equipment appropriate to applying safe work practices • support materials appropriate to activity • workplace instructions relating to safe working practices and addressing hazards and emergencies • relevant regulations, standards specifications and manuals, including industry related systems information.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate preparing and carrying out telecommunications work on roofs • oral or written questioning of the candidate to assess OHS requirements and work practices associated with working on roofs • review of JSAs and documentation prepared by the candidate.
Guidance information for	Holistic assessment with other units relevant to the

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EVIDENCE GUIDE	
assessment	industry sector, workplace and job role is recommended. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Hazards may include:	• contact with electrical wiring
	• environmental hazards:
	  • air pollution
	  • dangerous gases
	  • heavy or noxious metals pollution

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RANGE STATEMENT	
	• noise • petrochemical spillage • prevailing weather condition • release of hydrochlorofluorocarbons (HCFC) • fibre offcut damage to eyes and skin • flammable cleaning chemicals fluids and solvents • health hazards: • dangerous or harmful substances • handling of optic fibres and lasers • risk of infection • risk of sustained injury from repetitive tasks • laser damage to eyes • radio frequency (RF) exposure from transmitting antenna in close proximity • roof safety system in poor condition or non existent • safety hazards • biomechanical • lifting • potentially harmful procedures, such as welding • working at heights.
Designated personnel includes:	• OHS personnel • other persons authorised or nominated by the enterprise or industry to: • perform specified work • approve specified work • inspect specified work • direct specified work • project manager • site manager • supervisors • team leaders.
OHS legislative requirements may relate to:	• Australian standards • duty of care • health and safety representatives, committees and supervisors • industry OHS standards and guidelines

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RANGE STATEMENT	
	• licences, tickets or certificates of competency • national safety standards • OHS and Welfare Acts and regulations • safety codes of practice.

Workplace procedures may include:	• assessing risks
	• controlling hazards
	• emergency responses to:
	  • accidents
	  • fires
	  • other emergencies
	• identifying hazards
	• reporting OHS issues
	• resolving OHS issues
	• using personal protective equipment
	• using personal safety equipment.

Control risks may include:	• three steps in risk management process:
	  • assess risk
	  • identify hazard
	  • implement control methods.

Safe work practices may relate to:	• avoiding contact with chemicals, breathing in fumes and vapours, and digesting such materials
	• being aware of what to do and how to treat any potential accident
	• drugs and alcohol at work
	• general requirements for:
	  • safe use of plant and equipment
	  • use of personal protective equipment and clothing and personal safety equipment
	• housekeeping to ensure a clean, tidy and safe work area
	• manufacturer's warnings or instruction labels in relation to the laser product are not damaged or obscured during installation
	• no fibre particles, hazardous solvents or chemicals are left on site at the completion of the work
	• observing warning labels used in conjunction with laser and optical fibre systems and RF system

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RANGE STATEMENT	

	• preventing bullying and harassment
	• relevant Australian standards of required health and safety precautions
	• smoking in designated areas
	• specific organisational safety requirements
	• storing and removing debris
	• using appropriate warning labels on climbing equipment and rooftop
	• using fire fighting equipment
	• using first aid equipment
	• using safe operating procedures, including recognising and preventing hazards associated with:
	  • hazardous materials and substances
	  • service lines
	  • surrounding structures and facilities
	  • trip hazards
	  • use of tools and equipment
	  • worksite visitors and the public
	  • working at heights
	  • working in proximity to others.

Environmental requirements may include:	• clean-up protection and management • dust • noise • ozone protection • waste management.

Duty of care requirements relate to:	• legal responsibility to do everything reasonably practicable to protect others from harm
	• own responsibilities to comply with safe work practices:
	  • activities that require licences
	  • certificates of competency
	  • tickets
	• relevant state OHS requirements:
	  • construction supervisors
	  • construction workers
	  • designers
	  • employers and self-employed persons
	  • inspectors

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RANGE STATEMENT	
	• manufacturers and suppliers • persons in control of the work site • subcontractors.

Job safety analysis (***JSA***) may include:	• each new workplace or worksite situation
	• health, safety and environmental hazards
	• primary application of assessment
	• sheets to record the steps in the risk management process:
	  • assessment
	  • control
	  • identification.

Hazard identification may include:	• checking equipment and work area:
	  • before work commences
	  • during work
	• housekeeping
	• reviewing accident or incident records
	• workplace inspections.

Risk assessment may include:	• a scale:
	  • high
	  • low
	  • medium
	• awareness of likelihood and consequence factors
	• JSA.

Personal protective equipment used to control a hazard may include:	• breathing apparatus:
	  • dust masks
	  • respirators
	• clothing:
	  • boots
	  • gloves
	  • overalls
	  • protective jackets or pants for preparing, cutting or jointing optical fibres
	• face and head protection:
	  • face masks
	  • goggles
	  • helmets
	• radiation detectors.

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RANGE STATEMENT	
Personal safety equipment includes:	• aerial safety belts and lines • anchor straps • karabiners • lanyard • rope clamps • safety harness.
Relevant legislation, ***codes***, ***regulations and standards*** shall include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for aerial cables • Environmental Protection Acts • fire regulations • Institute of Electrical and Electronics Engineers (IEEE) • noise abatement and heritage legislation • OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Job information details may include:	• diagrams and sketches • instructions issued by customer • regulatory and legislative requirements • safe work procedures relating to working on roofs • signage • work order • work schedules, plans and specifications.

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RANGE STATEMENT	

Tools and equipment may include:	• communications equipment:
	  • mobile phones
	  • 2 way radios
	• fall protection
	• ladders
	• lifting and load shifting equipment, including:
	  • chain blocks
	  • elevated work platforms
	  • hoists and jacks
	  • scaffolds
	• perimeter protection
	• signage and barricades.

Roof safety system may include:	• footwalks • handrails • harness fixing points • kickboards • safety harness • scaffolds.
Lifting method may include:	• arranging for pre-delivery of goods • using block and tackle • using construction elevator • using elevated work platforms.
Report faults may be:	• according to company's workplace procedures • written or verbal notification.
Documentation may include:	• completed work order • modifications to procedures • reported faults • work details.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Occupational health and safety

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ICTOHS2153B Work safely near power infrastructure

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge to conduct telecommunications operations near substantial safety hazards. It includes safe hazard management at heights near electrical distribution infrastructure, radiation devices or other services in confined spaces.

If state or territory law require a licence to operate an elevated work platform (EWP) TLILIC508A Licence to operate a boom-type elevating work platform (boom length 11 metres or more) should be completed concurrently.

Application of the Unit

Field officers who work with cables on elevated work platforms, in confined spaces and on roofs and other structures apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an EWP is required, verify state or territory law requirements for a licence to operate an EWP.

If working at heights, achievement of the unit CPCPCM2015A Work safely on roofs from the CPC08 Construction and Plumbing Services integrated framework training package fulfils this requirement.

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This unit addresses confined spaces but does not confer endorsement for work in confined spaces. This requires extensive specialised training which is beyond the scope of this unit. Users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Conduct a risk assessment	1.1 Confirm work instructions with ***appropriate personnel*** and seek clarification if required 1.2 Select occupational health and safety ***(OHS) legislation, policy and procedures and technical standards*** relevant to the work and work site 1.3 Assess the ***risks from electrical, radiation, gas and other services*** in or adjacent to the worksite 1.4 Assess the safety of the worksite, other services and ***support structures*** using appropriate ***monitoring equipment*** 1.5 Complete a ***job safety analysis (JSA)*** or similar risk assessment record listing potential safety hazards associated with site and work requirements and report ***safety hazards*** to relevant personnel 1.6 Obtain and confirm permits from ***relevant authorities*** within scope of personal authority

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	1.7 Assess potential ***emergency situations*** relevant to the site 1.8 Note ***earthing arrangements*** for telecommunications infrastructure and any other services that impinge on the worksite
2. Develop hazard management plan	2.1 Propose strategies to ***manage potential safety hazards*** 2.2 Communicate hazard management strategies and confirm with co-workers 2.3 Establish and confirm safety procedures to ensure management of emergency situations 2.4 Obtain ***safety equipment*** and ***personal protective equipment*** 2.5 Delineate ***safe work zones and limits of approach*** to other services 2.6 Arrange ***road safety and traffic control measures*** 2.7 Implement safe strategies for working at heights and in ***confined spaces***
3. Work safely	3.1 Use safety equipment and clothing effectively 3.2 Use ***ladders, climbing or lifting equipment*** to work safely at heights 3.3 Operate hand and power tools safely at heights 3.4 Work within identified safety zones and approach limits 3.5 Comply with enterprise and industry earthing practices 3.6 Monitor and manage risks throughout work procedures 3.7 Apply emergency procedures in the event of an incident 3.8 Reinstate the worksite to ensure the safety of telecommunications workers, the public and the telecommunications network

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to listen and liaise with clients on technical and operational matters and raise OHS matters

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- literacy skills to interpret technical documentation and standards and demonstrate knowledge by incorporating technical language into identifying and reporting on safety hazards and emergency situations
- planning skills in establishing measures in road safety and strategies for working at heights
- problem solving skills to apply methodology in minimising risks
- research skills to identify OHS legislation, policy and procedures relevant to the worksite safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to distinguish between insulated and bare conductors, low voltage (LV) and high voltage (HV) cables and ways of ascertaining the voltages present.
-

Required knowledge

- appropriate electrical safety and technical knowledge relating to the type of work, operating plant or vehicle near power lines (safe system of work according to the relevant electrical regulations and Acts)
- environmental control processes:
  - disposal and handling of hazardous and dangerous substances
  - noise pollution
  - waste disposal
- rights and responsibilities of the workplace parties under environmental and OHS Acts, regulations and codes of practice
- sound knowledge of OHS including legislation and standards
- ways in which OHS is managed in the workplace, and activities required under OHS legislation, including:
  - hazard identification
  - hazards that exist in the workplace
  - OHS instruction
  - preferred order of ways to control risks (known as the hierarchy of control)
  - risk assessment and control
  - sound knowledge of operating safely at heights
  - training and provision of OHS information
- workplace environmental and OHS procedures relevant to the work being undertaken, including procedures for:
  - designated personnel responsible for OHS
  - employee participation in OHS management

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- meaning of OHS symbols found on signs and labels in the workplace
- raising OHS issues
- recognising and reporting on hazards
- responding to accidents, fires and emergencies
- work operations to control risks.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • conduct a risk assessment for a telecommunications site near power infrastructure • develop a hazard management plan • apply safety precautions while working at heights and confined spaces near power infrastructure.
Context of, and specific resources for assessment	Assessment must ensure: • telecommunications site near power infrastructure • relevant OHS Acts, regulations and codes of practice • enterprise OHS policies and procedures • personal protective equipment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate assessing and implementing safe work practices • oral or written questioning to assess knowledge of OHS concepts, risk assessment practices and development of hazard management plan • evaluation of written documentation on planning and implementation of safety measures and strategies.
Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, for example: • ICTWHS2170B Follow occupational health and safety and environmental policy and procedures • ICTCBL2065B Splice and terminate optical fibre cable for carriers or service providers. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Appropriate personnel may include:	• construction manager • consultant • project manager

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	• safety officer • site manager • site supervisor.
OHS legislation, policy and procedures and technical standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) standards TS 14 • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • general duty of care under OHS legislation and common law • International Standards ISO 9000 and 9001 • International Telecommunications Union (ITU) recommendations • OHS Acts and relevant codes and standards • provisions relating to OHS issue resolution • provisions relating to roles and responsibilities of health and safety representatives and OHS committees • road and traffic control legislation and codes • regulations and codes of practice relating to hazards present in the workplace or industry • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Telecommunications Act and relevant codes.
Risks from electrical, radiation, gas and other services may relate to:	• cable types • fire alarms • gas pipes • pole construction • radiation emissions • sewerage • voltages • water pipes.

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Support structures may include:	• joint use with electrical services, building services or other utilities
	• support structures construction may include:
	  • brick
	  • concrete
	  • steel or a suitable combination
	  • wood.

Monitoring equipment may include:	• electrical current leakages devices • gas leakage detector • pole safety tester • radio frequency (RF) leakage detector.

Job safety analysis (JSA) includes:	• documents for new workplace or worksite situation
	• health, safety and environmental hazards
	• primary application of assessment
	• sheets to record the steps in the risk management process:
	  • assessment
	  • control
	  • identification.

Safety hazards may include:	• electrical current leakage • general site conditions • geography structural faults in support structures • radiation • weather • debris on ground • electrically unsafe equipment • faulty equipment • gas leak • loose wires • slippery surfaces • unsafe work at heights.

Relevant authorities may include:	• cable location services (Dial Before you Dig)
	• environment protection
	• local government
	• private owners
	• utility providers:
	  • electricity
	  • gas
	  • telecommunications
	  • water.

Emergency situations	• collapse of support structure

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may include:	• damage to infrastructure • injury to personnel.
Earthing arrangements may include:	• ACMA standards • manufacturer's • enterprise • local environmental hazard requirements.
Manage potential safety hazards may include:	• additional safety precautions or equipment • road closures • roof guards • shutdown or relocation of other services • site clearances • specialised operational equipment • temporary outage • warning signs.
Safety equipment may include:	• aerial safety belts and lines • flashing lights • guards • traffic signs • warning signs and tapes • witches hats.

Personal protective equipment may include:	• asbestos precautions
	• dust protection
	• earmuffs
	• eye protection
	• gas monitoring equipment
	• gloves:
	  • plastic
	  • rubber
	  • leather
	• gumboots
	• hard hats
	• overalls
	• personal reflecting jackets
	• radiation protection clothing
	• riggers gloves
	• safety boots
	• vests.

Safe work zones and limits of approach may relate to:	• area near electricity supply assets and sources of radiation
	• advice published by:
	  • ACIF
	  • asset owners

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	• private companies • state and territory authorities • from one to several metres away from live electrical or radiation emitting infrastructure • gas and water services.
Road safety and traffic control measures may include:	• additional personnel to manage traffic flow • barricades • placement of cones • sign and warning lights.
Confined spaces includes:	• equipment cupboards • pits • power asset space • roof spaces • shafts.
Ladders, climbing or lifting equipment may include:	• devices to support construction personnel at heights: • elevated work platforms • fixed ladders • non-metallic ladders • safety harnesses.

Unit Sector(s)

Telecommunications - Occupational health and safety

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ICTOPN4115B Install and test a dense wavelength division multiplexing system

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install dense wavelength division multiplexing (DWDM) equipment in optical networks.

Application of the Unit

Telecommunications technical staff who install long haul or metropolitan area DWDM equipment apply the skills and knowledge in this unit. They install the DWDM unit and circuit cards and inspect, clean, and install optical fibres, connectors and associated equipment and prepare the system for subsequent testing and commissioning.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to install DWDM units	1.1 Determine the number of racks and DWDM units at each ***site*** by referring to installation documents 1.2 Determine the DWDM unit and equipment positions within the individual racks 1.3 Assemble ***equipment racks*** according to safe industry practice and manufacturer's instructions 1.4 Select ***tools*** and equipment 1.5 Prepare ***patch panels*** with connectors according to installation plan
2. Install DWDM units and associated cabling	2.1 Install DWDM unit in the designated rack position in order to maintain the planned link budget margin 2.2 Install patch panels and ***ancillary equipment and connections*** into equipment rack in preparation for commissioning procedures 2.3 Insert circuit cards into specified slot locations in readiness for commissioning procedures, but do not seat cards into backplane nor lock into position at this stage 2.4 Connect optical fibre cables between circuit cards, optical multiplexers, adjoining DWDM units and patch panels according to manufacturer's specifications
3. Test power connections and complete the installation	3.1 Measure the main and redundant power supplies to verify the correct polarity of the ground and power connections 3.2 Rectify any identified ***power wiring fault*** if applicable

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report	3.3 Confirm that cooling fans, panel lights, indicator lights and alarms behave according to the manufacturer's prescribed specifications when power is applied 3.4 Complete the installation report and reinstate site

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation
- technical skills to:
  - assemble and secure standard telecommunications equipment rack, associated ironwork and optical fibre support ducting
  - clean optical fibre connector
  - examine optical fibre connector for contamination and assess whether cleaning is required
  - prepare and connect power and ground wires
  - use a digital multimeter to measure DC and AC voltage and to check continuity.
  -

Required knowledge

- DWDM principles of operation
- electrostatic discharge
- optical fibre connector types and characteristics
- optical fibre types and characteristics
- specific OHS requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • conduct installation of DWDM systems and associated cabling according to plans and specifications • test power and ground connections • complete installation reports.
Context of and specific resources for assessment	Assessment must ensure: • suitable site for DWDM equipment installation • access to tools and equipment required for installation • a range of optical fibres to suit the installation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing a DWDM unit from a DWDM system together with installation of optical fibre interconnecting cables • review of DWDM installation report prepared by the candidate • oral or written questioning of the candidate to assess knowledge of DWDM installation practices.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3056A Install telecommunications network equipment • ICTBWN3088B Install optical fibre splitters in fibre distribution hubs. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Site may include:	• optical add drop multiplexer (OADM) site • terminal site.
Equipment racks may include:	• 19 inch type • 23 inch type • 535 mm (ETSI rack) type.

Tools may include:	• hand tools:
	  • crimping tool
	  • screwdrivers
	  • wire cutters
	  • wire stripping tool
	• optical fibre connector cleaning cassette
	• microscope or video fibre connector inspection instrument.

Patch panels may include:	• rack mounted • wall mounted.
Ancillary equipment and connections may	• air filter • alarm connections

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include:	• C/L band splitter tray • cooling fan assembly • coupler tray • craft terminal • data communications connections • equaliser tray • Ethernet hub • fibre management trays • optical attenuators • optical fibre patch cords • optical multiplexer • optical service channel tray • telemetry connections • variable optical attenuators.
Power wiring fault may include:	• battery and ground wires are reversed to the DWDM unit • battery wire is open or missing • return wire is open or missing.

Unit Sector(s)

Telecommunications - Optical networks

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ICTOPN4116A Use advanced optical test equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to test optical communication systems and components using advanced optical test equipment. It involves using the optical time domain reflectometer (OTDR), optical spectrum analyser (OSA) and optical return loss (ORL) test set for performance testing and link budget calculation. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Installation contractors, technical staff and field officers from telecommunications carriers or other private and public organisations, or regulatory authorities apply the skills and knowledge in this unit. They combine technical skills with organisational and administrative skills to perform specialised testing of complex optical faults, optical network monitoring and link budget calculations on broadband passive optical network (PON), fibre to the x (FTTx) networks, hybrid

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	fibre coaxial (HFC) networks and dense wavelength division multiplexing (DWDM) systems during installation, maintenance, commissioning and troubleshooting phases.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**

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ELEMENT	PERFORMANCE CRITERIA
1. Prepare to use advanced optical measuring instruments	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Notify ***customer*** for site access, security arrangements and location details of ***optical system*** and test purpose 1.3. Identify site ***hazards*** and notify appropriate personnel to make site safe 1.4. Devise and implement risk control measures of hazards with handling of optical fibres and lasers in consultation with appropriate personnel 1.5. Prepare a ***testing plan*** indicating the ***type of measurement***, procedures and nominated ***wavelength*** and seek approval from customer 1.6. Select the appropriate ***tools*** and ***test instruments*** according to the required measurement and enterprise practice
2. Evaluate optical performance and link budget using advanced optical test equipment	2.1. Set up test instrument according to manufacturer's instructions and occupational health and safety (***OHS***) ***and environmental requirements*** 2.2. Perform measurement using knowledge of appropriate testing techniques and advanced test equipment in a safe manner to evaluate the performance of optical system and component 2.3. Record test results and compare with standard test specifications from manufacturer's and enterprise guidelines 2.4. Perform end-to-end measurements on an optical link to a customer and record test results and test points 2.5. Calculate the optical losses for a link budget figure of an optical link to determine if within operational margins as specified in manufacturer's manual 2.6. Evaluate the test results and report on the functionality of the optical component or equipment and the performance of the optical link
3. Document measurement results	3.1. Document test results for future reference and make recommendations on optimising component and system performance 3.2. Clean worksite and make safe according to the enterprise requirements and to customer satisfaction 3.3. Notify appropriate personnel of job completion for sign off and present test documentations

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers and enterprise staff
- literacy skills to read and interpret work instructions and document work
- numeracy skills to gather and record data from measurements
- planning and organisational skills to plan prioritise and manage own work
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - clean an optical connector to an acceptable industry standard
  - safely inspect an optical connector for contamination and determine if cleaning is necessary
  - safely operate:
    - optical loss test set (OLTS)
    - optical time domain reflectometer (OTDR)
    - PON power meter

Required knowledge

- consequences of mating contaminated optical connectors
- decibels, dBm
- downstream and upstream signals
- DWDM metro and long haul system architecture
- measurement of DWDM signals
- measurement of gain and gain flatness of optical amplifier
- measurement of laser spectral stability, drift and unexpected variation in spectral transmission characteristics
- non-linear effects, four-wave mixing
- optical connector types
- optical signal to noise ratio (OSNR)
- optical spectrum limits, wavelengths used in various applications and International Telecommunications Union (ITU) grid

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REQUIRED SKILLS AND KNOWLEDGE

• optical transmitters and receivers
• ORL
• OTDR dead zones, dynamic range and launch cable
• reflectance
• safe handling procedures with optical fibres
• transmission system line rates:
  • optical Ethernet
  • optical transport network (OTN)
  • synchronous digital hierarchy (SDH)
• wavelength division multiplexing (WDM), coarse wavelength division multiplexing (CWDM) and DWDM principles and optical multiplexers

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to :
	• use OTDR, OSA and ORL advanced optical test equipment to:
	  • measure optical power level
	  • measure insertion loss of optical network
	  • measure end-to-end fibre loss (bi-directional)
	  • test and calculate optical link budget
	  • comply with all related OHS requirements and work practices.

Context of and specific resources for assessment	Assessment must ensure: • sites on which optical measurements can be conducted • tools and equipment required for measurements • manufacturer's documentation for test instruments and equipment under test.

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EVIDENCE GUIDE	
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing optical measurements • review of a written report for the OTDR, the OSA and the ORL test set • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN5118A Plan and configure dense wavelength division multiplexing systems • ICTOPN5119A Perform acceptance and commissioning tests on optical network • ICTOPN5120A Plan for an optical system upgrade and cut over • ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system • ICTOPN5122A Test the performance of specialised optical devices • ICTOPN5123A Analyse and integrate specialised optical devices in the network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require

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EVIDENCE GUIDE	
	language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • crane
	  • EWP
	  • forklift
	  • winch
	• Australian Construction Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Environmental Protection Acts
	• OHS

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RANGE STATEMENT	
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Customer may be:	• asset manager • installation manager • maintenance manager • nominated customer representative • outage manager • project manager.
Optical system may contain:	• add-drop multiplexer • Bragg filters • DWDM system • fibre hub • HFC network • optical amplifier • optical line termination (OLT) • optical links • optical network termination (ONT) • optical splitter.
Hazards may include:	• building debris • earth potential rise • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Testing plan may include:	• correct test set up • recording and evaluation of measurements • test layout • test procedures • test purpose • test sites and location • type of measurements • use of appropriate test equipment.
Type of measurement may include:	• dedicated ORL test set:

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RANGE STATEMENT	

	• optical power meter ORL
	• ORL versus wavelength.
	• OSA and ORL
	• PON splitter ORL
	• OSA:
	  • bandwidth of a device (multiplexer)
	  • central wavelength and channel spacing
	  • device flatness
	  • DWDM channel uniformity
	  • insertion loss:
	  • coupler
	  • filter
	  • optical splitter
	  • WDM
	  • non-linear effects (four-wave mixing)
	  • optical power level:
	  • at drop terminal
	  • at optical transmitter
	  • at patch panel
	  • at the OLT
	  • at the ONT
	  • optical signal to noise ratio (OSNR)
	  • ripple
	  • spectral purity of a source
	  • spectral stability and drift of a source
	• OTDR:
	  • break and fault location
	  • certification of new cabling
	  • characterisation of events in path
	  • detailed event table
	  • fibre attenuation
	  • fibre attenuation rate
	  • fibre attenuation uniformity
	  • identification of 'gainers'
	  • identification of 'ghost' events
	  • insertion loss of connectors and splices
	  • macro-bend detection
	  • ORL

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RANGE STATEMENT	
	• segment length.
Wavelength may include:	• 850 nm • 1310 nm • 1490 nm • 1550 nm.

Tools may include:	• alcohol swabs
	• dry type cleaning cassette for optical connectors hand tools
	• launch cable for OTDR
	• lint-free dry wipes
	• microscope for examining optical connector with:
	  • integral safety infra-red filter
	  • video microscope display
	• optical connector adaptors
	  • FC to LC
	  • FC to SC
	  • FC to ST
	  • SC to ST
	• optical fibre mandrel (single mode fibre low reflection termination)
	• optical termination
	• optical reference cable.

Test instruments may include:	• ORL test set • OSA • OTDR multimode • OTDR single mode • PON optimised OTDR.

OHS and environmental requirements may include:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services, including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and

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RANGE STATEMENT	
	handling of: • chemicals • materials • tools and equipment • work platforms • special access requirements • environmental considerations: • clean-up protection • stormwater protection • waste management.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN4117A Prepare activity plans and specifications for a fibre to the x installation

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to prepare the activity plans and specifications required by field technical staff to deploy a fibre to the x (FTTx) installation for optical access networks. Planning involves provisioning underground and aerial cable work, construction of fibre enclosures and providing specification details for installation and construction teams. Optical networks and FTTx are part of strategies by service providers using wave division multiplexing (WDM) to deliver very high speed broadband capacity through the Access Network for the National Broadband Network (NBN) initiative. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical cable supervisors apply the skills and knowledge in this unit when planning the installation activities for the deployment of broadband Access Networks using optical technologies. FTTx services can be underground or aerial and may

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	include hybrid fibre coaxial (HFC) installations. Optical access networks with FTTx installations provide services in Next Generation Networks (NGN) using emerging technologies. NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV, mesh networks and cloud computing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for FTTx planning tasks	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. ***Scope the work*** by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements 1.3. Notify appropriate personnel of identified ***safety hazards*** at the work site 1.4. Obtain ***tools and safety equipment*** and material to perform tasks safely and efficiently 1.5. Select and use required protective equipment and make site safe and secure for installation work 1.6. Identify and select ***plant and machinery*** for installation work activities
2. Plan FTTx activities and develop specifications	2.1. Follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work and identify and avoid ***other services*** 2.2. Inspect proposed cable route visually according to cable plan and identify barriers to the cable installation 2.3. Modify cable plan, if required, and notify appropriate personnel 2.4. Prepare ***installation activities*** for FTTx provisioning according to project plan 2.5. Prepare installation specifications according to safe work practices and manufacturer's instructions to include ***optical fibre cable size***, ***distribution area*** (***DA***), ***distribution joint including lead-in multiport serving area*** (***DLMSA***), ***enclosures***, location of ***optical network terminations*** (***ONT***), ***location and type of fibre distribution hub*** (***FDH***) and ***optical splitter*** provisioning 2.6. Verify cable length from customer access network fibre centre to end user ONT is within 20 km operating limit 2.7. Consult with appropriate personnel to confirm project scope, installation requirements and installation specifications according to project plan
3. Complete documentation and obtain sign off	3.1. Complete and present updated planning activities documentation to authorised personnel 3.2. Complete and provide updated specification documentation to vendors for supply of material and

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ELEMENT	PERFORMANCE CRITERIA
	resources 3.3. Submit documentation to appropriate person for approval and sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - interact with senior project staff and equipment vendors
  - work effectively within group
- literacy skills to:
  - prepare reports given a specific format
  - read and interpret technical and non-technical documentation
- numeracy skills to analyse and confirm installation requirements
- PC skills to carry out word processing and desktop research
- planning and organisational skills to:
  - make site access and equipment delivery arrangements
  - plan work activities according to project requirements and priorities
- problem solving skills to account for unexpected variations to requirements
- task management skills to work logically and systematically with required attention to detail
- technical skills to:
  - prepare FTTx specifications
  - prepare line drawings relevant to organisation
  - record design specifications in centralised system relevant to organisation

Required knowledge

- properties of passive optical devices including splitters and couplers
- FTTx installation equipment including tools and safety equipment
- FTTx specifications
- legislative privacy, safety and environmental requirements:
  - specific OHS requirements relating to handling of optical fibre and using laser optical sources

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REQUIRED SKILLS AND KNOWLEDGE
• other personal safety issues • plant and equipment safety to be used in installation plans • options for green ICT installations • manufacturer's requirements for safe operation of equipment • operation of optical transmitters and receivers • organisational policy and procedures • propagation of light in optical communication systems • role of optical transmitters and receivers in optical communication systems • concept of wavelength division multiplexing (WDM) • site engineering • typical issues and challenges that occur in preparing activity plans and on site • workplace and industry environment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • inspect proposed cable route visually • prepare installation activities for FTTx provisioning • prepare and document FTTx designs and specifications.
Context of and specific resources for assessment	Assessment must ensure: • sites on which FTTx installations may be designed and prepared • vendor product information and installation guides • relevant regulatory and equipment documentation that impact on installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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EVIDENCE GUIDE	
	• direct observation of the candidate carrying out preparation and design for FTTx installation within an optical distribution network • review of FTTx designs and specifications completed by the candidate • oral and written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN4116A Use advanced optical test equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different

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RANGE STATEMENT	
work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Scope the work may include:	• cable:
	  • route
	  • types
	  • supports
	• distribution areas (DA)
	• enclosures
	• equipment required:
	  • fibre hubs
	  • optical splitters
	• project type:
	  • large residential
	  • medium residential
	  • standard residential or small business.

Appropriate personnel may be:	• consultant • project engineer • project supervisor

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RANGE STATEMENT	
	• site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• active lasers with no safety labels
	• active optical fibres
	• contact with remote power feed
	• electrical supply that requires mandatory separation from communications cable
	• exposed fibres
	• unsafe support structures
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

Tools and safety equipment may include:	• personal protective equipment
	• safety equipment
	• test equipment:
	  • local area network (LAN) Cat tester
	  • network analyser
	  • optical time domain reflectometer (OTDR)
	  • passive optical network (PON) meter
	• tools:
	  • fibre cleaning kit
	  • fibre splicer
	  • labeller
	  • screw drivers
	  • spanners
	  • tagging tool.

Plant and machinery may include:	• back hoes • bobcats • cable hauling equipment • cable lifters • diggers • elevated work platforms • excavators • jacks and trolleys • tensioning equipment.

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RANGE STATEMENT	

OHS and environmental requirements may relate to:	• identifying other services including power and gas
	• personal protective equipment:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • chemicals
	  • materials
	  • tools and equipment
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Other services may include:	• alarms • electrical services • fire sprinkler systems • gas and water mains • high voltage (HV) power • other service provider networks.
Installation activities may include:	• aerial cable installation • cable hauling • cable terminations • construction work for underground enclosures

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RANGE STATEMENT	
	• end-to-end testing of cable system • excavation work • installation of enclosures • installation of FDH • installation of optical devices • marking out cable route and location of equipment • site surveys.
Optical fibre cable size may include:	• 12F • 24F • 36F • 48F • 60F • 72F.
Distribution area (***DA***) may include:	• expected type of buildings • number of service addresses • staging of development • types of service required.
Distribution joint including lead-in multiport serving area (***DLMSA***) may include:	• limit of 1 distribution joint including lead-in multiport (DLM) per pit • 4 or 6 way lead-in modules • avoid spurs and optimise cable hauling • reduce lead-in module tail lengths • 11 lead-ins per 12F tube. • lead-in cable lengths of 20, 40, 75 or 100 metres.
Enclosures may include:	• cabinet • FTTx cabinet • HFC housing • pit.
Optical network terminations (***ONT***) may include:	• standard residential or small business = 1 • medium residential = 2 - 30 • large residential = >30.

Location and type of fibre distribution hub (**FDH**) may include:	• location:
	  • standard residential or small business, external FDH
	  • medium residential, external FDH
	  • large residential, internal FDH
	• type:

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RANGE STATEMENT	
	• type 144 - 100 service addresses • type 288 - 220 service addresses • type 432 - 340 service addresses.
Optical splitter may include:	• 4 x 32 way • 8 x 32 way • 12 x 32 way.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN5118A Plan and configure dense wavelength division multiplexing systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to prepare the activity plans and specifications required by field technical staff to deploy a dense wavelength division multiplexing (DWDM) optical network suitable for a metropolitan area network (MAN) or long haul applications. It involves provisioning DWDM fibre and power cabling work, provisioning of splicing cabinets and patch panels, and providing specification details for installation and construction teams. DWDMs use optical multiplexing techniques to increase the carrying capacity of a fibre network by transmitting multiple optical wavelengths each carrying high speed data stream over a single fibre. DWDM systems offer up to 128 wavelengths, with each wavelength carrying up to 100 Gbps. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers and supervisors apply the skills and knowledge in this unit when planning installation activities for the deployment of high capacity networks using optical technologies.

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	Optical networks using DWDM provide services in Next Generation Networks (NGN) using emerging technologies. NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV and cloud computing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for DWDM planning activities	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. ***Scope the work*** by obtaining project plan from ***appropriate personnel*** and arrange for site access to comply with security arrangements 1.3. Notify appropriate personnel of identified ***safety hazards*** at the work site
2. Plan DWDM installation activities and develop specifications	2.1. Follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work and identify and avoid ***other services*** 2.2. Identify ***tools***, ***safety equipment***, ***plant and machinery*** for installation work activities 2.3. Conduct physical inspections of proposed DWDM sites and verify that backbone dark fibre is accessible and available according to cabling plan 2.4. Verify proposed backbone and customer fibre cable routes to the splicing cabinet and fibre patch panel and identify barriers to the cable installation 2.5. Verify proposed power cabling route from distribution board and circuit breakers and identify barriers to the cable installation 2.6. Modify cable plan if required and notify appropriate personnel 2.7. Prepare ***fibre installation specifications*** and ***power cable and grounding specifications*** according to cabling plan and safe work practices and manufacturer's instructions 2.8. Verify proposed location of ***associated hardware*** racks, cabinets and ironwork and confirm access to enterprise local area network (LAN)
3. Prepare DWDM shelf configuration and specifications according to customer requirements	3.1. Prepare a ***configuration document*** including configuration plans and specifications for the installation team 3.2. Specify location of DWDM shelves or racks and the shelf interconnection fibre cabling layout according to cabling plan 3.3. Specify the individual DWDM units and circuit card types required to suit customer requirements
4. Plan preliminary optical tests	4.1. Verify backbone fibres at patch panel and conduct bidirectional ***optical time domain reflectometer*** (***OTDR***) ***test*** and record measurement results and

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ELEMENT	PERFORMANCE CRITERIA
	OTDR images 4.2. Conduct bidirectional ***optical loss test set*** (***OLTS***) ***measurement*** of insertion loss on backbone fibres from patch panel to patch panel at adjacent sites and record measurement results
5. Complete documentation and obtain sign off	5.1. Provide results of optical measurements to design team 5.2. Complete and provide updated specification documentation to installation team 5.3. Submit documentation to appropriate person for approval and sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - analyse specific customer requirements
  - evaluate different types of technical data
  - identify details relating to the project from the approved network plan
- communication skills to discuss project brief with enterprise design and installation personnel, vendors, customers and contractors
- literacy skills to:
  - interpret technical documentation
  - write reports project briefs in required formats
- numeracy skills to:
  - interpret results and evaluate different types of technical data
  - analyse site survey data
- planning skills to:
  - consider current, new technology, facilities and features when developing options
  - plan, prioritise and monitor own work and that of others
- problem solving skills to address specific customer requirements
- research skills to:
  - analyse impacts on planning processes

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REQUIRED SKILLS AND KNOWLEDGE
• obtain and study information relating to new technology or technology features • obtain geographical site information • study relevant legislation and associated operational codes • technical skills to identify barriers to plan realisation and interpret test results
Required knowledge

• configuration of DWDM shelf
• DWDM principles of operation
• electrostatic discharge
• features and operating requirements of test equipment:
  • hand-held optical power meter
  • optical spectrum analyser
  • OTDR
  • transmission test set
• functions of optical add drop multiplexer
• internet protocol (IP) addressing, subnet mask, dynamic host configuration protocol (DHCP) and default gateway
• International Telecommunications Union (ITU) wavelength grid for DWDM
• optical fibre connector types and characteristics
• optical fibre types and characteristics
• path protection and protection switching
• physical optical loopbacks and software loopbacks
• protocols used on optical DWDM systems
• ring topologies and linear network topologies
• specific OHS requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to:

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EVIDENCE GUIDE	
competency in this unit	• plan DWDM installation activities • develop installation specifications • prepare DWDM shelf configuration and specifications • plan preliminary optical tests.
Context of and specific resources for assessment	Assessment must ensure: • sites on which testing, installation and configuring of a DWDM system may be conducted • use of test equipment currently used in industry • manufacturer's technical documentation • relevant regulations and specifications.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking DWDM planning tasks • review of data gathered, reports and project plans prepared by the candidate • oral or written questioning to assess knowledge of planning and configuring of DWDM systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

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RANGE STATEMENT	

Scope the work may include:	• cable route
	• cable supports
	• cable types
	• distribution areas (DA)
	• enclosures
	• equipment required
	• fibre hubs
	• optical splitters
	• project type:
	  • large residential
	  • medium residential
	  • small business
	  • standard residential.

Appropriate personnel may be:	• consultant • planning engineer • project engineer • project supervisor • site supervisor.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• active lasers without safety labels
	• active optical fibres
	• contact with remote power feed
	• electrical supply that requires mandatory separation from communications cable
	• exposed fibres
	• unsafe support structures
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • severe heat or cold
	  • thunderstorms.

OHS and environmental requirements may relate to:	• identifying other services, including power and gas
	• personal protective equipment
	  • earmuffs
	  • gloves
	  • head protection

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RANGE STATEMENT	
	• masks • protective suits • safety boots • safety glasses • safe working practices, such as the safe use and handling of: • chemicals • materials • tools and equipment • safety equipment: • flashing lights • safety barriers • warning signs and tapes • witches hats • special access requirements • environmental considerations: • clean-up protection • stormwater protection • waste management.
Other services may include:	• alarms • electrical services • fire sprinkler systems • gas and water mains • high voltage (HV) power • other service provider networks.
Tools, ***safety equipment*** may include:	• personal protective equipment • test equipment: • local area network (LAN) Cat tester • network analyser • OTDR • passive optical network (PON) meter • tools: • fibre cleaning kit • fibre splicer • labeller • screw drivers • spanners • tagging tool.

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RANGE STATEMENT	
Plant and machinery may include:	• back hoes • bobcats • cable hauling equipment • cable lifters • diggers • elevated work platforms (EWP) • excavators • jacks and trolleys • tensioning equipment.
Fibre installation specifications may include:	• connector types • fibre management system • identification label • patch cord type • splicing cabinet location.
Power cable and grounding specifications may include:	• cable colour code • cable termination lug type • cable wire gauge • identification label • overhead route • under floor cable route.

Associated hardware may include:	• cabinets
	• equipment racks:
	  • 19 inch
	  • 23 inch
	  • 535 mm
	  • European Telecommunications Standards Institute (ETSI) compliant
	• fibre distribution troughing
	• ironwork
	• LAN hubs and routers
	• rectifier cabinet.

Configuration document may include:	• circuit card locations • contents of each shelf • filler card locations.

Optical time domain reflectometer (***OTDR***) ***test*** may include:	• bidirectional 'footprint' test:
	  • at 1310 nm
	  • at 1550 nm
	  • at 1625 nm
	• fibre loss

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RANGE STATEMENT	
	• splice losses and their locations.

Optical loss test set (***OLTS***) ***measurement*** may include fibre insertion loss from:	• A to B at:
	  • 1310 nm
	  • 1550 nm
	  • 1625 nm
	• B to A at:
	  • 1310 nm
	  • 1550 nm
	  • 1625 nm.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN5119A Perform acceptance and commissioning tests on optical network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to conduct acceptance tests and commissioning tests on optical networks, including the optical portion of broadband hybrid fibre coaxial (HFC) networks, fibre to the x (FTTx) passive optical networks (PONs) and metropolitan and long haul dense wavelength division multiplexing (DWDM) networks. It ensures readiness of the new system through the application of appropriate inspections and tests to confirm compliance and specified performance. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technicians who install and maintain optical network equipment in access networks apply the skills and knowledge in this unit to provide services in Next Generation Networks (NGN) using emerging technologies. This unit applies to experienced field officers, technicians or technical supervisors working for telecommunications carriers, contractors or other service providers.

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	NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV, mesh networks and cloud computing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to conduct	1.1. Obtain ***installation and commissioning documents***

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ELEMENT	PERFORMANCE CRITERIA
acceptance tests	and planning specifications from ***appropriate personnel*** to ensure the installed ***optical network*** is as planned and specified 1.2. Conduct visual inspection of new installation and verify compliance of the system against ***relevant legislation***, ***codes***, ***regulations and standards*** and accepted industry practice 1.3. Select and obtain required ***test equipment*** for suitability of acceptance testing 1.4. Prepare acceptance schedule and ***test criteria*** in consultation with appropriate personnel
2. Conduct acceptance testing	2.1. Conduct and evaluate ***performance tests*** to ensure measurements meet with predetermined specifications and approved operating margins 2.2. Verify performance levels to be within tolerance specifications set in manufacturer's instructions 2.3. Test ***protection mechanisms*** to ensure performance criteria meets the specified standard 2.4. Test ***alarms*** for satisfactory operation and refer identified problems to appropriate personnel for remedial action 2.5. Record all acceptance test procedures and results
3. Complete administrative tasks	3.1. Complete acceptance documentation including recommendations 3.2. Notify appropriate personnel and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to interpret test equipment settings and readings
• communication skills to:
  • liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
  • prepare reports and technical documentation
• literacy skills to interpret technical specifications, standards documents and related

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REQUIRED SKILLS AND KNOWLEDGE

documentation
• numeracy skills to make calculations and necessary calibration changes
• planning and organisation skills to develop activity plans to undertake inspections and tests in efficient manner
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to correctly handle, connect and calibrate test equipment

Required knowledge
• cabling, terminations and supporting structures that may be encountered in the system under inspection • common performance levels and standards • electrical and optical properties to be measured • occupational health and safety (OHS) issues appropriate to the environment under inspection • overview of typical network topologies, switching, routing and transmission techniques • transmission type and signals that may be encountered • various test equipment types suitable for tests to be made

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • verify 'as built' installation against installation plans • undertake acceptance and commissioning tests and analysis against specified performance criteria • complete report, including acceptance test procedures, results and recommendations

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EVIDENCE GUIDE	
	• comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites on which acceptance tests may be conducted • use of testing equipment currently used in industry • relevant regulatory and equipment documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking acceptance tests • oral or written questioning to assess knowledge of tests and inspections types of systems and applications • review of completed acceptance documentation for systems and equipment prepared by the candidate, including recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5059A Commission telecommunications network equipment • ICTTEN5092A Undertake outage management. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those

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EVIDENCE GUIDE	
	required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Installation and commissioning documents may include:	• agreed modifications to original design plan • commissioning test results • preliminary test results • recommendations from commissioning procedures.
Appropriate personnel may include:	• network manager • planning manager • project manager.
Optical network may include:	• 10 Gbps ethernet local area network (LAN) services over the emerging global standard called optical transport network (OTN) • DWDM long haul system • DWDM metro system • gigabit Ethernet • optical portion of HFC network.
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • International Standards ISO 9000 and 9001 • ITU Standards

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RANGE STATEMENT	
	• OHS • Privacy Act • private property law.
Test equipment may include:	• advanced network tester - synchronous optical network (SONET)/synchronous digital hierarchy(SDH) • optical power meters • optical return loss test set • optical spectrum analyser • optical time domain reflectometer (OTDR) • protocol analyser.

Test criteria may include:	• 24 - 72 hours test duration
	• live traffic tests
	• test environment
	• test margins and errors
	• testing at highest data rate:
	  • 10 Gbps
	  • 40 Gbps
	  • 100 GBps
	• topology:
	  • point to point link
	  • protected ring
	• normal and extreme load tests
	• using installed optical fibre during test.

Performance tests may include:	• end-to-end bit error rate (BER) test:
	  • stressful pseudo random binary sequence (PRBS) pattern
	• forward error correction (FEC) testing
	• G.709 testing
	• receive interface specification:
	  • received optical power
	• stability tests
	• transmit interface specification:
	  • optical output power.

Protection mechanisms may include:	• 1:1 protection • 1+1 protection • optical channel path protection • path protection • wavelength protection.

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RANGE STATEMENT	
Alarms may include:	• audible alarms • on-screen display and monitoring systems • visual indicators.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN5120A Plan for an optical system upgrade and cut over

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan the activities of a major upgrade of optical systems from specifications provided by the planning and design section. Major upgrades in enterprise networks or telecommunications service provider's networks involve cut over activities to integrate additional work into existing network. The exponential growth of internet protocol (IP) traffic is driving IP optical integration, in particular the convergence of IP and dense wavelength division multiplexing (DWDM) networks in Next Generation Networks (NGN), necessitating regular system upgrades. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers whose work involves upgrading optical systems and equipment in enterprise networks and service providers' core and access networks apply the skills and knowledge in this unit. They are involved in maintenance, upgrades and cut overs of emerging technologies in IP based telecommunications networks.

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	Relevant jobs roles include a supervisor in charge of installation and maintenance teams responsible for the new installations and upgrades of telecommunications networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Gather information to prepare upgrade activity plan	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Obtain design specifications from the planning and design section to determine the scope and ***nature*** of the ***upgrade*** 1.3. Analyse the design specification and design plan and determine the accuracy of the design plan to site installation and requirements with ***customer*** 1.4. Determine the ***network equipment*** types and obtain installation details from manufacturer 1.5. Prepare an equipment and component list and source vendors for procurement
2. Prepare upgrade activity plans	2.1. Prepare a detailed ***installation plan*** of the upgrade for the installer 2.2. Prepare a detailed ***installation procedure*** to carry out the upgrade to minimise impact to the customer 2.3. Prepare pre-installation ***optical tests*** on existing equipment to determine benchmarks and performance levels prior to the upgrade 2.4. Prepare post-installation optical tests on upgrade to ensure upgraded system is achieving the desired results 2.5. Prepare monitoring schedule to progressively assess the ***progress of the upgrade*** 2.6. Prepare ***contingency plan*** for backing out if upgrade is not progressing according to schedule and disruptions to customer are excessive 2.7. Prepare cut over procedures
3. Complete documentation	3.1. Update and produce ***documentation*** for submission 3.2. Submit planning activity document to planning and design section for approval

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE

Required skills

- analytical skills to evaluate impact of upgrades on customer, equipment and systems
- communication skills to provide advice and guidance and liaise with other technical staff on operational matters
- literacy skills to:
  - prepare:
    - installation plans
    - installation procedures
    - pre-installation tests
    - post-installation tests
    - contingency plans
    - cut over plan
  - read and interpret:
    - enterprise procedures, manuals and specifications
    - technical data, technical and non-technical information from a range of sources
    - test results
- numeracy skills to interpret technical data
- PC skills to monitor installed software
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - prepare upgrade plan
  - troubleshoot common equipment and network problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards
  - follow enterprise occupational health and safety (OHS) procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - analyse the impact of applications on traffic flow in the network
  - determine customer requirements and an upgrade plan
  - determine the impact of upgrading hardware and software on network functionality
  - identify the technical requirements, constraints and manageability issues for a given customer network requirement
  - implement upgrade of equipment and software

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REQUIRED SKILLS AND KNOWLEDGE
• use test equipment and monitoring tools • use tools and equipment to assemble and disassemble equipment
Required knowledge
• alarms • backup systems • computer knowledge • escalation and outage procedures • network management systems • overview knowledge of telecommunications networks and equipment • telecommunications monitoring tools • telecommunications test equipment and test setups • telecommunications wiring practices • upgrade and post-upgrade routines

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• prepare an upgrade plan incorporating the essential activities listed:
	  • detailed installation plan and installation procedures
	  • pre-installation and post-installation tests
	  • monitoring schedule to assess progress of the upgrade
	  • contingency plan.

Context of and specific resources for assessment	Assessment must ensure: • site where upgrade and cut over may be planned • use of equipment, software, test and monitoring equipment currently used in industry

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EVIDENCE GUIDE	
	• relevant regulatory, equipment, enterprise and vendor documentation that impacts on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing upgrade • direct observation of the candidate performing tests and monitoring alarms • review of documents prepared by the candidate providing upgrade plan and assessing impact of upgrade taking into consideration customer feedback • oral or written questioning to assess knowledge of upgrade, testing and monitoring procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4073A Cut over customer premises equipment major upgrades • ICTTEN4076A Complete equipment and software upgrades • ICTTEN4086A Undertake routine maintenance of the telecommunications network • ICTTEN5061A Cut over new and replacement network equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require

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EVIDENCE GUIDE	
	language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS Acts • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Nature of upgrade work may include:	• commission of new system • installation of new additional equipment • installation of new software

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RANGE STATEMENT	
	• integration of new equipment into existing system • provision of temporary service • removal of redundant equipment • test on new system.

Upgrade may include:	• introducing dispersion compensation devices
	• moving to 40 Gbps technology
	• network capacity upgrade:
	  • additional optical fibres to be added
	  • additional DWDM wavelength channels and associated hardware to be added
	  • increase data rate by changing transmitter and receiver cards
	  • replace optical fibre with a type more suited towards 40 Gbps
	• upgrading from erbium doped fibre amplifiers (EDFA) to Raman optical amplifiers
	• upgrading laser transmitter power.

Customer may be:	• asset manager • contractor • network planner • nominated customer representative • project manager • service provider.
Network equipment may include:	• asynchronous transfer mode (ATM) switch • dispersion compensation devices • enclosures • hubs • optical add drop multiplexer (OADM) • optical amplifier • optical filters • optical splitters • patch panels • regenerator • synchronous digital hierarchy (SDH) multiplexers • transponder shelf.
Installation plan may include:	• cable trays • detailed drawings and equipment layout • detailed list of equipment and types

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RANGE STATEMENT	
	• earthing specifications • equipment locations • equipment mounting details • interconnecting cabling between racks • monitoring equipment • power feeds • rack positions • testing procedures • tools.

Installation procedures may include:	• setup procedures
	• monitoring progress according to plan
	• notification of network operations centre (NOC)
	• sourcing hardware and software
	• upgrade activity:
	  • installing optical equipment
	  • post-upgrade testing
	  • pre-update testing
	  • shutdown installation
	• rectifying faults.

Optical tests may include:	• bit error rate test (BERT) • default settings • functional test • optical power levels • optical return loss • optical signal to noise ratio (OSNR) • performance tests.
Progress of upgrade may include:	• rate of deliverables against project timeline • risk management • timing.
Contingency plan may:	• be developed as part of the upgrade planning and design • be escalated and referred to more specialist team • invoke partial upgrade to be continued at later stage • invoke reversion procedure to pre-update condition.
Documentation may include:	• configuration details • implementation and testing procedures

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RANGE STATEMENT	
	• network impact statement • software test results • system updates • test results and recommendations • upgrade details • vendor, equipment and enterprise specific details.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to test and commission optical transmission systems using dense wavelength division multiplexing (DWDM) technology. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff working with telecommunications carriers, service providers, public utilities and broadcasting companies apply the skills and knowledge in this unit. They combine technical optical communications skills with broader organisational and administrative skills to test and commission DWDM systems in a range of commercial contexts and environments. This unit applies to high capacity telecommunications transmission undertaken by carriers and utility companies for long haul communications as well as metropolitan area networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to commission DWDM transmission system	1.1. Implement hazard risk control measures 1.2. Review system specifications and technical data by identifying system operating parameters 1.3. Obtain and check tools and test equipment needed for the work 1.4. Verify all necessary equipment is installed, and circuit cards and filler cards are correctly located and seated 1.5. Check that interconnecting fibres to optical multiplexers and shelves are intact and correctly routed

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ELEMENT	PERFORMANCE CRITERIA
	1.6. Establish communication between computer and ***DWDM shelf*** 1.7. Upload latest software release to each DWDM shelf in the network
2. Commission DWDM transmission system	2.1. Connect an ***optical test set*** and a physical ***optical loopback*** to the system, and select ***protocol*** compatible with the DWDM hardware 2.2. Check the status of the connection and that test set data is passing correctly 2.3. Monitor quality of received signal by setting ***performance monitoring*** (***PM***) ***features*** and retrieve PM counts 2.4. Verify that no errors are counted by the test set during a ***long term stability test*** while customer input signal is set to the worst case (minimum) power level 2.5. Verify that no alarms are generated during the long term stability test period 2.6. Dispose of antistatic packaging to minimise environmental impact
3. Complete test and commissioning documentation	3.1. Finalise documentation on commissioning test results 3.2. Present results to ***appropriate person*** according to established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to:
  • liaise with internal and external personnel on technical and operational matters
  • relate to work associates, supervisors, team members and clients
• literacy skills to:
  • interpret technical documentation, such as equipment manuals, specifications and service orders

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REQUIRED SKILLS AND KNOWLEDGE

- write reports using standard formats
- numeracy skills to interpret results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and that of others
- problem solving and contingency management skills to:
  - adapt testing procedures to requirements of particular situations
  - modify activities depending on operational contingencies, risk situations and environments
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities especially when dealing with infra-red laser light
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - backup and restore
  - clean optical fibre connector
  - examine optical fibre connector for contamination and assess whether cleaning is required
  - install software
  - measure optical power using handheld optical power meter
  - measurement of DC and AC voltages
  - select and use appropriate test equipment
  - setup internet protocol (IP) addresses and subnet masks

Required knowledge

- alarms
- DWDM principles of operation
- electrostatic discharge precaution
- features and operating requirements of test equipment including:
  - hand-held optical power meter
  - transmission test set
  - optical spectrum analyser
- functions of optical add drop multiplexer
- IP addressing, subnet mask, dynamic host configuration protocol (DHCP) and default gateway
- International Telecommunications Union (ITU) wavelength grid for DWDM
- optical fibre connector types and characteristics

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REQUIRED SKILLS AND KNOWLEDGE
• optical fibre types and characteristics • path protection and protection switching • physical optical loopbacks and software loopbacks • protocols used on optical DWDM systems • ring topologies and linear network topologies • specific OHS requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and coordinate commissioning • test and commission DWDM transmission system • complete test and commissioning documentation • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • access to sites on which testing and commissioning a DWDM transmission system may be conducted • use of test equipment currently used in industry • manufacturer's technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing test and commissioning • review of test and commissioning documentation completed by the candidate • oral or written questioning to assess knowledge of test and commissioning procedures.

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EVIDENCE GUIDE	
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN5118A Plan and configure dense wavelength division multiplexing systems • ICTOPN5119A Perform acceptance and commissioning test on optical network • ICTOPN5120A Plan for an optical system upgrade and cut over • ICTOPN5122A Test the performance of specialised optical devices • ICTOPN5123A Analyse and integrate specialised optical devices in the network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
DWDM shelf maybe part of:	• long haul system • metropolitan area (metro) system.
Optical test set may include:	• Acterna/JDSU ANT-20 advanced network tester • synchronous digital hierarchy (SDH)/synchronous optical network (SONET) analyser • SDH/SONET STM-1/4/16 or OC-3/12/48 transmission test set - bit error rate test (BERT)
Optical loopback may include:	• fibre optic patchcord connecting transmit and receive ports via inline variable optical attenuator (VOA) • short fibre optic patchcord connecting transmit and receive ports with fixed attenuator at receive port input if required.

Protocol may include:	• D1 video 270 Mbps
	• ESCON 200 Mbps.
	• fast Ethernet
	• fibre channel
	• gigabit Ethernet
	• SDH:
	  • STM-1
	  • STM-4
	  • STM-16
	  • STM-64
	• SONET:
	  • OC-3
	  • OC-12
	  • OC-48
	  • OC-192.

Performance monitoring features	• equipment performance monitoring:

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RANGE STATEMENT	

may include:	• threshold crossing alerts
	• SDH:
	  • errored bytes (EB)
	  • errored seconds (ES)
	  • severely errored seconds (SES)
	  • out-of-frame seconds (OFS)
	• SONET:
	  • coding violation (CV)
	  • errored seconds (ES)
	  • severely errored seconds (SES)
	  • severely errored framed seconds (SEFS).

Long term stability test may refer to:	• 24 hour period • 48 hour period • 72 hour period.
Appropriate person may include:	• customer • network administrator • network planner • project manager • supervisor.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Optical networks

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ICTOPN5122A Test the performance of specialised optical devices

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to test the performance of specialised optical devices for integration into existing optical networks. The integration of specialised optical devices into existing networks may be required as part of an upgrade for higher bandwidths required by services and applications of Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff from telecommunications carriers, service providers or other private and public organisations who have experience in optical transmission apply the skills and knowledge in this unit. They combine this technical expertise with a range of analytical, research and planning skills to develop integration solutions for particular business needs. Relevant job roles include design and planning of networks using emerging technology.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to test specialised optical devices	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** and follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work 1.2. Work safely according to relevant safety legislation and company work practices identifying ***hazards*** and

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ELEMENT	PERFORMANCE CRITERIA
	using ***personal protective equipment*** 1.3. Determine the type of ***optical device*** using the design plan from ***appropriate person*** and obtain manufacturer's ***specifications*** for testing 1.4. Determine the test procedures and ***test equipment*** required to evaluate suitability of the optical device
2. Test the specialised optical device	2.1. Set up the test layout according to safe industry practice and connect the specialised optical device into the test set-up 2.2. Undertake a ***test regime*** to determine the performance characteristics of the specialised optical device 2.3. Analyse the test results to determine the suitability and compatibility of the optical device for integration into the network
3. Document the performance of the specialised optical device	3.1. Prepare an evaluation report with recommendations on the suitability of the specialised optical device 3.2. Present test results and evaluation report to appropriate person with copies filed for later reference according to organisation's policies

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to interpret test results
• communication skills to:
  • liaise with internal and external personnel on technical and operational matters
  • relate to work associates, supervisors, team members and clients
• literacy skills to:
  • interpret technical documentation, such as equipment manuals, specifications and service orders
  • write reports using standard formats
• numeracy skills to interpret results and evaluate different types of technical data
• planning and organisational skills to plan, prioritise and monitor own work and that

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REQUIRED SKILLS AND KNOWLEDGE

of others
• problem solving and contingency management skills to:
  • adapt testing procedures to requirements of particular situations
  • modify activities depending on operational contingencies, risk situations and environments
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities especially when dealing with infra-red laser light
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • backup and restore
  • clean optical fibre connector
  • examine optical fibre connector for contamination and assess whether cleaning is required
  • install software
  • measure optical power using hand-held optical power meter
  • measure DC and AC voltages
  • select and use appropriate test equipment
  • setup internet protocol (IP) addresses and subnet masks

Required knowledge

• amplified spontaneous emission (ASE)
• attenuation characteristics of optical fibres
• dense wavelength division multiplexing (DWDM) principles of operation
• features and operating requirements of test equipment including:
  • hand-held optical power meter
  • optical spectrum analyser
  • transmission test set
• dispersion characteristics of various fibres
• dispersion compensation devices
• electrostatic discharge precaution
• functions of optical add drop multiplexer (OADM) and reconfigurable optical add-drop multiplexer (ROADM)
• gain equalisation
• International Telecommunications Union (ITU) wavelength grid for DWDM
• measurement of dispersion

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REQUIRED SKILLS AND KNOWLEDGE
• optical amplifier operation • optical fibre connector types and characteristics • optical fibre types and characteristics • optical return loss (ORL) • path protection and protection switching • polarisation dependent loss (PDL) • protocols used on optical DWDM systems • reflectance • ring topologies and linear network topologies • specific OHS requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems • tunable laser sources and their characteristics

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and coordinate test activities and equipment • test specialised optical devices and determine suitability for integration into a network • analyse test results • report and make recommendations on suitability for integration • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites on which optical device testing may be conducted • use of test equipment currently used in industry • manufacturer's technical documentation, legislation, codes and standards.

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EVIDENCE GUIDE	
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing tests • review of test documentation and reports completed by the candidate • oral or written questioning to assess knowledge of testing procedures and required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN5118A Plan and configure dense wavelength division multiplexing systems • ICTOPN5119A Perform acceptance and commissioning test on optical network • ICTOPN5120A Plan for an optical system upgrade and cut over • ICTOPN5123A Analyse and integrate specialised optical devices in the network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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EVIDENCE GUIDE	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) • Australian building codes and regulations • compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5 or Category 6, 6A, 7 or 7A, and unshielded twisted pairs (UTP) • Environmental Protection Acts • fire regulations • Institute of Electrical and Electronics Engineers (IEEE) standards • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • flashing lights • gas and other hazard detection equipment • identifying other services, including power and gas • safety barriers • safety equipment • safe working practices such as the safe use and

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RANGE STATEMENT	
	handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • special access requirements • suitable light and ventilation • trench guards • warning signs and tapes • witches hats • environmental considerations: • clean-up protection • stormwater protection • waste management • noise, dust and clean-up management.
Hazards may include:	• activating equipment without notifying other staff who may be working remotely on the network • cleaning alcohol, epoxy resins and other solvents and chemicals may be carcinogenic, cause allergies or be dangerous to health in other ways • environmental hazards: • air pollution • damage to natural or heritage precincts • dangerous gases • ground water contamination • heavy or noxious metals pollution • noise • petrochemical spillage • release of hydrochlorofluorocarbons (HCFC) • flammable cleaning chemicals fluids and solvents • fibre offcut damage to eyes and skin • health hazards: • dangerous or harmful substances • handling of optic fibres and lasers

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RANGE STATEMENT	
	• risk of infection • risk of sustained injury from repetitive tasks • inhalation of fibre offcuts and particles from vacuum cleaning of worksite • laser damage to eyes.
Personal protective equipment may include:	• inspection microscope with integral laser safety filter • safety glasses • video microscope.
Optical device may include:	• Bragg grating • coupler • dispersion compensation device (DCD) • DWDM multiplexer • erbium doped fibre amplifier (EDFA) • gain equaliser • Raman amplifier • ROADM.
Appropriate person may include:	• network engineer • project engineer • project manager.
Specifications may include:	• bandwidth • insertion loss • operating wavelength • ORL • ripple.
Test equipment may include:	• broadband amplified spontaneous emissions (ASE) source • optical spectrum analyser • PDL controller • PDL meter • power meter • tunable laser source • variable attenuator.
Test regime may include:	• bandwidth • central wavelength and channel spacing • channel uniformity • insertion loss • ORL • PDL

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RANGE STATEMENT	
	• ripple.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN5123A Analyse and integrate specialised optical devices in the network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse and integrate specialised optical devices into existing optical networks to support the higher bandwidths associated with Next Generation Networks (NGN). Carriers and service providers regularly upgrade existing infrastructures and extend the length of their networks' optical links due to expansion of NGN services such as voice, data and video. Performance testing of specialised optical devices is covered in a separate unit ICTOPN5122A Test the performance of specialised optical devices. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff from telecommunications carriers, service providers or other private and public organisations who have experience in optical transmission apply the skills and knowledge in this unit. They combine technical expertise with a range of analytical, research and planning skills to develop

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	integration solutions for particular business needs. Relevant job roles include design and planning of networks using emerging technology.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Analyse specialised optical device and prepare for integration in the network	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** and follow occupational health and safety (***OHS***) ***and environmental requirements*** for the project work 1.2. Work safely according to relevant safety legislation and company work practices identifying ***hazards*** and using ***personal protective equipment*** 1.3. Obtain plans and drawings of existing ***optical network*** from ***appropriate person*** and review potential locations for suitability of integrating additional hardware 1.4. Analyse and evaluate a range of integration options using device ***specifications*** which satisfy the customer's network requirements 1.5. Prepare and submit the business case for adopting the recommended integration solution 1.6. Prepare design plan with interconnection details to existing system and ***installation options*** and seek approval to proceed from customer 1.7. Undertake an impact risk assessment of the hardware integration with the network operations centre (NOC) and prepare for contingencies using contingency plan
2. Integrate the specialised optical device in the network	2.1. Install and integrate ***specialised optical devices*** into existing network according to design plan 2.2. Test the network and evaluate the results to ***verify optical network performance*** with the integrated specialised optical devices in operation
3. Document the integration of the specialised optical device in dense wavelength division multiplexing (DWDM) network	3.1. Produce an updated design plan and submit to customer with copies filed for later reference according to organisation's policies 3.2. Prepare an evaluation report on the performance of the network with specialised optical devices with recommendations for future enhancements 3.3. Notify NOC of job completion and obtain sign off from appropriate person

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate technical information and develop integration options
- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to:
  - interpret technical documentation, such as equipment manuals, specifications and service orders
  - write reports using standard formats
- numeracy skills to interpret results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and that of others
- problem solving and contingency management skills to:
  - adapt testing procedures to requirements of particular situations
  - modify activities depending on operational contingencies, risk situations and environments
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities especially when dealing with infra-red laser light
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - backup and restore
  - clean optical fibre connector
  - examine optical fibre connector for contamination and assess whether cleaning is required
  - install software
  - measure optical power using handheld optical power meter
  - measure DC and AC voltages
  - select and use appropriate test equipment
  - setup internet protocol (IP) addresses and subnet masks

Required knowledge

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REQUIRED SKILLS AND KNOWLEDGE

• attenuation characteristics of optical fibres
• DWDM principles of operation
• features and operating requirements of test equipment, including:
  • hand-held optical power meter
  • optical spectrum analyser
  • transmission test set
• dispersion characteristics of optical fibres
• dispersion compensation devices
• electrostatic discharge precaution
• functions of optical add drop multiplexer (OADM) and reconfigurable optical add-drop multiplexer (ROADM)
• gain equalisation
• International Telecommunications Union (ITU) wavelength grid for DWDM
• measurement of dispersion
• optical amplifier operation
• optical fibre connector types and characteristics
• optical fibre types and characteristics
• optical return loss (ORL)
• path protection and protection switching
• protocols used on optical DWDM systems
• reflectance
• ring topologies and linear network topologies
• specific OHS requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems
• tunable laser sources and their characteristics

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • analyse a specialised optical device and prepare a

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EVIDENCE GUIDE	
competency in this unit	design to integrate it with a network • integrate and test the device • document the integration to the network and recommend enhancements • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites on which specialised optical device can be integrated • use of test equipment currently used in industry • manufacturer's technical documentation, legislation, codes and standards.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing integration • review of test documentation and reports completed by the candidate • oral or written questioning to assess required knowledge and skill.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN5118A Plan and configure dense wavelength division multiplexing systems • ICTOPN5119A Perform acceptance and commissioning test on optical network • ICTOPN5120A Plan for an optical system upgrade and cut over • ICTOPN5122A Test the performance of specialised optical devices. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • Australian building codes and regulations • compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5 or Category 6, 6A, 7 or 7A, and unshielded twisted pairs (UTP) • Environmental Protection Acts • fire regulations • Institute of Electrical and Electronics Engineers

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RANGE STATEMENT	
	(IEEE) standards • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

OHS and environmental requirements may relate to:	• decommissioning and isolating work site and lines prior to commencement
	• flashing lights
	• gas and other hazard detection equipment
	• identifying other services, including power and gas
	• safety barriers
	• safety equipment
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• special access requirements
	• suitable light and ventilation
	• trench guards
	• warning signs and tapes
	• witches hats
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management.

Hazards may include:	• activating equipment without notifying other staff who may be working remotely on the network
	• cleaning alcohol, epoxy resins and other solvents and chemicals may be carcinogenic, cause allergies or be dangerous to health in other ways
	• environmental hazards:
	  • air pollution
	  • damage to natural or heritage precincts

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RANGE STATEMENT	
	• dangerous gases • ground water contamination • heavy or noxious metals pollution • noise • petrochemical spillage • release of hydrochlorofluorocarbons (HCFC) • flammable cleaning chemicals fluids and solvents • fibre offcut damage to eyes and skin • health hazards: • dangerous or harmful substances • handling of optic fibres and lasers • risk of infection • risk of sustained injury from repetitive tasks • inhalation of fibre offcuts and particles from vacuum cleaning of worksite • laser damage to eyes.
Personal protective equipment may include:	• inspection microscope with integral laser safety filter • safety glasses • video microscope.
Optical network may include:	• coarse wavelength division multiplexing (CWDM) • DWDM • Hybrid fibre coaxial (HFC).
Appropriate person may include:	• customer • network manager • project engineer • project manager.
Specifications may include:	• bandwidth • insertion loss • operating wavelength • optical return loss (ORL) • ripple.
Installation options may include:	• location at intermediate location • location at OADM site • location at terminal site • location underground.

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RANGE STATEMENT	
Specialised optical devices may include:	• Bragg grating • coupler • dispersion compensation device (DCD) • DWDM multiplexer • erbium doped fibre amplifier (EDFA) • gain equaliser • Raman amplifier • ROADM.
Verify optical network performance may include:	• stability test • bit error ratio test (BERT).

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN6124A Manage optical ethernet transmission

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to manage an ethernet optical transmission system. It includes analysis of fault conditions that may occur. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers working with carrier telecommunications networks using optical technologies apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan to test optical ethernet link	1.1. Make worksite safe by identifying existing and potential site ***hazards***
	1.2. Determine the ***technical environment*** and network components
	1.3. Report on infrastructure to ensure that link is designed to meet performance requirements
2. Specify architecture requirements	2.1. Follow site specific safety requirements and enterprise occupational health and safety (OHS) procedures
	2.2. Determine ***architecture components***
	2.3. Determine ***functions*** and ***framework*** for the system to operate across network boundaries, taking into account performance criteria
3. Manage optical ethernet link	3.1. Conduct work in the context of ***appropriate tests***
	3.2. Analyse test results
	3.3. Provide a report on test results and compare with expected outcomes
	3.4. Document test results and refer to the ***appropriate person***

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to identify and rectify faults in Ethernet transmission
- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to:
  - interpret technical documentation, such as equipment manuals, specifications and service orders
  - write reports using standard formats
- research skills to gather data, observation and analysis of transmission issues
- technical skills to conduct tests and operate test equipment

Required knowledge

- ethernet:
  - applications of ethernet in optical systems
  - architecture of ethernet systems
  - operation of ethernet within a telecommunications environment
  - organisational policy and procedures
  - testing techniques
- familiarity with workplace and industry environment
- specific OHS requirements relating to:
  - handling of optical fibre
  - personal safety issues
  - use of laser light sources

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the

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EVIDENCE GUIDE	
performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan to test an optical ethernet link • select and perform a testing regime on ethernet optical transmissions • analyse and document test results • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • a telecommunications operations site with ethernet optical transmission system • test equipment currently used in industry.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning of the candidate • direct observation of the candidate carrying out relevant measurements within an ethernet optical communication system • evaluation of written report prepared by the candidate outlining architecture components, testing regime and analysis of test results.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTOPN4116A Use advanced optical test equipment • ICTOPN6129A Analyse optical transmission systems. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Hazards may include:	• optical cable: • hazardous laser light.
Technical environment may include:	• Ethernet frame structure • medium access control • physical media.
Architecture components may include:	• entire fibres • Lambda • time division multiplexing • waveband.
Functions may include:	• bandwidth profile parameters • class-of-service labels • network service parameters

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RANGE STATEMENT	
	• service attributes • service performance parameters.
Framework may include:	• auto-negotiation • physical coding sub-layer • physical medium attachment • physical medium dependent.

Appropriate tests may include:	• approval and acceptance tests:
	  • 1000BASE-T PMA
	  • 1000BASE-X PCS
	  • auto-negotiation
	  • electrical interfaces
	  • ethernet testing suite
	  • flow control test
	  • jitter measurements
	  • media access control (MAC) layer
	  • operating wavelength
	  • optical interfaces
	  • phase fluctuation and jitter
	  • physical interface
	  • physical-layer interoperability
	• media tests:
	  • advanced cable testing
	  • characteristic impedance
	  • crosstalk
	  • delay
	  • insertion loss or attenuation
	  • media categories
	  • return loss
	  • wiremap
	• performance tests:
	  • back-to-back frames
	  • frame loss ratio
	  • latency
	  • reset
	  • RFC 2544 Test
	  • system recovery
	  • throughput
	  • traffic generation.

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RANGE STATEMENT	
Appropriate person may include:	• authorised business representative • client • supervisor.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN6125A Manage dense wavelength division multiplexing transmission system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to manage a dense wavelength division multiplexing (DWDM) transmission system using graphical user interface (GUI) management software. Network management software provides a single point of access to the fault, performance, security and administrative functions of network management. Alarms are displayed and performance data and statistics are visible, allowing network degradation to be detected before actual failure occurs. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff in telecommunications who work with DWDM optical transmission systems where network management is implemented apply the skills and knowledge in this unit. The network management operations are often carried out at a central Network Operations Centre (NOC).

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to manage transmission system	1.1. Determine ***networking issues*** and requirements from ***appropriate person*** 1.2. Install network management software according to vendor instructions, including access, security and administration 1.3. Create a customised representation of the enterprise's ***network topology*** 1.4. Set and configure thresholds for performance

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ELEMENT	PERFORMANCE CRITERIA
	monitoring 1.5. Prepare a plan to integrate the DWDM management system into a broader network management system where applicable
2. Manage transmission system	2.1. ***Manage the network*** using appropriate communications links 2.2. Monitor the network for faults and performance and produce a fault and performance report
3. Use network management to report on the overall state of transmission system	3.1. Analyse performance monitoring data and alarm data 3.2. Prepare a report and make recommendations based on the analysis 3.3. Report on ***network degradation*** over a period of time

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to identify and rectify faults in DWDM transmission system
• communication skills to:
  • liaise with internal and external personnel on technical and operational matters
  • relate to work associates, supervisors, team members and clients
• information technology skills particularly interoperability between management systems
• literacy skills to:
  • interpret technical documentation, such as equipment manuals, specifications and service orders
  • write reports using standard formats
• problem solving skills to resolve software inoperability problems
• research skills to gather data, observe and analyse transmission issues
• technical skills to operate test equipment

Required knowledge
• familiarity with workplace and industry environment

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REQUIRED SKILLS AND KNOWLEDGE
• optical communications principles • DWDM technology • simple network management protocol (SNMP) • organisational policy and procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • monitor the network for faults and performance and produce a fault and performance report • analyse performance monitoring and alarm data and prepare a report with recommendations based on this analysis.
Context of and specific resources for assessment	Assessment must ensure: • access to sites on which DWDM equipment and associated network management can be operated • access to DWDM system and test equipment currently used in industry • access to relevant equipment manuals, software manuals and other procedural documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate using transmission system manuals and specifications to manage the network and analyse test results • evaluation of measurement results and reports produced by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
	for example: • ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system • ICTOPN6124A Manage optical ethernet transmission • ICTOPN6128A Design a dense wavelength division multiplexing system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

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RANGE STATEMENT	
situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Networking issues may include:	• access • administration • protocols: • SNMP • security • transaction language 1 (TL1).
Appropriate person may include:	• network administrator • network planner • project manager.
Network topology may include:	• background maps • communications links between network elements or groups • groups of elements • nested groups of elements • physical shapes.
Manage the network may include:	• acknowledging or clearing alarms • determining alarm severity • determining overall network status • integrated with external management system • locally • managing connections • managing protection • monitoring the network for faults • monitoring the performance of network elements • performing software download and upgrade • producing equipment inventory at a given site • remotely • stand alone management • viewing historical event logs and alarm data • viewing performance parameters and thresholds • viewing real time active alarm data.
Network degradation may include:	• decreasing received optical power level • decreasing transmit optical power level.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN6128A Design a dense wavelength division multiplexing system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design a high capacity dense wavelength division multiplexing (DWDM) optical network suitable for a metropolitan area network (MAN) or long haul applications. It involves link budget design and providing specification details for configuration and commissioning teams. DWDMs use optical multiplexing techniques to increase the carrying capacity of a fibre network by transmitting multiple optical wavelengths each carrying high speed data stream over a single fibre. DWDM systems offer up to 128 wavelengths, with each wavelength carrying up to 100 Gbps. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers and supervisors apply the skills and knowledge in this unit when designing DWDM systems for the deployment of high capacity networks using optical technologies. Optical networks using DWDM provide services in Next

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	Generation Networks (NGN) using emerging technologies. NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV and cloud computing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to produce a DWDM system design	1.1. Obtain the planning document from ***appropriate person*** and determine ***site details*** 1.2. Obtain the ***service type*** and the number of channels required between customer traffic sources and destinations and the type of ***protection*** required 1.3. Obtain ***specifications*** of the ***optical fibre*** between sites 1.4. Determine the fibre loss between sites
2. Calculate link budget for each wavelength path	2.1. Use vendor's engineering design rules, specifications and data to calculate link budget and link margin for each DWDM wavelength and path 2.2. Evaluate link budget and assess the calculated margin and make recommendations for improvement if warranted 2.3. Analyse the specifications of the installed optical fibre and determine if dispersion will limit the maximum traffic data rate 2.4. Generate options for system design that are realistic for the enterprise and network 2.5. Evaluate and select preferred option based on enterprise business strategy outcomes, service policy and compliance with relevant legislation 2.6. Discuss and confirm selected option with customer
3. Prepare detailed configuration documents for the DWDM system	3.1. Outline the ***detailed requirements*** of the DWDM system for ***configuration document*** 3.2. Prepare a configuration document according to the customer's traffic needs 3.3. Prepare an internet protocol (***IP***) ***address allocation*** for all DWDM shelves and associated routers and gateways 3.4. Submit documentation to appropriate person for approval and sign off
4. Investigate upgrade options using emerging technologies	4.1. Investigate the option of using a reconfigurable optical add-drop multiplexer (ROADM) and make recommendations outlining the benefits 4.2. Investigate the feasibility of a future upgrade up to 100 Gbps system using optical transport network (OTN)-DWDM technology

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to identify details relating to the project from the approved network plan
- communication skills to discuss project brief with enterprise design and installation personnel, vendors, customers and contractors
- literacy skills to:
  - write project briefs and interpret results and evaluate different types of technical data
  - interpret technical documentation and write reports in required formats
- numeracy skills to:
  - interpret results and evaluate different types of technical data
  - analyse site survey data
- planning skills to:
  - consider current, new technology, facilities and features when developing options
  - plan, prioritise and monitor own work and that of others
- problem solving skills to address and analyse specific customer requirements
- research skills to:
  - analyse impacts on planning processes
  - obtain and study information relating to emerging DWDM technologies
  - obtain geographical site information
  - study relevant legislation and associated operational codes
  - technical skills to identify barriers to plan realisation and evaluate emerging DWDM technologies

Required knowledge

- configuration of DWDM shelf
- DWDM principles of operation
- electrostatic discharge
- features and operating requirements of test equipment including:
  - optical time domain reflectometer (OTDR)
  - hand-held optical power meter
  - transmission test set
  - optical spectrum analyser

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REQUIRED SKILLS AND KNOWLEDGE
• functions of optical add drop multiplexer (OADM) • functions of reconfigurable optical add drop multiplexer (ROADM) • IP addressing, subnet mask, dynamic host configuration protocol (DHCP) and default gateway • International Telecommunications Union (ITU) wavelength grid for DWDM • laser stability • dispersion compensation devices • link budget calculations and link margins • optical fibre connector types and characteristics • optical fibre types and characteristics • path protection and protection switching • physical optical loopbacks and software loopbacks • traditional protocols and emerging OTN technologies used on optical DWDM systems • ring topologies and linear network topologies • specific occupational health and safety (OHS) requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine the fibre loss between sites • calculate link budget and link margin • prepare DWDM shelf configuration and specifications • produce a configuration document • investigate an emerging DWDM technology.
Context of and specific resources for assessment	Assessment must ensure: • sites on which design of a DWDM system may be

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EVIDENCE GUIDE	
	conducted • manufacturer's technical documentation, relevant regulations and specifications.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking DWDM calculations • review of data gathered, reports and project plans prepared by the candidate • oral or written questioning to assess knowledge of design and configuring of DWDM systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN6125A Manage dense wavelength division multiplexing transmission system • ICTOPN6129A Analyse optical transmission systems. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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EVIDENCE GUIDE	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate person may include:	• consultant • planning engineer • project engineer • project supervisor • site supervisor.

Site details may include:	• location of network sites
	• number of network sites
	• optical fibre path distance between sites
	• straight line distance between sites
	• type of site:
	  • OADM
	  • ROADM
	  • terminal.

Service type may include:	• interface requirements
	• protocol and bit rate:
	  • digital video broadcasting - asynchronous serial interface (DVB-ASI)
	  • enterprise system connection (ESCON)
	  • ethernet
	  • fast ethernet 100 Mbps
	  • 1 GbE
	  • 10 GbE
	  • fibre channel
	  • OTN
	  • synchronous digital hierarchy (SDH)

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RANGE STATEMENT	

	• synchronous optical networking (SONET)
	  • STM-1 155 Mbps
	  • STM-4 622 Mbps
	  • STM-16 2.48 Gbps
	  • STM-64 10 Gbps
	  • STM-256 40 Gbps
	• 100 Gbps
	• HD-SDI
	• SD-SDI.

Protection may include:	• equipment protection • path protection.

Specifications may include:	• chromatic dispersion (ps/nm*km)
	• cladding diameter
	• core diameter
	• end-to-end attenuation or dB loss per km at nominated wavelength
	• fibre type
	  • non-zero dispersion shifted fibre (NZDSF) ITU-T G.655
	  • non-dispersion shifted fibre (NDSF) ITU-T G.652 also known as standard single mode fibre 'SMF'
	  • dispersion-shifted fibre (DSF) ITU-T G.653
	  • 1550-nm loss-minimised fibre (ITU-T G.654)
	  • ITU-T G.656
	  • LEAF fibre
	• number of fusion splices
	• polarisation mode dispersion
	• refractive index profile of core.

Optical fibre may include:	• existing fibre • fibre optimised for DWDM system • new fibre.
Detailed requirements may include:	• actual wavelengths specified • chirp parameter • dispersion compensation devices • maximum allowable span length • optical amplifier

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RANGE STATEMENT	

	• optical signal to noise ratio (OSNR)
	• receiver threshold
	• transmit laser:
	  • maximum power
	  • minimum power
	  • stability
	  • type.

Configuration document may include:	• channel configuration information • fixed optical attenuators • protection details • slot positions and circuit card type • type and quantity of circuit cards.
IP address allocation may include:	• default gateway IP address • shelf IP addresses • subnet mask.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Optical networks

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ICTOPN6129A Analyse optical transmission systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse optical transmission systems deployed by service providers in core and access networks. Network service providers adapt their existing optical networks to meet the demand for higher bandwidths for Next Generation Networks (NGN). Upgrading to 128 channels at transmission rates of up to 100 Gbit/s has a significant effect on the network's tolerance to optical impairments, such as noise level, chromatic dispersion and polarisation mode dispersion (PMD). Before an existing network is upgraded, its characteristics must be characterised and verified to ensure it will support the new modulation requirements of the equipment. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Experienced technical staff from telecommunications carriers, service providers or other private and public organisations who have experience in the optical transmission area apply the skills and knowledge in this unit.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to conduct characterisation tests on existing optical network	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards relevant legislation***, ***codes***, ***regulations and standards*** and follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work 1.2. Identify ***hazards*** and work safely according to relevant safety legislation and company work practices using ***personal protective equipment***

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ELEMENT	PERFORMANCE CRITERIA
	1.3. Construct ***test procedures*** for each test to be conducted 1.4. Notify customer and arrange for site access
2. Conduct link characterisation tests and analyse existing optical network	2.1. Perform ***optical tests*** to characterise the existing fibre link 2.2. Analyse the results of the optical tests, and determine the extent and nature of future upgrades based on the tests
3. Document the analysis of optical network with recommendations	3.1. Produce final drawings and plans of proposed upgrade requirements for optical transmission and submit to project manager according to enterprise policy 3.2. Prepare a report on the measured performance of the network and recommendations on future upgrades

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to:
  - interpret technical documentation, such as equipment manuals, specifications and service orders
  - write reports using standard formats
- numeracy skills to interpret results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and that of others
- problem solving and contingency management skills to:
  - adapt testing procedures to requirements of particular situations
  - modify activities depending on operational contingencies, risk situations and environments
- safety awareness skills to:

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REQUIRED SKILLS AND KNOWLEDGE

- apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities especially when dealing with infra-red laser light
- select and use required personal protective equipment conforming to industry and OHS standards
- work systematically with required attention to detail without injury to self or others, or damage to goods or equipment

- technical skills to:
  - backup and restore
  - clean optical fibre connector
  - examine optical fibre connector for contamination and assess whether cleaning is required
  - install software
  - measure DC and AC voltages
  - measure optical power using handheld optical power meter
  - select and use appropriate test equipment
  - setup IP addresses and subnet masks

Required knowledge

- attenuation characteristics of optical fibres
- chromatic dispersion (CD) test
- dense wavelength division multiplexing (DWDM) principles of operation
- dispersion
- dispersion characteristics of various fibres
- dispersion compensation devices
- electrostatic discharge precaution
- features and operating requirements of test equipment including:
  - hand-held optical power meter
  - optical spectrum analyser
  - transmission test set
- functions of optical add drop multiplexer (OADM) and reconfigurable optical add-drop multiplexer (ROADM)
- gain equalisation
- insertion loss test
- International Telecommunications Union (ITU) wavelength grid for DWDM
- measurement of dispersion
- methods to reduce dispersion
- optical amplifier operation
- optical fibre connector types and characteristics
- optical fibre types and characteristics

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REQUIRED SKILLS AND KNOWLEDGE
• optical return loss (ORL) test • optical signal to noise ratio (OSNR) test • optical time domain reflectometer (OTDR) test • path protection and protection switching • performance qualification of 40 Gbit/s and 100 Gbit/s transceivers • polarisation mode dispersion (PMD) test • protocols used on optical DWDM systems • reflectance • ring topologies and linear network topologies • specific OHS requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• conduct four of the following measurements:
	  • OTDR testing from both ends
	  • OLTS loss test
	  • ORL
	  • CD
	  • PMD
	  • non-linearity (four wave mixing)
	  • OSNR
	• analyse complex optical measurement results
	• recommend the most appropriate upgrades for the existing system.

Context of and specific resources for assessment	Assessment must ensure: • sites on which link characterisation testing may be conducted

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EVIDENCE GUIDE	
	• use of test equipment currently used in industry • test equipment and manufacturer's technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing integration • review of test documentation completed by the candidate • oral or written questioning to assess knowledge of test and commissioning procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN5118A Plan and configure dense wavelength division multiplexing systems • ICTOPN5119A Perform acceptance test and commission an optical network • ICTOPN5120A Plan for an optical system upgrade and cut over • ICTOPN5122A Test the performance of specialised optical devices. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those

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EVIDENCE GUIDE	
	required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• Australian building codes and regulations
	• compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5 or Category 6, 6A, 7 or 7A, and unshielded twisted pairs (UTP)
	• Environmental Protection Acts
	• fire regulations
	• International Electrotechnical Commission (IEC):
	  • IEC 61282-3 Technical report on calculation of PMD
	  • IEC 61290-1 Gain of optical amplifiers
	  • IEC 61290-2 Power measurements on optical amplifiers
	  • IEC 61291 Generic specs for optical amplifiers
	  • IEC 61291-4 Performance template for

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RANGE STATEMENT	
	multi-channel optical amplifiers • IEC 61941 Standard on PMD measurement for single mode optical fibre • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • flashing lights • gas and other hazard detection equipment • identifying other services, including power and gas • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • safety barriers • safety equipment • special access requirements • suitable light and ventilation • trench guards • warning signs and tapes • witches hats • environmental considerations: • clean-up protection • noise, dust and clean-up management • stormwater protection • waste management.
Hazards may include:	• infra-red laser light at transmitter ports and fibres • needle stick injuries from fractured optical fibres.
Personal protective equipment may include:	• dust protection • earmuffs • eye protection • gloves

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RANGE STATEMENT	
	• hard hats • personal reflecting jackets • safety boots • safety glasses • traffic signs • warning signs and tapes.
Test procedures may include:	• expected measurement results • test conditions • test instrument settings • test instruments required • test setup.

Optical tests may include:	• tests:
	  • CD
	  • non-linearity (four wave mixing)
	  • optical loss test set (OLTS)
	  • ORL
	  • OSNR
	  • OTDR testing from both ends
	  • PMD
	• wavelength:
	  • 1310 nm
	  • 1550 nm
	  • 1625 nm.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Optical networks

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ICTPMG2130A Prepare site for support installation

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to prepare a site for support installation. It may involve preparation for aerial or underground cable or for erection of radio towers or above ground or underground equipment enclosures. Licensing, legislative, regulatory and certification requirements apply to working at heights, confined spaces, crane operation, rigging, driving and other operations involved in this unit. Users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff whose work involves civil construction of telecommunications sites apply the skills and knowledge in this unit. A relevant job role is civil construction worker whose work includes site preparation.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for installation	1.1. Confirm the location of proposed installation is according to the ***installation plan*** and ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Recognise and report ***hazards***
	1.3. Obtain ***approvals*** and authorisations for work and carry at all times during works
	1.4. Inform land owner or tenant of imminent works
	1.5. Locate adjoining services according to enterprise guidelines and occupational health and safety (OHS) practices
	1.6. Clear site of vegetation and debris according to work specifications and any relevant approvals

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ELEMENT	PERFORMANCE CRITERIA
2. Excavate site	2.1. Place pegs for proposed installation according to enterprise guidelines and site plans 2.2. Excavate using the appropriate equipment for the size of excavation, the location of the works, and according to enterprise guidelines 2.3. Conduct levelling of the site within the tolerance specified in the installation plan 2.4. Employ ***OHS practices*** and ***personal protective equipment***, where appropriate, in the manner intended by the manufacturer
3. Complete administration	3.1. Note approved alterations on the original plan and design using the appropriate symbols, and return plan to originator 3.2. Complete and sign ***reports*** according to enterprise policy where required 3.3. Inform land owner or tenant of construction completion and the expected next steps according to enterprise guidelines

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to read and interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - interpret drawings related to preparing a site for an installation
  - use hand, power tools and excavation equipment

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REQUIRED SKILLS AND KNOWLEDGE
Required knowledge
• construction methods and performance requirements • features and operating requirements of construction equipment • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer requirements for safe operation of equipment • specific OHS requirements relating to the activity and site conditions • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare and clear site for installation • excavate site • complete reports and record variations to plans.
Context of and specific resources for assessment	Assessments must ensure: • access to sites on which installations can be performed • use of equipment and personal protective equipment currently used in industry • access to relevant regulatory, organisational and equipment documentation that impact on installation activities
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a site project completed by the candidate • review of an oral and written report with completed documentation

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EVIDENCE GUIDE	
	• direct observation of the candidate preparing a site for a support installation • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG2173A Plan, organise and undertake work activities. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised

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RANGE STATEMENT	
wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Installation plan may include:	• local environment requirements to ensure that reinstatement may be completed appropriately • safe working practices and personal protective equipment where appropriate in the manner intended by the manufacturer and stipulated by the enterprise • small or short term job, part of a larger project • tools and equipment are used according to guidelines.

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • backhoe operator
	  • borer
	  • chainsaw operation
	  • crane
	  • crane chaser
	  • crane operator
	  • dogman
	  • drivers
	  • elevated work platform (EWP)
	  • forklift
	  • heavy vehicle
	  • machinery operation
	  • rigger
	  • winch
	• AS Communications Cabling Manual (CCM) Volume 1
	• Australian Communications Industry Forum (ACIF) standards and codes
	• Australian Communications and Media Authority (ACMA) technical standards
	• Australian building codes and regulations
	• Australian standards
	• enterprise standards
	• Environmental Protection Acts
	• fire regulations
	• heritage legislation

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RANGE STATEMENT	

	• industrial relations agreements, including awards and enterprise agreements
	• international standards
	• local government
	• manufacturer's enterprise operating policy and procedures
	• OHS
	• other services and utilities codes of practice and standards:
	  • electricity
	  • gas
	  • water
	• Privacy Act
	• Spectrum Management Authority
	• statutory requirements
	• Trade Practices Act
	• traditional land owners.

Hazards may include:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • radio frequency (RF) emission
	• contact with remote power feed
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service
	• unsafe support structures:
	  • condemned poles
	  • visible signs of decay or stress
	• unsafe weather:
	  • heavy rains
	  • high winds
	  • thunderstorms
	  • severe heat or cold.

Approvals may include:	• environmental protection • land clearances • noise pollution • plant and equipment installation • site permits

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RANGE STATEMENT	
	• waste production and removal.

OHS practices may include:	• antenna principles for working safely on telecommunications radio structures
	• devices to support construction personnel at heights:
	  • elevated personnel vehicles
	  • non-metallic ladders
	  • platforms
	• external factors affecting works:
	  • concentration of other services
	  • terrain
	  • weather conditions
	• fall arrest:
	  • fixed
	  • temporary
	• precautions for unsafe weather conditions to undertake works:
	  • heavy rains
	  • high winds
	  • severe cold
	  • severe heat
	  • thunderstorms
	• preparing for work at a telecommunications site with potential electromagnetic radiation (EMR) hazards
	• safety issues in roof work:
	  • fall arrest
	  • fall guarding
	• traffic management
	• verifying and maintaining the EMR hazard management plan against an on site situation.

Personal protective equipment may include:	• earmuffs
	• eye protection
	• gloves:
	  • plastic
	  • rubber
	  • leather
	• gumboots
	• hard hats

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RANGE STATEMENT	
	• overalls • personal reflecting jackets • riggers' gloves • safety boots • vests.

Reports may include:	• communication with affected parties:
	  • customer
	  • neighbour
	  • occupants
	  • other property owners
	  • utility providers
	• computer-based documentation
	• electronic communication
	• enterprise procedures
	• manuals.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG2173A Plan, organise and undertake work activities

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan, organise and undertake work activities in a telecommunications environment, including voice, video and data networks in domestic, commercial or industrial installations. The work activity may be a project for a new installation or upgrade of capacity or technology for existing network or subsystem for convergence to Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who plan, organise and undertake work on customer premises and service providers for new and upgrades of telecommunications activity apply the skills and knowledge in this unit. They may be part of a project team responsible for cabling, equipment deployment in network infrastructure, such as broadband provisioning, wireless mobile and data networks.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to undertake work activities	1.1. Prepare work ***requirements*** from job request or work orders and confirm with appropriate parties including customer and other appropriate parties and/or by site inspection 1.2. Apply and monitor occupational health and safety (OHS) standards, statutory requirements, ***relevant legislation codes***, ***regulations and standards*** and enterprise procedures throughout the work procedure

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ELEMENT	PERFORMANCE CRITERIA
	1.3. Procure ***resources*** required to satisfy job plan for compliance with job specifications 1.4. Coordinate requirements, including requests for ***equipment isolation***, with others involved or affected by the work according to enterprise requirements
2. Coordinate and undertake work	2.1. Coordinate work activities with appropriate parties according to **enterprise *procedures***, job and ***environmental requirements*** 2.2. Undertake and monitor tasks to comply with plans, work requirements and enterprise procedures
3. Complete the work	3.1. Finalise work and restore worksite according to enterprise procedures and job requirements 3.2. Notify appropriate parties of work completion according to enterprise procedures and job requirements 3.3. Complete **job records**, costing data and necessary reports according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with and convey information to others
- literacy skills to prepare and interpret work procedures
- problem solving skills to estimate materials and resource requirements
- task management skills to:
  - coordinate and sequence work requirements
  - develop and implement work plan
  - review job progress against agreed goals
- technical skills to use hand and power tools and equipment

Required knowledge

- appropriate tools, plant, equipment and materials required to do the work
- enterprise permit procedures and recording procedures

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REQUIRED SKILLS AND KNOWLEDGE
• OHS • relevant engineering and design practices and procedures • relevant statutory requirements • team communication process and goals • time management techniques • work planning and organisation theory

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and prepare for work activities • coordinate and undertake work activities applying all related OHS requirements and work practices • complete all document and reports for work activities • demonstrate alignment with job request and consideration of customer needs.
Context of and specific resources for assessment	Assessments must ensure: • sites on which work may be conducted • use of equipment including equipment currently used in industry • relevant regulatory, organisational procedures and equipment documentation that impact on work.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a range of work activities completed by the candidate • review of an oral and written report with completed documentation • direct observation of the candidate planning,

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EVIDENCE GUIDE	
	organising and undertaking work activities.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG2130A Prepare site for support installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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RANGE STATEMENT	
Requirements may include:	• codes of practice • customer requirements and specifications • design specifications • job specifications • manufacturer specifications • national and state guidelines, policies and imperatives relating to the environment • procedures and work instructions • quality assurance systems • standards called-up in specifications.
Relevant legislation codes, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS 3901 and AS 3902 and any subsequent updates • enterprise-specific policies, procedures and standards • environmental protection act • International standards ISO 9000 and ISO 9001 • OHS • relevant building and electrical codes • trade practices legislation.
Resources may include:	• materials • network equipment • personnel • plant • safety equipment • tools.

Equipment isolation may include:	• danger tag system for greater safety of:
	  • multiple locking systems
	  • flow of steam, electricity, gases or liquids
	  • operation of machinery, plant or equipment
	  • use of faulty or unsafe plant and equipment
	• lock-out and tag-out
	• safety device systems:
	  • full pressure blanks
	  • isolating switches
	  • locks
	  • safety bars
	  • shields

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RANGE STATEMENT	
	• spectacle blanks to lock systems or devices to an 'off' position.
Enterprise procedures may refer to:	• arrangements for dealing with emergencies • formal arrangements of how work is to be done and by whom • making provision for the recycling or re-use of materials • modifying job requirements to meet unforeseen requirements • communicating the extent of change to those affected.

Environmental requirements may relate to:	• area surrounding the work site including:
	  • atmosphere
	  • drains
	  • ecosystem
	  • soils
	  • underground water tables
	• protection of the environment including:
	  • containment of chlorofluorocarbons
	  • correct handling of toxic substances
	  • correct use of enterprise vehicles and machinery
	  • minimisation of construction waste materials
	  • minimisation of factors that contribute to the production of greenhouse gases
	  • proper disposal of waste materials
	  • reduction of energy usage
	  • restriction of burning off
	  • re-use or recycling of trade materials.

Job records may include:	• contract history file • daily diary • plans • time sheets or cards.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG4048B Schedule installation of customer premises equipment

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge to effectively schedule the installation of customer premises equipment (CPE). It includes planning, provisioning and monitoring of customer premises installations.

CPE may be for small to medium enterprises or large government organisations with installations in computer networking, security installations, radio frequency identification (RFID), cable TV (CATV), home networks and internet protocol TV (IPTV) networks.

Application of the Unit

Lead foremen or estimators with appropriate authority to direct the activities of customer premises installation staff, building workers, contractors, manufacturers and vendors apply the skills and knowledge in this unit.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Plan installation project	1.1 Obtain ***relevant legislation, codes, regulations and standards*** and follow occupational health and safety ***(OHS) and environmental requirements*** for the given work 1.2 Plan ***work schedules*** for ***relevant parties*** to provision services and deliverables in correct sequence for satisfactory project completion within the specified timeframe 1.3 Order materials in advance of needs to avoid work delays 1.4 Negotiate the provision and connection of required network capacity and facilities with network provider 1.5 Determine ***customer equipment*** types and quantities and organise timing of delivery according to work schedule timeframe 1.6 Determine ***essential criteria*** for selecting labour resources in order to satisfy regulatory, enterprise and client requirements 1.7 Calculate installation workloads to complete task within specified timeframe
2. Provision resources for installation project	2.1 Arrange for connection of ***network services*** to customer equipment 2.2 Coordinate logistics associated with the delivery of material to site according to the installation timeframe

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	2.3 Allocate labour to the installation as determined in the planning stage 2.4 Ensure that all installation personnel are advised of installation and customer requirements
3. Monitor and adjust resource allocations	3.1 Adjust labour resources as necessary, to meet budget and completion timeframe 3.2 Monitor work progress against project schedules and budgets

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communications skills to efficiently deal with employees, labour hire companies, customers, consultants, contractors and suppliers
- learning skills to proactively keep up to date with changes in the CPE area
- literacy skills to read and interpret basic technical data
- numeracy skills to estimate or calculate cost of labour and materials
- planning and organisational skills to:
  - improve systems and procedures
  - prioritise and organise own work
  - efficiently plan work schedules
- research skills to source alternative parts supplies
- technology skills to use software and hardware when:
  - planning work schedules
  - ordering supplies.
  -

Required knowledge

- Australian Communications and Media Authority (ACMA) licensing requirements (cabling provider rules)
- operation of computers and application of software programs as used in the Telecommunications Industry
- industry cabling practices
- OHS procedures
- overview of project management including:

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  - phases of project management
  - roles and responsibilities within project management
  - project reporting
- telecommunications components and assemblies
- telecommunications CPE.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan an installation project • plan work schedules of installation team • organise supply of materials • arrange for connection of network services.
Context of, and specific resources for assessment	Assessment must ensure: • work site where scheduling may be conducted • use of computer hardware and software currently used in industry.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of scheduling different CPE types in different locations • review of an oral and written report with completed documentation • direct observation of the candidate scheduling a CPE installation.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

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	• ICTCBL4004B Schedule and supply cabling installation • ICTCBL4023B Supervise cabling project. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Communications Alliance: • Australian Communications Industry Forum (ACIF) standards and codes • AS/ACIF S008:2006 and AS/ACIF S009:2006 AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003

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	• AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • compliance with appropriate ACMA technical standard requirements for underground, aerial, Category 5 or Category 6, 6A, 7 or 7A and unshielded twisted pairs (UTP) • Environmental Protection Acts • fire regulations • noise abatement and heritage legislation • OHS • relevant international standards • Trade Practices Act.

OHS and environmental requirements may relate to:	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management
	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services, including power and gas
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats

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	• special access requirements • suitable light and ventilation.
Work schedules may include:	• building works • connection to network boundary • council approvals • cutover of customer equipment • delivery of network services from carrier • installation of customer equipment • jumpering of building distributor • loading of database information • logistics.
Relevant parties may include:	• carrier • clients • CPE installation contractors • earthmoving or building work contractors • equipment vendors • inspectors • local council • regulatory bodies.
Customer equipment may include:	• answering machine • cable modem • cable TV set-top boxes • digital subscriber line routers • fax machine • Internet protocol (IP) PBX • IP PBX server • key telephone system • PBX • Session initiation protocol (SIP)-enabled UC system • telephone handsets • video conferencing equipment • voice over internet protocol (VoIP) gateway • worldwide interoperability for microwave access (WiMAX) CPE.
Essential criteria may include:	• experience • licences • physical abilities • project management skills • qualification • vendor certifications.
Network services may	• the provision of:

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include:	• bandwidth • digital or analogue circuits • exchange circuits • radio spectrum • virtual PBX • wireless access.

Unit Sector(s)

Telecommunications - Project management

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ICTPMG4152A Manage the delivery of network infrastructure

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to manage the delivery of network infrastructure. It includes scoping the project, developing a project brief and managing the project. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with appropriate project management roles and authority to direct the activities of installation staff, building workers, contractors, manufacturers and vendors apply the skills and knowledge in this unit. This unit applies to projects associated with access and core Networks, including switching and transmission via optical fibre, radio, microwave and satellite.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope network infrastructure requirements	1.1. Determine the requirements of the project from client and approved network plan 1.2. Assess current access network conditions to determine existing network capacity and capability 1.3. Analyse ***site survey data*** and geographical information where necessary to assess suitability of site to design requirements 1.4. Assess risk of ***barriers to plan realisation*** to enure delivery of network infrastructure project is achievable 1.5. Analyse the impact on planning of ***relevant legislation and associated operational codes***

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ELEMENT	PERFORMANCE CRITERIA
	1.6. Produce a ***scoping document*** with consideration to new technology or technology features required in the project
2. Develop project brief	2.1. Develop planning options considering current and new technology, facilities, features, present and future needs 2.2. Conduct cost-benefit studies to guide decision making processes according to sound business practice 2.3. Discuss project brief with the customer, as required, and obtain approval of planning options 2.4. Produce planning specifications relating to location, route, area, product and/or platform 2.5. Estimate timing, costing and an operating budget according to enterprise policy 2.6. Prepare the final ***project brief*** and present to operational staff for implementation
3. Manage the project	3.1. Define the roles and responsibilities of stakeholders within the terms of the project 3.2. Establish a reporting and communications line to ensure project is effectively managed 3.3. Review and continually monitor progress of the project against deliverables and timelines and invoke contingencies if required 3.4. Complete ***project documents*** in line with enterprise standards and guidelines

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analysis skills to:
  • analyse site survey data
  • assess current Access Network capacity and capability
• communications skills to liaise and negotiate with customers to ensure requirements are known and can be met within timeframes

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REQUIRED SKILLS AND KNOWLEDGE

• literacy skills to produce:
  • contingency plan
  • planning specifications
  • project brief
  • scoping document
• numeracy skills to conduct cost-benefit analysis
• planning and organisational skills to:
  • plan efficient work schedules
  • plan location route area, product and platform
  • prioritise and organise own work
• problem solving skills to account for unexpected variations to requirements
• research skills to gain and maintain relevant and current technical product knowledge

Required knowledge
• Australian Communications and Media Authority (ACMA) licensing requirements • common customer telecommunications applications and related equipment • computer operation • familiarity with the workplace and industry environment • industry cabling practices • leasing versus purchase options • legislative and environmental impacts, including options for green ICT installations • network and transmission equipment • network topologies, interface and interconnect solutions • occupational health and safety (OHS) procedures • performance parameters and typical faults in equipment and related connection and transmission media, and various test equipment types • project management • telecommunications components and assemblies • warranty information and contractor work guarantees

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • scope network infrastructure requirements • analyse and document considerations in project specifications • analyse impact of legislative and environmental conditions to project plan • prepare project brief outlining specifications, timeframes, costing and operating budget • manage the delivery of network infrastructure to completion.
Context of and specific resources for assessment	Assessment must ensure: • sites on which projects may be conducted • relevant databases, legislative requirements and other site and project related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking delivery of network infrastructure including scoping the project, developing a project brief an managing delivery • review of project brief prepared by the candidate outlining specifications, timeframes, costing and operating budget • review of report prepared by the candidate outlining monitoring processes and contingency plan • oral or written questioning to assess knowledge of network infrastructures and project planning.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4050A Install and configure a wireless mesh network • ICTTEN4126A Install and configure internet protocol TV in a home network • ICTTEN4211A Design, install and configure an internetwork.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Site survey data may include:	• building availability or capacity • earthing requirements • environmental impact • geological and land surveys • line of sight data

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RANGE STATEMENT	
	• power availability • regulatory and statutory requirements • site availability • site ownership and acquisition data • weather conditions.
Barriers to plan realisation may include:	• building availability • community opposition • environmental considerations • financial constraints • government policy • heritage legislation restrictions • land acquisition problems • planning approvals • technology availability.
Relevant legislation and associated operational codes may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • compliance with appropriate ACMA technical standard requirements for underground, aerial, Category 5 or Category 6, 6A, 7 or 7A and unshielded twisted pairs (UTP) • Environmental Protection Acts • fire regulations • Institute of Electrical and Electronics Engineers (IEEE) standards • mining legislation • noise abatement and heritage legislation • OHS • relevant international standards

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RANGE STATEMENT	
	• technical standards AS/ACIF S008:2006, and AS/ACIF S009:2006 • Trade Practices Act.
Scoping document may include:	• barriers to plan realisation • existing network capacity and capability • recommendations with changes to original specifications • survey findings.
Project brief may include:	• contingency plan • management and reporting systems • project description • project parameters • relevant maps • resources required to complete project • risk analysis • scheduling data • sketch plan • suggested parallel activities.
Project documents may include:	• details of contingency plan • monitoring details • project briefs • project update information • reporting documents.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Project management

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ICTPMG5027A Develop customer premises equipment installation project plans

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan installation of customer premises equipment (CPE). This can include customer premises cabling and CPE. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical planners, designers and supporting administration staff apply the skills and knowledge in this unit. It may apply to technical staff moving into planning and management positions. Installation projects may be new installations, upgrade of capacity or technology for an existing network or subsystem for convergence to Next Generation Networks (NGN).

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Assess project requirements	1.1. Discuss and clarify project deliverables with ***customer*** using available ***documentation*** 1.2. Determine the ***type of CPE project*** required for the installation 1.3. Evaluate access, occupational health and safety (***OHS***) ***and environmental issues*** and include in job specification 1.4. Quantify and source ***equipment*** required 1.5. Estimate costs using organisational costing guidelines
2. Prepare detailed equipment, system	2.1. Capture ***data*** necessary to the project design brief 2.2. Negotiate system specifications based on project

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ELEMENT	PERFORMANCE CRITERIA
design and configuration	requirements with customer and sales staff 2.3. Translate available data into a detailed ***system design and configuration*** 2.4. Verify deliverables with customer
3. Detail project and quality plans	3.1. Develop ***project plan*** to meet customer's needs with detailed task list, resource needs and timeframes 3.2. Develop contingency plans to meet problems that may arise 3.3. Produce a ***quality plan*** incorporating flow process charts 3.4. Verify plans with customer and appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to compare and evaluate most effective technical solutions
- communication skills to:
  - liaise with customers to ensure requirements are known and can be met within timeframes
  - negotiate approvals and contract arrangements with suppliers and contractors
- literacy skills to:
  - interpret technical specifications and manuals
  - document technical requirements and procedures
- numeracy skills to:
  - analyse and confirm capacity requirements
  - calculate budget requirements and limitations
- planning and organisational skills to:
  - make site access and equipment delivery arrangements
  - set out project requirements and priorities
- problem solving skills to account for unexpected variations to requirements
- research skills to gain and maintain relevant and current technical product knowledge

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REQUIRED SKILLS AND KNOWLEDGE
Required knowledge

• cabling types, structures and connectors
• common customer telecommunications applications and related equipment
• connections to carrier infrastructure or equipment
• current legislation relating to installation of telecommunications equipment and connection to carrier services
• CPE
• environmental impacts including options for green ICT installations
• cost-effective solutions in installation:
  • leasing
  • purchase
• network and transmission equipment
• network topologies, interface and interconnect solutions
• OHS requirements:
  • electrical safety
  • materials handling
  • physical hazards
  • confined spaces
  • heights
  • lifting
• power requirements
• typical performance parameters and typical faults that may be encountered in customer equipment and related connection and transmission media
• warranty information for equipment supplies and contractor work guarantees

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • assess CPE project requirements

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EVIDENCE GUIDE	
competency in this unit	• prepare detailed system design and configuration • develop project and quality plans for CPE installation.
Context of and specific resources for assessment	Assessment must ensure: • site on which CPE installation can be planned • relevant documentation, data, technical manuals and other site related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking practical planning • review of plans completed by the candidate • oral or written questioning to assess knowledge of installation issues, types of systems and applications.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG5031A Prepare a project brief • ICTPMG5039A Prepare project specifications. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Customer may include:	• architects
	• building construction managers
	• companies
	• home owners
	• third parties:
	  • communications consultant
	  • contractor to a major supplier.

Documentation may include:	• quotation forms • sales orders • specification lists.
Type of CPE project may include:	• cabling • new equipment installation • equipment upgrade.
OHS and environmental issues may include:	• confined spaces • electrical safety • hazardous material • height hazards • trip hazards • waste disposal.
Equipment may include:	• alarm equipment • bandwidth managers • biometric systems • closed circuit TV (CCTV)

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RANGE STATEMENT	

	• cordless private automatic branch exchange (PABX) and business systems
	• digital subscriber line (DSL):
	  • asymmetrical DSL (ADSL)
	  • cable TV (CATV)
	• fibre to premises terminal equipment
	• internet protocol TV (IPTV)
	• modems
	• network equipment
	• PABX
	• peripherals
	• radio frequency identification (RFID)
	• security systems
	• voice over internet protocol (VoIP) phones.

Data may include:	• applications:
	  • hotel
	  • redundancy
	  • voice mail
	• barred services
	• competitive call billing data
	• class of service
	• extension relationship
	• international and national dialling access details
	• operational configuration.

System design and configuration may involve:	• architecture • compatibility • competing technologies • firmware • hardware • interoperability • longevity • performance • return on investment • scalability • software • topologies.
Project plan may include:	• checklists • Gantt charts • PERT charts

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RANGE STATEMENT	
	• software-based programs.
Quality plan may include:	• dependencies • inspection • manufacturer's technical manuals • responsibilities • technical standards • testing and related procedures • work instructions.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG5031A Prepare a project brief

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to prepare a brief for realising a telecommunications project, including costing, vendor and technology choices, scheduling and resourcing. It may be for a new installation or upgrade of capacity or technology for existing network or subsystem. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical managers, supervising technicians, project managers within an organisation or contracted to a network design or construction organisation apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan a project brief	1.1. Contact ***customer*** to obtain ***project*** details and approved network plan 1.2. Assess current ***network conditions*** 1.3. Analyse ***site survey data*** and geographical information to initiate studies if required 1.4. Assess ***barriers to plan*** realisation 1.5. Analyse the impact of ***relevant legislation***, ***codes***, ***regulations and standards*** on planning processes
2. Develop preliminary project brief	2.1. Develop ***project specifications***, including ***new technology*** according to customer requirements 2.2. Draft a sketch plan according to enterprise practice for area in question 2.3. Clarify project brief with the customer as required

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ELEMENT	PERFORMANCE CRITERIA
	2.4. Present final report with option for approval before proceeding with project brief
3. Assess tenders	3.1. Follow ***process for seeking quotes or issuing* tenders** for completion of project 3.2. Assess quotes or tenders against project criteria and any proposed variations 3.3. Examine detailed project costing estimates to ensure that budget parameters are attained 3.4. Assess competitive tenders with ***consideration*** to meet specified timeframes 3.5. Obtain tender approval from the customer
4. Monitor contract progress and completion	4.1. Monitor contract activity with progress against specifications 4.2. Establish and maintain regular liaison with project manager and site supervisor 4.3. Discuss contract problems or difficulties with project manager and contractor as required 4.4. Negotiate and implement contract variations 4.5. Prepare project completion advice in conjunction with project manager, installation manager and operational staff 4.6. Undertake a ***quality audit*** of the project and submit any recommendations for improvement according to enterprise procedures 4.7. Prepare a final report on project outcomes and achievement 4.8. Present report to customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to compare and evaluate most effective technical solutions • communication skills to: • liaise with internal and external personnel on technical and operational matters

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REQUIRED SKILLS AND KNOWLEDGE

• negotiate approvals and contract arrangements with suppliers and contractors
• literacy skill to:
  • interpret technical specifications, equipment manuals and tenders
  • write reports and document technical requirements and procedures
• numeracy skills for:
  • confirming capacity requirements
  • budget requirements
• planning and organisation skills to:
  • set out and monitor project requirements and priorities
  • undertake audits
• problem solving skills to address variations and contract issues
• research skills to maintain current technical product knowledge

Required knowledge
• common customer telecommunications applications and related equipment • familiarity with the workplace and industry environment • leasing versus purchase options • legislative and environmental impacts including options for green ICT installations • network and transmission equipment • network topologies, interface and interconnect solutions • performance parameters and typical faults in equipment and related connection and transmission media, and various test equipment types • warranty information and contractor work guarantees

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop a project brief for a telecommunications project • analyse and document considerations in project

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EVIDENCE GUIDE	
	specifications • apply legislative and environmental conditions to project brief development • assess tenders and monitor contract work to completion.
Context of and specific resources for assessment	Assessment must ensure: • sites on which projects may be conducted • relevant databases, legislative requirements and other site and project related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking brief preparation and monitoring contracts • review of project brief prepared by the candidate outlining specifications, specified timeframes, enterprise financial systems and policy • review of report prepared by the candidate outlining specified planning processes • oral or written questioning to assess knowledge of planning, types of systems and applications.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG5027A Develop customer premises equipment installation project plans • ICTPMG5039A Prepare project specifications. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Customer may include:	• communication consultants • enterprises • government bodies • internal or external to the organisation • other carriers • service providers.

Project may include:	• installation or upgrade for:
	  • broadband network
	  • switching
	  • transmission
	  • radio network:
	  • fixed
	  • mobile
	• systems including:
	  • optical
	  • radio

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RANGE STATEMENT	
	• microwave and satellite • multiplexing • transmission • network management • physical support infrastructure • various transmission paths.
Network conditions may be obtained from:	• capacity assessment data • network performance data associated with the network • traffic dimensioning data.
Site survey data may include:	• building availability and capacity • earthing requirements environmental impact • geological surveys • line of sight data • power availability • regulatory and statutory requirements • site availability • site ownership and acquisition data • weather conditions.
Barriers to plan may include:	• community opposition • environmental considerations • government policy • heritage legislation restrictions • local planning approvals.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) standards TS 14 • Australian standards applying to radio frequency (RF) hazards • heritage legislation • industrial awards and conditions • International standards ISO 9000/9001 • International Telecommunications Union (ITU) recommendations • National Parks Act • OHS Act • State/Territory and Federal Environment Acts • Telecommunications Act and relevant codes.
Project specifications may include:	• broad project description • cost-benefit studies as a guide to the decision making process

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RANGE STATEMENT	
	• costing estimates and operating budget • location, route, area, product and platform • planning options for future needs to include new technology • preferred equipment and vendors • profit margins according to enterprise policy • proposed project timing • resources • sketch plan.
New technology may include:	• internet protocol (IP) networks • optical networks • virtual networks • web-based networks • wireless networks.
Process for seeking quotations or issuing tenders may include:	• confidential tender processes • existing service level agreement • multiple quotes • requirements for preferred suppliers.
Consideration may include:	• capacity • performance • price • product type • quality • timeframes.
Quality audit includes:	• requirements of customer or organisation • review of process and methodology.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units	

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Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG5039A Prepare project specifications

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop project specifications for a telecommunications project. The project may be a new installation, upgrade of capacity or technology for an existing network or subsystem for convergence to Next Generation Networks (NGN). Preparing the specifications involves costing, scheduling and resourcing. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other services providers apply the skills and knowledge in this unit. This unit applies to switching, transmission and radio networks and the various transmission paths including cable, optical fibre, radio, microwave and satellite. Relevant job roles include designer and installer of NGN. These internet protocol (IP) networks provide fast internet, voice over internet protocol (VoIP) and internet protocol TV (IPTV) services.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for project estimate	1.1. Analyse project design obtained from ***appropriate personnel*** to determine project requirements according to project plan 1.2. Verify project requirements with customers and project team 1.3. Ascertain impact of time restraints on estimate

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Analyse the impact of ***relevant legislation***, ***codes***, ***regulations and standards*** on planning processes 1.5. Establish availability of all appropriate ***data and documentation*** to allow for the completion of the work
2. Estimate resource requirements	2.1. Conduct site inspection to verify design details and project context 2.2. Produce an estimate of type, quantity and schedule of ***resources*** required for the project from the project plans 2.3. Prioritise sequence of work appropriate to enterprise needs 2.4. Calculate contractor and employee labour hours required according to project requirements, industrial awards and enterprise policies 2.5. Record estimates of materials, equipment and labour hours according to enterprise guidelines
3. Calculate costing details	3.1. Estimate the amount and type of resources required for successful completion of project including risk management and contingencies 3.2. Calculate costs for resources from ***current information*** following standard costing procedures 3.3. Produce a detailed record of all required resources and costing details for project specifications
4. Prepare detailed project plan	4.1. Prepare detailed plan, including specifications for materials, equipment, resources, locations and network routes 4.2. Forward plan and specifications to the appropriate personnel for project implementation

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to compare and evaluate most effective solutions • communication skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• liaise with customers to ensure requirements are known and can be met within timeframes • negotiate approvals and contract arrangements with suppliers and contractors • literacy skills to: • interpret technical specifications, equipment manuals and tenders • write project specifications and detailed project plan • numeracy skills to: • calculate budget requirements and limitations • determine workforce requirements • planning and organisational skills to: • prioritise sequence of work • set out project requirements • problem solving skills to address variations and contract issues • research skills to gain and maintain relevant and current technical product knowledge • technical skills to prepare drafts of detailed plan
Required knowledge
• common customer telecommunications applications and related equipment • cost effective solutions in planning • drafting techniques • familiarity with the workplace and industry environment • legislative and environmental impacts including options for green ICT installations • network and transmission equipment • network topologies, interface and interconnect solutions • specific occupational health and safety (OHS) requirements • warranty information and contractor work guarantees

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • estimate and cost resources for a telecommunications project • analyse project design to determine specification options • prepare detailed project plan including specifications for resources and network routes.
Context of and specific resources for assessment	Assessment must ensure: • sites on which projects may be conducted • relevant databases, legislative requirements and other site and project related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking project specification tasks • review of plans and specifications prepared by the candidate • oral or written questioning to assess knowledge of the planning process • review of completed specifications for a project.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG5031A Prepare a project brief. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be

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EVIDENCE GUIDE	
	combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate personnel may include:	• planning manager • project coordinator • project manager • project supervisor.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS Communications Cabling Manual (CCM) Volume 1 • Australian building codes and regulations • Australian Standards • enterprise standards • environmental protection • fire regulations • heritage legislation • industrial relations agreements, including awards and enterprise agreements • International standards • local government

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RANGE STATEMENT	

	• manufacturer's enterprise operating policy and procedures
	• national code
	• OHS Act
	• other services and utilities codes of practice and standards:
	  • electricity
	  • gas
	  • water
	• power company requirements
	• Privacy Act
	• spectrum management authority
	• statutory requirements
	• Trade Practices Act
	• traditional land owners.

Data and documentation may include:	• design plans
	• drawings:
	  • detailed drawings
	  • schematic
	• materials and equipment:
	  • quantity
	  • size
	  • type
	• project information
	• schematic diagrams
	• tender specifications
	• text.

Resources may include:	• equipment • funds • labour • material • plant machinery • skilled support.
Current information may include:	• catalogues • industrial award and agreement documents • information sheets • manuals • price lists • technical data

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RANGE STATEMENT	
	• tender and project specifications.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG6033A Develop a project management plan

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge to develop a plan for a telecommunications project. It includes assessing project requirements and planning for all stages to completion and final documentation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff apply the knowledge and skills in this unit to switching, transmission and radio network and cable, optical fibre, radio, microwave and satellite transmission paths. Relevant job roles include provisioning of installations, maintenance, upgrades and new services.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare project management plan	1.1. Evaluate and assess ***project brief and related documents*** 1.2. Produce a ***document*** on project ***tasks and associated timelines***, including installation processes and test requirements 1.3. Assess and produce a document on ***resource requirements*** to assist allocation of appropriate resources 1.4. Produce a ***training plan*** assessing training needs and associated timelines for efficient project implementation 1.5. Determine and document ***budgetary requirements*** 1.6. Assess the roles of all identified ***parties*** associated with the project to ensure their involvement

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ELEMENT	PERFORMANCE CRITERIA
	1.7. Produce a project verification document, including monitoring and control processes and review processes such as ***quality audits*** 1.8. Consult with all relevant parties prior to finalising draft plan and make changes as appropriate
2. Develop and evaluate management plan	2.1. Produce a preliminary plan for consultation including identified ***factors*** that may impact on the realisation of the project and observance of ***relevant legislation***, ***codes***, ***regulation and standards*** 2.2. Consult with customer and clarify any amendments 2.3. Develop a final plan with recommendations
3. Finalise documentation	3.1. Produce and document a final plan to include implementation details and training needs. 3.2. Present plan to customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to compare and evaluate most effective technical solutions
- communication skills to:
  - liaise with customers to ensure requirements are known and can be met within timeframes
  - negotiate approvals and contract arrangements with suppliers and contractors
- literacy skills to interpret technical specifications and related documentation and document technical requirements and procedures
- numeracy skills to:
  - determining workforce requirements
  - calculating budget requirements and limitations
  - assessing channel capacities and overall dimensioning requirements
- organisation skills to arrange training and relevant documentation
- planning and organisation skills to:
  - set out project requirements and priorities
  - make site access and equipment delivery arrangements
- problem solving skills to account for unexpected faults or equipment

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REQUIRED SKILLS AND KNOWLEDGE
incompatibilities or logistics problems • research skills to gain and maintain relevant and current technical product knowledge
Required knowledge

• common customer telecommunications applications and related equipment
• connections to carrier infrastructure or equipment
• current legislation relating to installation of telecommunications equipment and connection to carrier services
• customer premise equipment
• leasing versus purchase options to assist in delivering cost effective solutions
• network and transmission equipment
• network topologies, interface and interconnect solutions
• occupational health and safety (OHS) requirements for:
  • electrical safety
  • materials handling
  • physical hazards:
  • confined spaces
  • heights
  • lifting
• power requirements and electrical safety
• typical performance parameters and typical faults that may be encountered in customer equipment and related connection and transmission media
• various test equipment types suitable for tests to be made
• warranty information for equipment supplies and contractor work guarantees

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare a project management plan

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EVIDENCE GUIDE	
	• develop and evaluate a project management plan.
Context of, and specific resources for assessment	Assessment must ensure: • a telecommunications operations site with relevant telecommunications technology and infrastructure • relevant databases, legislative requirements and other site and project related documentation • organisational documentation relating to equipment, warranties, leasing, contracts and audits.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking planning tasks • review of reports and plans completed by the candidate • oral or written questioning to assess knowledge of planning, types of systems and applications • a completed project plan for a telecommunications project.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL6029A Plan the development and growth of the telecommunications network • ICTPMG6034A Prepare a detailed design brief. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required

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EVIDENCE GUIDE	
	knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Project brief and related documents refer to:	• equipment and system needs:
	  • computer network equipment site evaluation, including barriers to installation
	  • switching
	  • transmission and radio network
	  • transmission paths:
	  • cable,
	  • optical fibre
	  • radio
	  • microwave
	  • satellite
	• safety aspects of building or area using available software:
	  • building and equipment hazards
	  • ceiling access
	  • construction type
	  • system design and configuration.

Document may refer to:	• activities:
	  • dependencies
	  • inspection

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RANGE STATEMENT	
	• manufacturer's technical manuals and responsibilities • requirements to ensure that installation and service activities are performed under controlled conditions • technical standards • testing and related procedures • work instructions • contingency plans to account for delays and other problems • critical paths and timelines • quality plans: • check lists • Gantt charts • software based programmes • process flow charts • tasks and overall work structure.
Tasks and associated timelines may include:	• estimating overall timeframes based on standard installation times • identifying critical paths and minimum timelines • identifying independent tasks and those that depend on others • identifying timeframes associated with each aspect of the project • initiating documentation: • sales orders • quotation forms • specification lists • making allowances for: • likely network outages and restrictions • anticipated barriers and contingency provisions for delays and problems • special award conditions: • weather allowance • site allowance • district allowance • timelines for planning approvals: • government planning bodies • local government

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RANGE STATEMENT	
	• frequency spectrum agency.

Resource requirements may include:	• locating possible resource banks
	• merits of using contract versus enterprise resources
	• material requirements including spare parts
	• identifying documentation required including:
	  • design briefs
	  • labour contracts
	  • manuals
	  • plans
	  • specifications
	• identifying systems, including communication tools
	• identifying test equipment:
	  • hand-held cable testers
	  • insulation resistance tester
	  • multimeter
	  • optical time domain reflectometer (OTDR)
	  • oscillator and probe set
	  • proprietary devices
	  • protocol analysers
	  • pulse echo tester
	  • signal generator
	  • signal level meter
	  • spectrum analyser
	  • time domain reflectometer (TDR)
	• using tendering process according to enterprise policy:
	  • by letter or through the press, contracting and subcontracting
	  • consideration of:
	  • capacity
	  • company performance
	  • delivery times
	  • performance
	  • price
	  • product type
	  • quality assurance processes
	  • quality.

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RANGE STATEMENT	

Training plans may include:	• consideration of costs
	• location of delivery
	• method
	• project and customer needs and skills gaps
	• specific resources for training
	• timeframe
	• use of:
	  • installation staff
	  • specialist trainers.

Budgetary requirements may include:	• costings with compliance and profit margin • detailed financial statement • expenditure approval procedures in line with enterprise policy • risk analysis of financial options.
Parties may include:	• contractor • customer • designers • equipment manufacturers • installers • lessee • operational staff • planners • project management • site owner • sub contractor • suppliers.
Quality audits may refer to:	• reviews of process • reviews of methodology

Factors may include:	• competencies and skills gap
	• critical paths
	• equipment and system needs
	• independent tasks and relationship
	• network outage
	• resources:
	  • tools and equipment
	  • finance
	  • manpower
	  • machinery
	  • equipment and spares

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RANGE STATEMENT	
	• safety aspects • timelines.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) technical standards • Australian building codes and regulations • Environmental Protection Act • fire regulations • heritage legislation • industrial awards and conditions • International Standards ISO 9000 and 9001 • International Telecommunications Union (ITU) recommendations • noise abatement • OHS compliance requirements which may vary in different states and countries. • Telecommunications Act and associated codes • Trade Practices legislation.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG6034A Prepare a detailed design brief

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to prepare a detailed design brief to realise a building and equipment provisioning project. The project may be a new installation, upgrade of capacity or technology for an existing network or subsystem for convergence to Next Generation Networks (NGN). Preparing the brief involves costing, vendor and technology choices, scheduling and resourcing. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit is relevant to technical managers, supervising technicians, project managers, consultants or contractors in organisations conducting network design or construction to deploy or convert to internet protocol (IP) based technologies.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate design requirements	1.1. Consult ***relevant legislation***, ***codes***, ***regulations and standards*** that impact on the project 1.2. Determine need for enhancement to new or existing ***telecommunications network*** from telecommunications project plan and associated project brief 1.3. Determine specific purpose and type of ***network growth and enhancement*** using collated ***data*** from other relevant sources 1.4. Consult customer regarding ***enterprise criteria*** and determine timeframe for design plan 1.5. Establish and organise design ***resource***

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ELEMENT	PERFORMANCE CRITERIA
	requirements
2. Evaluate information to prepare design drawings	2.1. Obtain site access through consultation with affected property owners where project impacts on private property 2.2. Collect ***field data*** and propose ways to manage physical impediments that may affect building construction work 2.3. Verify existing equipment, equipment layouts and ***building services*** to plan for network growth 2.4. Ascertain the impact of relevant ***heritage***, ***environmental and other governmental legislation*** and initiate action or organise consultative processes to gain approvals according to ***enterprise policy*** 2.5. Prepare ***design drawing*** according to enterprise requirements
3. Select design option	3.1. Analyse proposed ***network needs*** to determine a set of realistic ***design options*** 3.2. Evaluate and select preferred design option according to approved enterprise criteria and discuss selected option with customer 3.3. Assess system compatibility and make modifications to design
4. Prepare design plan	4.1. Prepare detailed design plan including relevant ***geographical and topological information***, ***equipment and material*** and cost estimates 4.2. Discuss final designs with planners and project management and obtain approval to proceed 4.3. Produce final detailed design brief with drawings, material requirements and testing and maintenance plans for operational staff to follow

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to compare and evaluate effective technical solutions of new and

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REQUIRED SKILLS AND KNOWLEDGE

emerging technologies of NGN
• communication skills to:
  • negotiate approvals and contract arrangements with suppliers and contractors
  • liaise with customers to ensure requirements are known and can be met within timeframes
• literacy skills to:
  • interpret technical specifications and related documentation
  • document technical requirements and procedures
• numeracy skills to:
  • determine workforce requirements
  • analyse and confirm capacity requirements
  • calculate budget requirements and limitations
• organisational skills to arrange relevant documentation and approvals
• planning and organisational skills to:
  • set out project requirements and priorities
  • make site access and equipment delivery arrangements
• problem solving skills to account for unexpected variations to requirements
• research skills to gain and maintain relevant and current technical product knowledge
• technical skills to plan NGNs

Required knowledge

• common customer telecommunications applications and related equipment
• connections to carrier infrastructure or equipment
• cost-effective solutions in planning
• current legislation relating to installation of telecommunications equipment and connection to carrier services
• customer premises equipment
• environmental impacts and options for green ICT installations
• network and transmission equipment
• network topologies, interface and interconnection solutions
• occupational health and safety (OHS) requirements for:
  • electrical safety
  • materials handling
  • physical hazards:
  • confined spaces
  • heights
  • lifting
• power requirements and electrical safety

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REQUIRED SKILLS AND KNOWLEDGE
• technology of NGN • test equipment types

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare a design brief for building and equipment design provisioning • analyse network and enterprise needs to determine design options • prepare detailed design documentation to enable realisation of design.
Context of and specific resources for assessment	Assessment must ensure: • sites on which projects may be designed • relevant databases, legislative requirements and other site and project related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking design tasks • review of drawings, plans and specifications prepared by the candidate • oral or written questioning to assess knowledge of the design process • a completed design brief for a project.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG6033A Develop a project management plan.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) technical standards • Australian building codes and regulations • environmental protection • fire regulations

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RANGE STATEMENT	
	• heritage legislation • industrial relations awards and agreements • International Standards ISO 9000 and 9001 • International Telecommunications Union (ITU) recommendations • local government • OHS • Privacy Act • Spectrum Management Authority • Telecommunications Act and Telecommunications National Codes.

Telecommunications network may include:	• NGN delivery:
	  • broadband access
	  • data transfer
	  • internet protocol TV (IPTV)
	  • mobile data
	  • mobile telephony
	  • multimedia
	  • video
	  • voice over IP (VoIP)
	• radio:
	  • fixed
	  • mobile
	• satellite
	• switching
	• transmission
	• video.

Network growth and enhancement may refer to:	• access
	• broadband
	• IP
	• radio:
	  • fixed
	  • mobile
	• satellite
	• switch
	• transmission path.

Data may include:	• abutting enterprise development plans • enterprise databases • existing enterprise cable designs and plans

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RANGE STATEMENT	
	• interviews with field-based colleagues and organisations.
Enterprise criteria may include:	• enterprise business strategy outcomes • enterprise service policy • information systems • planned project outcomes.
Resource requirements may include:	• design personnel • finance • material • tools • vehicles.
Field data may include:	• building inspections • inspection • maps • plans • site surveys.
Building services may include:	• air conditioning • cable access • earthing • lighting • power • racking.
Heritage, ***environmental and other governmental legislation*** may require contact with:	• federal agencies • local councils • local residents • other service providers • property owners • state agencies.
Enterprise policy may include:	• cost • customer demand • equipment and system upgrades • future maintenance • modification • resource requirements • time.
Design drawing may include:	• existing and proposed layout • facilities route • physical placement of equipment.

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RANGE STATEMENT	
Network needs may include:	• conditions and planned needs • existing network • heeding legislative and other barriers.
Design options may relate to:	• customer service • economics • equipment • labour • material • network integrity • preferred technologies • time • timing.

Geographical and topological information may include:	• access
	• dams
	• fences
	• hazards
	• location of:
	  • other services
	  • plant
	• potential hazards
	• potential soil erosion areas
	• survey marks.

Equipment and material	• antenna
	• cable support materials
	• cabling and terminating equipment and tools
	• ducting
	• frame and superstructure equipment
	• hand and power tools
	• mechanical aids
	• power:
	  • cables
	  • connectors
	• racking
	• radio equipment
	• structure
	• switching and transmission gear
	• test equipment
	• tower
	• wave guide.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG7145B Undertake a telecommunications project

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor changes to several performance criteria. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to undertake a telecommunications project. It requires research and planning to cover an extensive range of complexities and technologies.

Application of the Unit

Telecommunications technical staff apply the skills and knowledge in this unit to undertake complex projects requiring high levels of planning and management.

Their job roles combine technical and occupational health and safety (OHS) skills to perform project work using emerging and converging technologies within the ICT industry.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for a telecommunications project	1.1 Obtain project plan from ***authorised personnel*** to identify the ***nature of the project*** and ***project specifications***
	1.2 Verify location of proposed project work according to the appropriate plans
	1.3 Analyse project specifications and research emerging telecommunications technology that may benefit the project
	1.4 Consult authorised personnel to finalise the project specifications and obtain agreement
	1.5 Source and work with allocated ***project resources*** as required, including those for safe work practices
	1.6 Prepare contingency plans, including any risks that could impact on the project
	1.7 Develop implementation plan for ICT products and solutions according to ***standards*** with minimal workplace disruption and obtain agreement from authorised personnel
	1.8 Notify authorised personnel of possible network outage where required
2. Carry out the telecommunications project work	2.1 Follow ***OHS and environmental requirements*** according to plan and manufacturer specifications
	2.2 Inform appropriate personnel of existing and potential

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	hazards on work site 2.3 Perform project work phases according to agreed plan and accepted work practice 2.4 Implement project planning ***principles***, including risks that may impact on the project 2.5 Monitor the project to completion to ensure that it is progressing according to plan and risks are minimised 2.6 Report on the implementation phases
3. Clean up work site and complete documentation	3.1 Remove and dispose of project waste and debris from work site according to environmental requirements as required 3.2 Restore changes made to the work area to the customer's satisfaction as required 3.3 Complete all project documents and present to the customer 3.4 Declare asset ready for commissioning and integration if required 3.5 Notify the customer and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate risks and new technologies
- communication skills to work effectively in a group, present information and negotiate project implementation issues
- information technology skills for word processing and desktop research
- literacy skills to prepare reports and document work
- numeracy skills to carry out telecommunications work
- problem-solving skills to anticipate and respond to issues in project progress
- research skills to gather data, observe and analyse project issues.
-

Required knowledge

- organisational project management policy and procedures

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- operation of transmitters and receivers
- safety management:
  - personal protective equipment conforming to industry and OHS standards
  - precautions required to minimise, control or eliminate hazards that may exist during work activities
  - relevant legislation, codes, regulations and standards
- telecommunications system principles and operational procedures
- workplace and industry environment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • research and report on emerging technology for a telecommunications project • prepare an implementation plan with contingency plan and risk analysis • conduct and monitor telecommunications project work.
Context of and specific resources for assessment	Assessment must ensure: • a telecommunications operations site on which a project can be carried out • computers and relevant computer software • relevant legislation, codes, regulations and standards.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out project work • oral or written questioning to assess required knowledge and skills • review of reports and implementation plans prepared by the

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	candidate for telecommunications projects.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN7182B Produce a radio link budget • ICTTEN7193B Plan a transmission network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Authorised personnel may include:	• consultant • contractor

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	• network administrator • project manager.

Nature of the project may refer to:	• equipment type:
	  • computing
	  • networking
	  • optical
	  • radio
	  • switching
	  • transmission
	• functional type:
	  • building and construction
	  • cabling
	  • customer project
	  • network
	  • planning
	  • service provider project
	  • services
	• operational type:
	  • service provisioning
	  • switching
	  • transmission
	• project type:
	  • installation upgrade
	  • maintenance
	  • new installation.

Project specifications may include:	• budget • outage requirements • preferred vendor and vendor product • project plan • service level agreements • specific customer requirements • timelines • urgency.

Project resources may include:	• documentation:
	  • installation manuals
	  • manufacturer’s instructions
	  • testing procedures
	  • vendor recommendations
	• funding
	• labour

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	• major equipment and materials:
	  • building provisioning
	  • computer networking equipment
	  • power management
	  • radio and optical equipment
	  • safety equipment and personal protective equipment
	  • switching and transmission
	• test equipment:
	  • communication system analysers
	  • digital analysers
	  • local area network (LAN) Cat tester
	  • laptop computer
	  • optical testers
	  • optical time domain reflectometer (OTDR)
	  • protocol analysers
	  • radio frequency (RF) test sets
	  • spectrum analysers
	• time
	• tools:
	  • anti-static testers
	  • hand
	  • power
	  • soldering irons.

Standards may include:	• Australian Communications and Media Authority (ACMA) regulations relating to functional earthing • ACMA Standards TS 14 • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian Communications Industry Forum (ACIF) standards and codes • Australian standards applying to radiation hazards • AS 3901 and AS 3902 • cabling security codes and regulations

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	• Environment Protection Acts • heritage legislation • International Telecommunication Union (ITU) recommendations • OHS Acts and relevant codes and standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

OHS and environmental requirements may refer to:	• identifying other services, including power and gas
	• need to decommission and isolate work site and lines before beginning work
	• personal protective equipment:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• safe working, practices such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection

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	• stormwater protection • waste management.
Hazards may include:	• optical cable • building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural and other gas build-up • needle stick injury • RF equipment emitting radiation • remote power feeding services • vermin.
Principles may include:	• best practice • budget control • business continuity • complete and review • return on investment • service level agreements • waste minimisation.

Unit Sector(s)

Telecommunications - Project management

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ICTPMG8142A Manage a telecommunications workplace

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to fulfil workplace management responsibilities at a managerial and supervisory level in a telecommunications business environment. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Telecommunications engineering staff with management responsibilities apply the skills and knowledge in this unit. They combine technical skills with management skills to manage technical staff in an advanced technological environment.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Support human resources activities	1.1. Assist and advise on recruitment action and induction of new staff 1.2. Monitor staff training needs and implement technical training activities for staff 1.3. Provide information and advice to ***relevant personnel*** 1.4. Review and advise on occupational health and safety (OHS) and security in the workplace
2. Manage conflict in the workplace	2.1. Assess conflict situation 2.2. Determine ways to resolve conflict with conflicting parties 2.3. Apply ***decision-making procedures*** to the business model for conflict resolution
3. Apply quality management systems	3.1. Determine essential requirements of a product using a quality management approach

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ELEMENT	PERFORMANCE CRITERIA
and processes in the workplace	3.2. Assess the relationship between ***customer and owner*** to identify process to achieve agreement on measurable quality features 3.3. Analyse quality investigation for improvement by involving individuals, groups and managers
4. Monitor work practices to ensure business objectives will be met	4.1. Develop strategies using ***management characteristics*** to meet business objectives 4.2. Analyse individual management objectives that would be applicable to the workplace 4.3. Produce a business model representing the activities of a sound management plan for a telecommunications workplace
5. Determine human factors when managing people and groups	5.1. Establish consultation processes between management and staff to resolve grievances 5.2. Analyse the interpersonal skills required of managers and team leaders using identified ***communications channels*** 5.3. Conduct discipline and performance feedback in the workplace to evaluate consultation processes, including principles of equal employment opportunity (EEO), cultural diversity and change management
6. Perform work using self-organisation principles	6.1. Evaluate methods of improving own productivity and perform a self-appraisal 6.2. Evaluate the effectiveness of ***information processing*** methods used in the workplace applying time management techniques 6.3. Produce a report to communicate information efficiently and effectively in the workplace
7. Apply effective communication techniques to business meetings	7.1. Research the levels, directions and effectiveness of ***channels*** used when communicating in business 7.2. Develop a plan for managing business meetings in the workplace

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE
Required skills

• analytical skills to evaluate information
• communication skills to:
  • work effectively in a group
  • conduct oral presentations to a group
• conflict management skills to deal with grievances, disputes or disagreements
• information technology skills for word processing and desktop research
• initiative and enterprise skills to identify improvements to quality
• literacy skills to prepare reports
• planning and organisational skills to plan, prioritise and organise own work
• problem solving skills to resolve issues in the workplace
• research skills to gather data and information

Required knowledge

• equity and diversity principles
• management procedures and policies
• OHS requirements
• organisational policy and procedures
• overview knowledge of behaviour theories:
  • Herzberg's two factor
  • McClelland's acquired needs
  • Vroom's expectancy
• personal safety issues
• public sector legislation, codes of practice and other formal agreements that directly impact on business operations
• technical knowledge of telecommunications networks
• workplace and industry environment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine the human factors which need to be analysed when managing people and groups • conduct business meetings applying effective communication techniques • determine essential requirements of a product applying quality management principles • monitor and implement training for staff • resolve problems and conflicts in a business environment • support human resource management program.
Context of and specific resources for assessment	Assessment must ensure: • a telecommunications workplace • relevant enterprise documentation, including human resources (HR) and quality management policies.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate running a productive business meeting and effective interview techniques • oral or written questioning to assess the required knowledge and skills • review of quality reports prepared by the candidate • evidence of consultations with staff and management.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTPMG8143A Manage a telecommunications project. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally

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EVIDENCE GUIDE	
	appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant personnel may include:	• colleagues • employee groups • managers • OHS committees and other people with specialist responsibilities • employees • specialist resource managers • supervisors • unions.
Decision-making procedures may include:	• objectivity • qualitative • quantitative • subjectivity.

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RANGE STATEMENT	

Customer and owner may include:	• customer:
	  • external
	  • internal
	• owner:
	  • management
	  • shareholders.

Management characteristics may include:	• authority • coaching • consultation • control • delegation • duties • management hierarchy • mentoring • ownership • partnership • responsibility • skilling and training.
Communications channels may include:	• industrial relations • internal • pro-active • public relations • retro-active.
Information processing may include:	• classification • flagging • follow-up • procedures • storage.

Channels may refer to:	• oral
	• non-verbal
	• written:
	  • agendas
	  • minutes
	  • memos
	  • letters and faxes
	• visual
	• electronic:
	  • email
	  • web notifications

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RANGE STATEMENT	
	• social networking.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Project management

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ICTPMG8143B Manage a telecommunications project

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to produce a plan and manage a telecommunications project using project management processes.

Application of the Unit

Telecommunication systems managers apply the skills and knowledge in this unit to implement specified projects that may be for an installation or upgrade of the telecommunications network.

Their job roles include producing plans for projects, developing risk management strategies, preparing budgets, planning for contingencies, developing procedures for commissioning the project and archiving project documentation.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to manage a project	1.1 Develop a project proposal, including specific ***project management processes***
	1.2 Determine the role of major stakeholders and implications for the project
	1.3 Develop a risk management strategy and present to stakeholders for agreement
	1.4 Check for technical compliance of project with relevant standards
	1.5 Select project management computer software
	1.6 Conduct a skills audit of personnel and identify additional training requirements
2. Apply project management processes	2.1 Determine participants' responsibilities using critical path method (CPM) to draw a network diagram
	2.2 Sequence and coordinate ***activities*** required for a specific project
	2.3 Determine the critical path to optimise timing of the project deliverables
	2.4 Assess the viability of project estimates by preparing a budget
	2.5 Perform risk analysis to determine factors that may hinder the project deliverables
	2.6 Assess the progress of the project with ***contingencies*** to

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	manage risks 2.7 Determine any updates and recommendations in agreement with the customer 2.8 Prepare contract variations if required
3. Complete work and document activities	3.1 Select procedures for commissioning if required and finish the project 3.2 Produce final documentation with recommendations and present to customer 3.3 Document and archive project documentation 3.4 Obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate risks
- communication skills to work effectively in a group, present information and negotiate contract variations
- information technology skills for word processing, desktop research and using project management software
- literacy skills to prepare reports and contract variations
- numeracy skills to:
  - calculate budget requirements
  - determine workforce requirements
- problem solving skills to anticipate and respond to issues in project progress
- research skills to gather data, observe and analyse project issues.
-

Required knowledge

- organisational project management policy and procedures
- safety management:
  - personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - precautions required to minimise, control or eliminate hazards that may exist during work activities

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  - relevant legislation, codes, regulations and standards
- workplace and industry environment:
  - commissioning procedures
  - industrial issues
  - roles and responsibilities
  - skills audit
- telecommunication communication systems
- site engineering
- project management processes and software.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare and apply project management process to a telecommunications project using project management software • develop a plan to manage a telecommunication project with a risk management strategy, budget and contingencies • complete work and project documentation.
Context of and specific resources for assessment	Assessment must ensure: • a telecommunications site on which projects can be managed • computers and relevant computer software • relevant legislation, codes, regulations and standards.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning to assess knowledge and skills in the project management process • direct observation of the candidate performing project

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	management tasks • review of the candidate generated project documentation.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG8142A Manage telecommunications workplace • ICTPMG7145B Undertake a telecommunications project • ICTPMG8149B Evaluate and use telecommunications management networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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Project management processes may include:	• calendaring • constraints • contingencies • CPM • critical paths • Gantt chart • PERT • project variables • reviews • salvage value • variations.
Activities may include:	• contracts and procurement • cost management • human resource (HR) management • project communications methods • project tracking • quality • risk • scope • time management.
Contingencies may include:	• increase staff numbers • reinstallation • replacement components • work amendments.

Unit Sector(s)

Telecommunications - Project management

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ICTPMG8149B Evaluate and use telecommunications management networks

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor changes to unit descriptor, application and two performance criteria. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to analyse, evaluate and monitor business performance using appropriate network diagnostic models and tools in the management of open systems in IT/ICT communications networks.

Application of the Unit

Network, IT and engineering staff who analyse and monitor performance of telecommunications network apply the skills and knowledge in this unit.

Relevant job roles include managing and monitoring operational communications networks, such as asynchronous transfer mode (ATM), cellular networks, telephone exchanges and computer clusters.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to evaluate and use telecommunications management network	1.1 Research and evaluate network management architectures in common carrier and extended models 1.2 Evaluate features and functionality of the Standards Committee International Telecommunications Union (ITU-T) TMN architecture and network models 1.3 Research and evaluate techniques for collecting management information from network nodes using interrupts and polling 1.4 Analyse configuration management problems and produce an assessment report on solutions by integrated network management systems
2. Analyse fault management and accountability procedures	2.1 Evaluate effectiveness of fault management processes from beginning to resolution, including automation of fault management 2.2 Analyse reasons for alarm correlation with process analysis and apply ***fault identification*** to network problems
3. Plan for reliability and survivability	3.1 Research and produce a report on quality of service (QoS) in a telecommunications context, including relevant international standards and range and type of possible

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	monitoring parameters for a QoS 3.2 Analyse reasons for service levels in a telecommunications context 3.3 Perform linear and exponential trend analysis on real or simulated data for a single ***monitoring parameter*** 3.4 Research and assess reliability and survivability in a telecommunications context with reference to disaster and security management policies and procedures 3.5 Develop a disaster recovery plan for a telecommunications network
4. Research and report network management techniques	4.1 Research how accounting records are generated and used for both voice and data networks 4.2 Analyse the process of generating bills from accounting records, configuration and customer information as appropriate 4.3 Research and report on network management ***techniques and standards*** used for the IT/ICT systems and networks 4.4 Research and report on standards used in the simple network management protocol (SNMP) network management model and the global system for mobiles (GSM) network 4.5 Analyse network management functions over a CNET network simulation or similar data network and produce a report on the findings

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate a range of complex technical data
- communication skills to work effectively within a group and present information
- information technology skills for word processing, using statistical data and desktop research
- literacy skills to prepare reports and read and interpret technical standards
- planning and organising skills to manage own work in short timeframes
- research skills to gather data and information
- technical skills to use telecommunications management networks.
-

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Required knowledge

- administrative network management systems
- business model
- business processes
- enterprise solutions
- operations network management systems
- organisational policy and procedures
- workplace and industry environment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• research and evaluate the architectural features and functions of network management systems
	• research and report:
	  • major features, configuration and functions of management systems
	  • on fault management and accountability procedures
	  • major features and functions of QoS agreements
	  • on network management techniques
	• analyse the major features of planning for reliability and survivability.

Context of and specific resources for assessment	Assessment must ensure: • a telecommunications operations site with a network management system • networked computers with relevant software.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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	• oral or written questioning to assess knowledge of network management • direct observation of the candidate performing network management functions within a telecommunication system • review of research reports prepared by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTRFN8180B Analyse a cellular mobile network system • ICTTEN8194A Investigate the application of cloud networks in telecommunications switching. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Fault identification may include:	• congestion • major alarm • minor alarm • out of service • outage • trouble ticket.
Monitoring parameter may include:	• grade of service • bit errors • block errors.
Techniques and standards may include:	• ATM1 • integrated services digital network (ISDN) • synchronous digital hierarchy(SDH)/synchronous optical network (SONET).

Unit Sector(s)

Telecommunications - Project management

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ICTPRO5026A Develop training, marketing and sales resources for telecommunications products

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop documentation and training material providing product-specific technical information to clients within an organisation. The training resources are likely to be for new products using emerging technologies supplied by the service provider. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Staff with high level communication skills who are involved in sales and marketing of new and emerging technologies of Next Generation Networks (NGN) apply the skills and knowledge in this unit. They may be technical or semi-technical staff with responsibilities for professional development on product-specific material. They develop product technical information resources, including web resources for use by technical, sales and training personnel.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare information and formats for training, marketing and sales resources	1.1. Identify ***target audience***, product type, ***resources*** type, format and purpose to be developed 1.2. Locate enterprise resources relating to ***telecommunications product information and technical data*** suitable for training such as marketing and sales materials, manufacturer's documentation and sites for suitable resources 1.3. Research a range of formats for the resources and

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ELEMENT	PERFORMANCE CRITERIA
	materials to meet requirements of the identified audience 1.4. Determine specifications for the resource material and confirm with customer for approval
2. Develop resources and obtain approvals	2.1. Produce draft training, marketing and sales resources in consultation with relevant ***user groups*** and ***training resource designers*** 2.2. Check that resources are for the latest product available for sales and marketing 2.3. Produce clear and accurate training manuals and user guides for consultation 2.4. Confirm accuracy of information with ***appropriate technical staff*** prior to publication or production and obtain approvals
3. Monitor distribution and maintenance of resources	3.1. Develop schedule for distribution of resources consistent with product or facility release and list of users 3.2. Seek feedback on the content and presentation from users and make improvements as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to determine enterprise information requirements
• communication skills to:
  • explain product information
  • liaise with others to determine needs
• interpersonal skills to relate to customers and other members of staff
• literacy skills to:
  • develop written technical information resources
  • interpret technical specifications and related documentation
• PC skills to collate and present information
• planning and organisational skills to:
  • plan project requirements and priorities

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REQUIRED SKILLS AND KNOWLEDGE
• prepare for distribution of product technical information for technical, sales and training staff • research skills to gain and maintain relevant and current technical knowledge
Required knowledge
• common customer telecommunications applications and related equipment • occupational health and safety (OHS) and regulatory requirements • specific product knowledge and reference documents relevant to products • technical terminology • training resource development

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • interpret and use equipment and system manuals, specifications, relevant enterprise policy and documentation • develop training resources for different knowledge and skill levels • evaluate web-based training resources • implement improvements based on feedback • provide a range of resource types, including print based and web-based.
Context of, and specific resources for assessment	Assessment must ensure: • workplace where technical information may be developed and distributed to technical, sales and training staff • relevant product technical information, databases, legislative requirements and other site and project related documentation.

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EVIDENCE GUIDE	
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of resources developed in different formats by the candidate for a range of training resources • oral or written questioning to assess knowledge of the process for researching and creating training resources.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTEDU5025A Develop and deliver training associated with new or modified products. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Target audience may refer to:	• customers • marketing staff • new staff • personnel external or internal to the organisation • promotional staff • sales personnel • technical staff • trainers.

Resources may include:	• brochures
	• manuals:
	  • technical
	  • training
	• manufacturer's materials
	• product presentations
	• specific resources for disability groups
	• user guides
	• web-based training resources
	• websites.

Telecommunications product information and technical data may relate to:	• customer premises equipment (CPE) products:
	  • accessories
	  • computer equipment
	  • local or wide area network equipment
	  • mobile phones
	  • modems
	• comparison charts
	• information intended to assist sales representatives
	• installation and set-up procedures
	• launch of new product
	• network facilities and system features

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RANGE STATEMENT	

	• new vendor products and technologies
	• owner's manuals
	• peripherals
	• product database:
	  • model numbers
	  • recalls
	  • serial numbers
	  • upgrades
	  • variants.

User groups may be:	• human resources section • marketing and sales section • section or project managers • supervisors • training or staff development officers.
Training resource designers may be:	• brochure designer • contracted • in-house • manual designer • web designer.
Appropriate technical staff may include:	• equipment supplier • technical designers • technical staff responsible for providing product information and technical data • vendor technical expert.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Product skills and advice

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ICTRFN2163B Install a satellite antenna

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install and test satellite antenna equipment on dwellings, buildings, masts and other structures, or at ground level to receive signals from geostationary communications satellites.

Application of the Unit

Technical staff who install or replace satellite antennas on single and multiple dwellings, commercial buildings, telecommunications structures and at ground level apply the skills and knowledge in this unit.

Installations may be new or existing, standalone or part of a site with multiple antennas.

Licensing/Regulatory Information

Depending on the particular installation, organisational requirements and state or territory legislation, specific licences may be required in areas such as:

- working on roofs
- working at heights
- structure climbing
- tower rescue

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- hoisting and mounting antennas
- installing feedlines
- electromagnetic energy (EME) awareness.

Users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for work on a satellite antenna	1.1 Prepare for installation applying all ***relevant legislation***, ***codes, regulations and standards*** and identify any ***safety issues***
	1.2 Organise resources to be available on site
	1.3 Notify customer to arrange access to the site and possible outage
	1.4 Organise ***tools and equipment*** and ensure they are in safe working order and adjusted to manufacturer's specifications
	1.5 Obtain ***details of satellite*** to be acquired and precise details of ***satellite antenna location***
	1.6 Determine the ***look angles*** for the satellite receiving antenna
	1.7 Determine polarisation angle of the satellite receiving

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	antenna feedhorn 1.8 Determine ***suitable position*** to mount the antenna with agreement from customer
2. Assemble and mount satellite antenna and cables	2.1 Assemble satellite antenna on site according to plans, specifications and enterprise guidelines using safe industry practices 2.2 Connect ***coaxial cable*** to antenna and install lightning protection devices 2.3 Mount satellite antenna onto installed mounting arrangements and set ***initial antenna azimuth, elevation and polarisation***
3. Test and align antenna system	3.1 Connect installed antenna system to satellite receiver or ***test equipment*** and make final adjustments to azimuth, elevation and polarisation to ***optimise the signal*** level and quality 3.2 Conduct ***performance tests*** according to manufacturer's specifications and enterprise guidelines 3.3 Interpret test results and compare with manufacturer's design specifications and make adjustments
4. Complete administrative duties	4.1 Record test results and complete appropriate records 4.2 Secure and clean up site to original condition in an environmentally safe manner 4.3 Notify customer of work completion and obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customer on operational and site matters
- literacy skills to interpret technical documentation, including antenna specifications and test equipment manuals
- numeracy skills to:
  - determine look angles from charts or by calculation
  - evaluate different types of technical data
  - interpret results
  - take radio frequency (RF) measurements

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- planning and organisation skills to arrange site access
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - assemble antenna according to plans
  - physically align antenna
  - strip, prepare and terminate single, dual, triple and quad shield coaxial cable
  - use hand and power tools and operate test equipment
  - use multimeter to test coaxial cable
  - use signal level meter or spectrum analyser.
  -

Required knowledge

- antenna:
  - directivity
  - front to back ratio
  - operation of parabolic reflector and feedhorn
  - optimum placement
  - pattern
  - polarisation
- bit error ratio (BER)
- coaxial cable types and properties
- electromagnetic waves:
  - absorption by trees and buildings
  - awareness of exposure to electromagnetic radiation (EMR)
  - reflection
- legislation, codes of practice and other formal agreements that directly impact on antenna installation
- modulation:
  - bandwidth
  - individual spectrum shape of digital satellite television signals
- modulation error ratio (MER)
- RF spectrum:
  - terminology related to bands used for satellite broadcasting: (C, S, L, Ku, Ka bands)
- satellite antenna product knowledge

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- signal level expressed in dBuV units
- specific OHS requirements that impact on the installation of satellite antenna equipment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • assemble, install, align and test a satellite antenna according to plans and specifications, and site specific safety requirements • conduct performance tests according to manufacturer's specifications and enterprise guidelines.
Context of and specific resources for assessment	Assessment must ensure: • suitable site for satellite antenna installation • range of antennas and cables currently used in industry • range of general and test equipment required for satellite antenna installation and testing.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing a satellite receiving antenna given the satellite details and the satellite antenna coordinates • direct observation of the candidate preparing, securing and connecting a cable to the satellite antenna • direct observation of appropriate signal performance measurement and adjustment of azimuth, elevation and polarisation alignment • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

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	• ICTRFN2164B Install a terrestrial antenna • ICTDRE3156B Install digital reception equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS Communications Cabling Manual (CCM) Volume 1 • Australian building codes and regulations

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	• AS/NZS 1367:2007
	• AS/NZS 1768:2007
	• AS 1417.1:1987
	• enterprise standards
	• environmental protection
	• fire regulations
	• heritage legislation
	• industrial relations agreements including awards and enterprise agreements
	• international standards
	• local government
	• manufacturer's enterprise operating policy and procedures
	• national code
	• OHS Act
	• other services and utilities codes of practice and standards:
	  • electricity
	  • gas
	  • water
	• power company requirements
	• Privacy Act
	• Spectrum Management Authority
	• statutory requirements
	• Trade Practices Act
	• traditional land owners.

Safety issues may refer to:	• devices to support construction personnel at heights:
	  • elevated personnel vehicles
	  • non-metallic ladders
	  • platforms
	• external factors affecting works:
	  • concentration of other services
	  • terrain
	  • weather conditions
	• precautions for unsafe weather conditions to undertake works:
	  • heavy rains
	  • high winds
	  • severe cold
	  • severe heat
	  • thunderstorms
	• preparing for work at a telecommunications site with potential EMR hazards

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	• safety issues in:
	  • fall arrest
	  • fall guarding
	  • roof work.

Tools and equipment may include:	• fall arrest systems required on structure where no ladder cages installed
	• general equipment:
	  • elevated platform
	  • hand and power tools
	  • ladder
	  • winch
	• magnetic compass
	• personal protective equipment:
	  • earmuffs
	  • eye protection
	  • dust protection
	  • gloves
	  • hard hats
	  • personal reflecting jackets
	  • safety boots
	• safety equipment:
	  • aerial safety belts and lines
	  • helmets
	  • safety cages
	  • traffic signs
	  • warning signs and tapes
	  • witches hats.

Details of satellite may include:	• horizontally polarised transponders:
	  • forward correction error (FEC)
	  • frequency
	  • symbol rate
	• satellite longitude
	• satellite name
	• vertically polarised transponders:
	  • FEC
	  • frequency
	  • symbol rate.

Satellite antenna location may include:	• latitude • longitude.

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Look angles may refer to:	• azimuth angle relative to north • elevation angle relative to horizontal.
Suitable position may include:	• consideration of future building additions • consideration of growth of trees • ground level • outside wall of building • rooftop • unobstructed view in direction of satellite.
Coaxial cable may include:	• coaxial cable with flooded polyethylene (PE) jacket for underground applications • RG11 quad shielded • RG6 quad shielded.
Initial antenna azimuth, elevation and polarisation may be set according to:	• calibrated markings on antenna mount • inclinometer • magnetic compass • plumb bob.
Test equipment may include:	• field strength meter • multimeter • satellite meter • signal level meter • spectrum analyser.
Optimise the signal may refer to:	• achieving uniform performance across multiple transponders • BER pre FEC • carrier to noise ratio (C/N) • MER • signal strength in dBuV.
Performance tests may include:	• signal quality across all satellite digital channels • signal strength of satellite digital television channels.

Unit Sector(s)

Telecommunications - Radio frequency networks

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ICTRFN2164B Install a terrestrial antenna

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install and test receiving antenna equipment on dwellings, buildings, masts and other structures to receive terrestrial signals.

Application of the Unit

Technical staff who install or replace receiving antennas on single and multiple dwellings, commercial buildings and telecommunications structures apply the skills and knowledge in this unit.

This unit may apply to installations for digital radio and digital TV reception applications. Installations may be new or existing, standalone or part of a site with multiple antennas.

Licensing/Regulatory Information

Depending on the particular installation, organisational requirements, and state or territory legislation, specific licences may be required in areas, such as:

- working on roofs
- working at heights
- structure climbing

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- tower rescue
- hoisting and mounting antennas
- installing feedlines
- electromagnetic energy (EME) awareness.

Users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for work on a terrestrial antenna	1.1 Prepare for installation applying all ***relevant legislation***, ***codes, regulations and standards*** and identify any ***safety issues***
	1.2 Organise resources to be available on site
	1.3 Notify customer to arrange access to the site and possible outage
	1.4 Organise ***tools and equipment*** and ensure they are in safe working order and adjusted to manufacturer's specifications
2. Assemble and mount antenna and coaxial cable	2.1 Assemble antenna on site according to plans, specifications and enterprise guidelines using safe industry practice
	2.2 Connect ***coaxial cable*** to antenna and install lightning protection devices

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	2.3 Mount antenna to structure and set ***polarisation*** and ***initial antenna azimuth and elevation***
3. Test and align antenna system	3.1 Connect installed antenna system to appropriate ***test equipment*** and pan antenna to ***optimise the signal*** across all specified channel frequencies 3.2 Conduct ***performance tests*** according to manufacturer's specifications and enterprise guidelines 3.3 Interpret test results and compare with manufacturer's design specifications and make adjustments
4. Complete administrative duties	4.1 Record test results and complete appropriate records 4.2 Secure and clean up site to original condition in an environmentally safe manner 4.3 Notify customer of work completion and obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customer on operational and site matters
- literacy skills to interpret technical documentation, including antenna specifications and test equipment manuals
- numeracy skills to:
  - evaluate different types of technical data
  - interpret results
  - take radio frequency (RF) measurements
- planning and organisation skills to arrange site access
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - assemble antenna according to plans
  - physically align antenna

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- strip, prepare and terminate single, dual, triple and quad shield coaxial cable
- use hand and power tools and operate test equipment
- use multimeter to test coaxial cable
- use signal level meter or spectrum analyser.
-

Required knowledge

- antenna:
  - directivity
  - front to back ratio
  - optimum placement
  - pattern
  - polarisation
- bit error ratio (BER)
- coaxial cable types and properties
- electromagnetic waves:
  - absorption by trees and buildings
  - awareness of exposure to electromagnetic radiation (EMR)
  - reflection
- legislation, codes of practice and other formal agreements that directly impact on antenna installation
- modulation:
  - bandwidth
  - individual spectrum shape of analog and digital television signals and DAB+ digital radio signals
- modulation error ratio (MER)
- RF spectrum:
  - Australian DAB+ digital radio channel frequencies
  - Australian television UHF and VHF channel plan (digital and analog)
  - terminology related to bands used for broadcasting (Bands I , II, III, IV and V)
- signal level expressed in dBuV units
- specific OHS requirements that impact on the installation of terrestrial antenna equipment
- television antenna product knowledge.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • assemble, install, align and test a terrestrial antenna according to plans and specifications, and site specific safety requirements • conduct performance tests according to manufacturer's specifications and enterprise guidelines.
Context of and specific resources for assessment	Assessment must ensure: • site for antenna installation • range of antennas and coaxial cables currently used in industry • range of general and test equipment required for antenna installation and testing.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing a directional receiving antenna with a given direction of polarisation • direct observation of the candidate preparing, securing and connecting a coaxial cable to the antenna • direct observation of appropriate signal performance measurement and adjustment of azimuth alignment • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN2163B Install a satellite antenna • ICTDRE3156B Install digital reception equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS Communications Cabling Manual (CCM) Volume 1 • Australian building codes and regulations • AS/NZS 1367:2007 • AS/NZS 1768:2007 • AS 1417.1:1987 • enterprise standards • environmental protection • fire regulations • heritage legislation • industrial relations agreements including awards and enterprise • international standards

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	• local government
	• manufacturer's enterprise operating policy and procedures
	• national code
	• OHS Act
	• other services and utilities codes of practice and standards:
	  • electricity
	  • gas
	  • water
	• power company requirements
	• Privacy Act
	• spectrum management authority
	• statutory requirements
	• Trade Practices Act
	• traditional land owners.

Safety issues may refer to:	• devices to support construction personnel at heights:
	  • elevated personnel vehicles
	  • non-metallic ladders
	  • platforms
	• external factors affecting works:
	  • concentration of other services
	  • terrain
	  • weather conditions
	• precautions for unsafe weather conditions to undertake works:
	  • heavy rains
	  • high winds
	  • severe cold
	  • severe heat
	  • thunderstorms
	• preparing for work at a telecommunications site with potential EMR hazards
	• safety issues in:
	  • fall arrest
	  • fall guarding
	  • roof work
	• working safely on telecommunications radio structures.

Tools and equipment may include:	• fall arrest systems required on structure where no ladder cages installed • general equipment: • elevated platform

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	• hand and power tools • ladder • winch • magnetic compass • personal protective equipment: • earmuffs • eye protection • dust protection • gloves • hard hats • personal reflecting jackets • safety boots • safety equipment: • aerial safety belts and lines • helmets • safety cages • traffic signs • warning signs and tapes • witches hats.
Coaxial cable may include:	• coaxial cable with flooded polyethylene (PE) jacket for underground applications • RG11 quad shielded coaxial cable • RG6 quad shielded coaxial cable.
Polarisation may include:	• circular • horizontal • vertical.
Initial antenna azimuth and elevation may be set according to:	• best estimate of transmitter direction • compass bearing provided by plans • portable measuring instrument.
Test equipment may include:	• antenna analyser • digital video broadcasting – Terrestrial (DVB-T) digital terrestrial meter • field strength meter • multimeter • signal level meter • spectrum analyser.
Optimise the signal may refer to:	• achieving uniform performance across multiple channels • carrier to noise ratio (C/N) • BER pre forward error correction (FEC) • MER

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	• signal strength in dBuV.
Performance tests may include:	• signal quality across all terrestrial digital channels • signal strength of analog television channels • signal strength of digital television channels.

Unit Sector(s)

Telecommunications - Radio frequency networks

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ICTRFN3055A Install a radio communications antenna and feedline

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and test a communications antenna and feedline on a range of fixed or mobile structures. Depending on the particular installation, organisational requirements, and state or territory legislation, specific licences may be required in areas, such as: • working at heights • structure climbing • tower rescue • hoisting and mounting antennas • installing feedlines • electromagnetic energy (EME) awareness. Users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Telecommunications and radio communications technicians apply the skills and knowledge in this unit on installations for cellular, radio broadband and digital TV reception applications. Installations may be new or existing, standalone or part of a site with multiple antennas.

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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan the assembly of an antenna system	1.1. Arrange access to the site according to required procedure 1.2. Apply all relevant ***legislation***, ***codes***, ***regulations and standards*** in the planning process 1.3. Obtain relevant antenna specifications ,requirements and ***radio communication site management book*** (***RCSMB***) from ***appropriate personnel*** 1.4. Organise appropriate installation personnel to be

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ELEMENT	PERFORMANCE CRITERIA
	available on site 1.5. Assess relevant hazard levels from RCSMB and take appropriate preventative action according to prescribed safety requirements 1.6. Identify ***other antennas*** at site location and notify those who may be affected by outages 1.7. Inspect the ***antenna system*** and ***feedline*** for physical damage before any further work is performed 1.8. Organise ***tools and equipment*** and ensure they are in safe working order and adjusted to manufacturer's specifications
2. Assemble, mount and align antenna and prepare feedline	2.1. Follow site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures 2.2. Assemble antenna system in a safe manner according to manufacturer's instructions 2.3. Mount antenna with correct azimuth and ***polarisation*** according to manufacturer's instructions and work practices 2.4. Install radome to antenna if provided 2.5. Install ***lightning protection systems*** according to plans and specifications 2.6. ***Align*** the antenna in the horizontal and vertical planes to maximise signal
3. Test antenna installation and document test results	3.1. Conduct ***performance tests*** in a safe manner according to manufacturer's specifications and instructions 3.2. Record, interpret and compare test results with manufacturer's data or the design specifications 3.3. Confirm correct overall operation of antenna system
4. Complete administrative tasks and clean up site	4.1. Complete and store appropriate records and test results according to enterprise policy 4.2. Label radio frequency (RF) transmitter equipment and feed lines according to legislation 4.3. Notify all affected by outage that normal operation can resume 4.4. Clean, pack and store all tools and test equipment and organise transport in suitable protective casing where appropriate 4.5. Restore any changes made to the worksite to the client's satisfaction and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to provide advice and guidance to others or to seek assistance
- literacy skills to read and interpret manuals, specifications, relevant enterprise policy and documentation
- negotiation skills to enable interaction with site owner and organisations or individuals who may be affected by an outage
- numeracy skills to:
  - evaluate different types of technical data
  - interpret results
  - setup and check that equipment is calibrated
  - take RF measurements
- planning and organisational skills to organise and prepare installation resources
- problem solving skills to respond to typical antenna installation challenges
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - operate a range of specialised radio communications equipment
  - perform diagnostic procedures
  - use hand and power tools

Required knowledge

- current industry practice for antenna installation including:
  - earthing
  - lightning protection
- detailed knowledge of procedures and equipment required for:
  - antenna sweep testing to measure return loss
  - measurement of distance to fault
  - measurement of feedline insertion loss
  - measurement of forward and reflected RF power
- features of instrument and equipment test methods and performance requirements
- legislation, codes of practice and other formal agreements that directly impact on operation and testing of radio communications antennas and equipment
- overview knowledge of antennas and feedlines

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REQUIRED SKILLS AND KNOWLEDGE
• RF awareness, electromagnetic radiation (EMR) standards and specific OHS requirements that impact on the use and testing of radio communications instruments and equipment • suitability of antennas to withstand extreme environments • typical issues and challenges that occur in telecommunications antenna installations

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • conduct installation of a communications antenna according to plans and specifications • assess hazard levels at an RF site and apply knowledge of safety precautions for self, fellow workers and the public at large • mount antenna, connect transmission line and physically align antenna • use appropriate test equipment to perform a return loss sweep measurement or a measurement of forward and reflected power on at least two different antenna systems.
Context of, and specific resources for assessment	Assessment must ensure: • site for antenna installation • range of antennas and feedlines currently used in industry • range of general and test equipment required for antenna installation and testing.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing a

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EVIDENCE GUIDE	
	directional communications antenna and adjusting its alignment • direct observation of the candidate preparing, securing and connecting a coaxial transmission line or waveguide to the antenna under test • review of sweep test reports completed by the candidate for two different antenna types • oral or written questioning of candidate to assess knowledge of antenna installation practices.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN3070A Install mobile telecommunication in motor vehicles. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) EMR standard • Australian building codes and regulations • Australian standards • enterprise standards • Environmental Protection Acts • equipment standards, • fire regulations • heritage legislation • international standards • intrinsically safe lightning protection • local government • OHS • Radcoms Act • site engineering standard • Telecoms Act.
Radio Communication Site Management Book (***RCSMB***) may include:	• building coverage • limited • proposed • provisional.
Appropriate personnel may include:	• construction manager • consultant • project manager • safety officer • site manager • site supervisor.
Other antennas may include:	• belonging to the same organisation • civil agencies • co-located at this site

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RANGE STATEMENT	
	• defence agencies • government agencies • operating in the same or other frequency bands • other carriers • private enterprise.
Antenna system may include:	• antenna • connector • flange • feedline.

Feedline may include:	• flexible coaxial cable
	• interconnected cable harness
	• non-pressurised coaxial lines
	• pressurised coaxial lines
	• rigid or semi-rigid coaxial line
	• waveguide:
	  • circular cross section
	  • elliptical or cross section
	  • non-pressurised types
	  • pressurised types
	  • rectangular cross section
	  • rigid or semi-rigid waveguides.

Tools and equipment may include:	• general equipment:
	  • crane
	  • elevated platform
	  • hand and power tools
	  • winch
	• test equipment:
	  • antenna analyser
	  • directional RF power meter
	  • multimeter
	  • return loss measuring equipment
	  • RF termination
	  • spectrum analyser.

Polarisation may include:	• circular polarisation • horizontal direction of electric field • vertical direction of electric field.
Lightning protection systems may include:	• air terminal or lightning rod • down conductor

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RANGE STATEMENT	
	• lightning protectors or surge arrestors.
Align may refer to:	• azimuth • elevation.

Performance tests may include:	• antenna sweep:
	  • antenna analyser
	  • return loss bridge and RF sweep generator
	  • scalar network analyser
	  • vector network analyser
	  • voltage standing wave ratio (VSWR) measurements
	• distance to fault
	• insertion loss
	• reflected power:
	  • antenna analyser
	  • directional power meter at a single frequency only
	  • return loss bridge and RF sweep generator
	  • scalar network analyser
	  • vector network analyser
	• return loss.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Radio frequency networks

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ICTRFN3070A Install mobile telecommunications in motor vehicles

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge to install radio transceivers and cellular mobile phone handsets with powered docking cradle in domestic, commercial or industrial motor vehicles. It also involves installing peripheral components such as external antenna, microphone, loudspeaker, mobile data terminals and global positioning systems (GPS). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Installers or technicians engaged in fitting mobile communications equipment to motor vehicles apply the skills and knowledge in this unit. This unit applies to the fitting of telecommunications equipment in police, fire, ambulance, emergency vehicles and taxis that form a complex mobile network of communications and data equipment.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan for installation of mobile telecommunications in motor vehicles	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** and follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work 1.2. Obtain ***mobile telecommunications equipment*** and manufacturer's installation documentation 1.3. Determine ***critical automotive electrical systems*** which need to be considered during the installation

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ELEMENT	PERFORMANCE CRITERIA
	process to prevent any damage to the vehicle system 1.4. Verify ***installation requirements*** from customer and advise customer of ***issues affecting performance*** 1.5. Obtain ***tools*** and ***test equipment*** required for safe work practices
2. Install mobile equipment	2.1. Attach ***primary mobile telecommunications equipment*** to vehicle using ***fixing and fastening hardware*** clear of air bag deployment and according to customer, vehicle and equipment manufacturer and OHS requirements 2.2. Wire primary mobile telecommunications equipment to vehicle electrical system using ***industry wiring practices*** without impacting on other electrical systems 2.3. Attach and wire ***peripheral mobile telecommunications components*** of the installation to customer and manufacturer's requirements 2.4. Replace any existing fittings or vehicle components removed during installation and restore to original condition 2.5. ***Test*** the completed installation to verify that the operation of critical automotive electrical systems have not been affected and rectify if required
3. Complete installation	3.1. Restore vehicle and worksite to customer's satisfaction by disposing of waste materials according to environmental requirements 3.2. Note and document any damage which may have occurred during installation and report according to enterprise procedures 3.3. Instruct customer on operation of installed equipment 3.4. Complete all ***administrative tasks*** and file according to ***enterprise requirements***

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise and negotiate with customer and colleagues
- literacy skills to interpret technical documentation, specifications and service orders
- numeracy skills to take measurements and interpret results
- planning and organisational skills to organise and prepare installation resources
- problem solving skills to respond to typical installation challenges
- task management skills to adhere to all safety requirements and work systematically with required attention to detail
- technical skills to:
    - perform diagnostic procedures
    - use hand and power tools

Required knowledge

- customer service principles, particularly dealing with customers face to face
- electrical fundamentals
- electromagnetic radiation awareness
- enterprise or service-specific knowledge of products and services supplied
- objectives and methods of training for product use for customer education
- OHS principles and enterprise-specific job safety analysis (JSA) requirements
- overview knowledge of mobile radio and cellular radio product range and connection methods
- pre-installation enterprise-specific requirements
- quality assurance of enterprise requirements
- radio frequency (RF):
    - principles
    - safety
    - theory
- return path technology
- telephony principles to support return path awareness
- test set-ups for final testing
- vehicle electrical, electronics and computer-managed systems

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install cable loom, wiring mobile and peripheral equipment • test the equipment to verify correct installation and operation.
Context of and specific resources for assessment	Assessment must ensure: • sites on which installation may be conducted • use of testing equipment currently used in industry • relevant regulatory and equipment documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking installation • review of installation documentation completed by the candidate • oral or written questioning to assess knowledge of tests and types of systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTRFN3055A Install a radio communications antenna and feedline. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally

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EVIDENCE GUIDE	
	appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communication Industry Forum (ACIF) standards and codes • AS 3901: • AS 3902: • AS 4346: • AS 2809.1: • AS 2772.1: • International Standards ISO 9000, ISO 9001 • OHS • Environmental Protection Act • Trade Practices legislation • safety regulations for specialised vehicles, such as petrol tankers, public service vehicles, fire engines and gas driven vehicles.

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RANGE STATEMENT	

OHS and environmental requirements may include:	• personal protective clothing:
	  • earmuffs
	  • gloves
	  • safety glasses
	• safe working, practices such as the safe use and handling of:
	  • materials
	  • tools and equipment
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management.

Mobile telecommunications equipment may include:	• digital radio communications Association Public Safety Communications Officials standard (APCO-25)
	• GPS
	• mobile data terminal
	• powered cellular mobile equipment cradle incorporating:
	  • Bluetooth device
	  • charger
	  • power and external antenna connections
	• speaker, microphone and external antenna
	• terrestrial trunked radio
	• two-way transceiver:
	  • high frequency (HF)
	  • ultra-high frequency (UHF)
	  • very high frequency (VHF).

Critical automotive electrical systems may include:	• air bags • antilock braking system circuitry • engine management modules • mobile data systems for taxis • patient monitoring equipment • police communications computer network • vehicle alarm systems • vehicle computers.
Installation requirements may include:	• position of external speaker, microphone and external antenna • replacement or repositioning of existing equipment

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RANGE STATEMENT	
	• type of equipment.
Issues affecting performance may include:	• excessive length of coaxial cable • external antenna mounted too close to metal surfaces • external antenna mounted too close to other antennas • external antenna mounted too low on vehicle • inappropriate or low efficiency antenna.

Tools may include:	• cable identification kit
	• hand tools:
	  • crimping tools
	  • hole punch
	  • nibbling tool
	  • pliers
	  • reamer
	  • screwdrivers
	  • terminating tools
	• power tools:
	  • drill
	  • hole saw
	  • soldering iron.

Test equipment may include:	• cellular phone tester • directional power meter • multimeter • site master cable and antenna analyser • standing wave ratio indicator • test lamp.
Primary mobile telecommunications equipment may include:	• powered equipment cradle for cellular handset • two-way radio transceiver.

Fixing and fastening hardware may include:	• adhesives:
	  • double sided tape
	  • injected polystyrene foam
	• cable ties
	• equipment brackets
	• expanding anchors suitable for sheet metal
	• heat shrink
	• plastic sheathing

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RANGE STATEMENT	
	• screws and nuts • spiral wrap.
Industry wiring practices may include:	• avoiding running power leads and antenna cable in parallel with vehicle wiring over long distances • maintaining as great a distance as possible between radio power leads and vehicle's electronic modules and wiring • powering mobile unit directly from the battery using waterproof fuse holder • routing and securing under hood wiring from mechanical hazards, such as exhaust and moving parts • using caution when routing cables to avoid chafing and pinching of wires.
Peripheral mobile telecommunications components may include:	• external antenna • external speaker • microphone.

Test may include:	• functionality:
	  • intended operation of all functions of the mobile equipment
	  • operation of entertainment units.

Administrative tasks may include:	• completing job orders and submitting to appropriate enterprise organisational unit • completing test sheets as per specification and logging test instrument usage • completing warranty forms • following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • recording test results.
Enterprise requirements may relate to:	• commercial vehicle • domestic vehicle • police and emergency vehicle • reporting • work procedures for implementing maintenance and installation work.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN3146A Install WiMAX customer premises equipment broadband wireless access equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and set up worldwide interoperability for microwave access (WiMAX) customer premises equipment (CPE) in homes and commercial premises. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who install outdoor WiMAX CPE equipment for wireless broadband access to customer premises apply the skills and knowledge in this unit. It involves connecting the indoor unit to customer network.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for WiMAX equipment installation	1.1. Arrange access to the site according to required procedure 1.2. Verify ***customer requirements***, type of ***WiMAX CPE equipment*** and location of proposed installation according to the plans obtained from ***authorised personnel*** 1.3. Prepare ***tools***, ***equipment*** and CPE required for installation
2. Install the outdoor unit and antenna	2.1. Make worksite safe by identifying existing and potential ***hazards*** 2.2. Comply with ***relevant legislation***, ***codes***, ***regulations and standards***, **occupational health and safety** (***OHS***) ***and environmental requirements*** 2.3. Mount the outdoor unit according to manufacturer's specifications and enterprise plans

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ELEMENT	PERFORMANCE CRITERIA
	2.4. Connect the outdoor unit to the indoor unit using specified cable 2.5. Position the antenna towards the distant WiMAX base station for preliminary orientation 2.6. Align the unit for maximum signal strength using received signal strength indication (RSSI) display 2.7. Record the installation and alignment details 2.8. Connect ***indoor unit and accessories*** to customer equipment
3. Test the performance of the installation	3.1. Test WiMAX CPE according to manufacturer's procedures 3.2. Check operating environment does not degrade test results 3.3. Evaluate test results to verify operational performance with customer
4. Restore site and complete documentation	4.1. Restore worksite to the customer's satisfaction 4.2. Complete reports on installation 4.3. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise with customers on technical and operational matters
• literacy skills to interpret technical documentation and standards and incorporate technical language into written reports
• numeracy skills to interpret technical data such as specifications of equipment operations
• problem solving skills to address common operational problems in installation
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or

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REQUIRED SKILLS AND KNOWLEDGE

others, or damage to goods or equipment
• technology skills to:
  • install outdoor units and antenna
  • connect to indoor units
  • test WiMAX equipment

Required knowledge

• WiMAX:
  • products
  • protocols IEEE 802.16 and IEEE 802.11
• microwave propagation and losses caused by foliage, buildings, and metallic structures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install and test WiMAX CPE outdoor unit • install indoor unit and connect to customer network • reinstate site, document and complete installation reports.
Context of and specific resources for assessment	Assessment must ensure: • sites on which WiMAX installations can be conducted • tools and equipment required for installation • relevant regulatory and equipment documentation..
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the

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EVIDENCE GUIDE	
	candidate • review of an oral and written report with completed documentation • direct observation of the candidate installing and connecting WiMAX CPE equipment.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTDRE3165A Install a complex digital reception system • ICTRFN4095A Conduct radio frequency measurements. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT

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RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Customer requirements may include:	• backup procedures • bandwidth • congestion • network connectivity • power back up • quality of service (QoS) • redundancy • wireless access.
WiMAX CPE equipment may include:	• indoor unit • outdoor unit • USB unit.
Authorised personnel may include:	• customer • network administrator • network planner • project manager • supervisor.
Tools may include:	• crimping tool • cable stripping tool • drill bits • screwdrivers • spanner • wall anchors and screws.
Equipment may include:	• compass • global positioning system (GPS) • inclinometer • laptop.
Hazards may include:	• building debris • earth potential rise • glass fibre • live power lines • manual handling • radio frequency (RF) equipment emitting radiation.

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RANGE STATEMENT	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) electromagnetic radiation (EMR) standard • AS/NZS 4268:2008 • AS/NZS 4295:2004 • AS/NZS 4415.1:2003 • AS/NZS 4582:1999 • AS/NZS 4583:1999 • AS/NZS 4769.1:2000 • AS/NZS 4770:2000 • Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • equipment standards • European Telecommunications Standards Institute (ETSI) EN 300 220-1 • ETSI EN 301 406 • fire regulations • heritage legislation • international standards • intrinsically safe lightning protection • local government • OHS • Radcoms Act • RSS-119 • site engineering standards • spectrum planning reports • Telecommunications Act • Telecommunications Industry Alliance and Electronic Industries Alliance (TIA/EIA) standards.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • identifying other services, including power and gas

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RANGE STATEMENT	

	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather
	  • head protection
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	  • safety harness
	  • safety line
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	• waste management.

Indoor unit and accessories may include:	• correct cable:
	  • crossover
	  • straight-through

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RANGE STATEMENT	

	• optional extension module:
	  • voice over internet protocol (VoIP)
	  • wireless fidelity (WiFi)
	• power unit:
	  • AC power
	  • DC power adaptor
	  • DC power supply
	• protection device:
	  • lightning protection
	  • surge protection.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN3155A Construct and test a radio communications device

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to construct and test a radio communications transmitting or receiving device. This is an entry level and foundation unit in radio communications. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff in the field of radio communications apply the skills and knowledge in this unit to assemble and test a radio transmitter or receiver. Relevant job roles include radio maintenance technician, radio installer and radio repairer.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to construct radio communications device	1.1. Prepare for construction applying all relevant ***legislation***, ***codes***, ***regulations and standards*** and identify any ***safety issues*** 1.2. Determine details of ***radio communications device*** to be constructed from ***project specifications*** 1.3. Produce wiring diagram, ***component list*** and ***block diagram*** of the radio communications device to prepare for the construction and testing of the device 1.4. Draw up plans showing the ***method of construction*** and the ***enclosure details*** 1.5. Designate suitable ***test points*** along the signal flow paths on circuit diagram for testing of the functional

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ELEMENT	PERFORMANCE CRITERIA
	blocks 1.6. Produce test setups to evaluate the performance of the radio communications device 1.7. Obtain ***tools*** and ***test equipment***
2. Construct and test radio communications device	2.1. Assemble radio communications device according to circuit diagram and layout drawing 2.2. Test ***performance*** and operation of individual functional blocks and overall radio communications device according to the test regime 2.3. Transmit or receive signals to evaluate the qualitative performance through radio communications device
3. Complete documentation and clean up worksite	3.1. Document results of test procedures and compare with initial project specifications 3.2. Finalise project report and make recommendations for improvement to the radio communications device 3.3. Remove waste from worksite according to environmental requirements and restore site to safe condition

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with technical, operational and business related matters • literacy skills to interpret technical documentation and write reports in required formats • numeracy skills to take test measurements, interpret results and evaluate performance • planning and organisational skills to plan, prioritise and monitor own work • problem solving skills to troubleshoot and manage contingencies to adapt construction and test procedures to requirements of radio communications device • research skills to source components from supplier catalogues, databases and websites

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REQUIRED SKILLS AND KNOWLEDGE

• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • operate an oscilloscope and radio frequency (RF) test equipment
  • solder, construct and prepare wires and cables
  • use hand tools

Required knowledge

• electrical symbols and circuit diagrams
• general principles of radio communications and radio propagation
• identification of:
  • components
  • device pinouts
  • part numbers
  • polarities
  • ratings
• operation and characteristics of:
  • amplifiers
  • demodulators
  • mixers
  • modulators
  • oscillators
• principles of modulation
• terminology related to radio communications.

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and prepare for construction of a radio communications device • prepare wiring diagram and component list • construct radio communications device • test radio communications device.
Context of, and specific resources for assessment	Assessment must ensure: • site where radio communications device may be constructed and tested • use of test instruments currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate constructing and testing a radio communications device • oral or written questioning of required skills and knowledge • evaluation of report prepared by the candidate outlining construction, testing procedures, results and recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN2140A Use hand and power tools • ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS Communications Cabling Manual (CCM) Volume 1 • Australian standards • Broadcasting Services Act 1992 • enterprise standards • fire regulations • manufacturer's enterprise operating policy and procedures • OHS Act

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RANGE STATEMENT	
	• Privacy Act • Radiocommunications Act 1992 • spectrum management regulations • statutory requirements.
Safety issues may relate to:	• drilling metal and printed circuit boards • etching printed circuit board • folding metal • soldering • tapping • threading • using metalwork guillotine, notcher or bender.

Radio communications device may include:	• amateur band transceiver
	• amateur band transverter
	• low noise converter
	• radio receiver:
	  • AM broadcast receiver
	  • FM stereo broadcast receiver
	  • global positioning system (GPS) receiver
	  • single side band (SSB) receiver
	  • very high frequency (VHF) weather satellite receiver
	• radio transmitter:
	  • amateur band transmitter
	  • low power FM stereo transmitter.

Project specifications may include:	• modulation type:
	  • amplitude modulation:
	  • amplitude shift keying (ASK)
	  • double side band full carrier (DSBFC)
	  • double side band suppressed carrier (DSBSC)
	  • single side band suppressed carrier (SSBSC)
	  • frequency modulation:
	  • analog
	  • frequency shift keying (FSK)
	  • phase modulation:
	  • analog
	  • binary phase shift keying (BPSK)
	  • spread spectrum:

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RANGE STATEMENT	
	• direct sequence • frequency hopping • operating frequency band: • high frequency (HF) • low frequency (LF) • medium frequency (MF) • ultra-high frequency (UHF) • very high frequency (VHF) • very low frequency (VLF) • schematic diagram of radio device • supply voltage • type of radio communications device: • radio transmitter: • RF output power • radio receiver: • sensitivity • transceiver.
Component list may include:	• component description: • inductor winding details • power or voltage rating • style • manufacturer • supplier details.
Block diagram may include:	• functional blocks: • amplifiers: • audio frequency (AF) • intermediate frequency (IF) • RF • bandpass IF filter • demodulator • direct digital synthesizer (DDS) • low pass filter (LPF) • microcontroller • mixer • modulator • oscillator • power supply.

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RANGE STATEMENT	
Method of construction may include:	• dead bug • kitset • perforated matrix board • physical layout drawing of the device • printed circuit board • rats nest point-to-point wiring • veroboard.
Enclosure details may include:	• die cast box • folded sheet metal • plastic box.
Test points may include:	• ground 0 volts • mixer output • oscillator output • positive supply line.
Tools may include:	• desoldering braid • drill bits • hand reamer • lead free solder • long nosed pliers • nibbling tool • power drill • safety glasses • screwdrivers • solder sucker • soldering fume extractor • soldering iron and stand • spring loaded side cutters.
Test equipment may include:	• AC voltmeter • frequency counter • modulation meter • multimeter • noise and distortion meter • oscilloscope • RF power meter • RF probe • RF signal generator • spectrum analyser.
Performance may include:	• receiver: • image frequency response

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RANGE STATEMENT	
	• quieting • sensitivity • signal to noise ratio • SINAD • transmitter: • carrier frequency • harmonic levels • modulation depth • modulation quality • RF output power • spurious oscillations.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to operate and maintain radio communications technical instruments and field equipment. It involves taking measurements, fault-finding, minor repair and commissioning new instruments and equipment. Individuals must comply with radio communications transmitter licensing requirements and operator certificates for maritime and aeronautical services and occupational health and safety (OHS) electromagnetic radiation (EMR) licensing requirements.

Application of the Unit

Application of the unit	Technical staff who work with radio communications equipment in radio communications apply the skills and knowledge in this unit. This may include field officers from regulatory authorities or other private and public organisations.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for use of instruments and field equipment	1.1. Plan and prepare work according to site procedures, ***operating environment*** and relevant ***legislation***, ***codes***, ***regulations and standards*** 1.2. Select ***measurements*** required to meet performance outcomes 1.3. Read, interpret and use equipment and system manuals, specifications and relevant organisation policy to determine work requirements 1.4. Select and ensure ***equipment*** for work activities is ready for operation 1.5. Determine, address and report ***potential risks and hazards*** and ***environmental issues*** 1.6. Adhere to relevant emergency procedures, policy guidelines and OHS procedures to ensure safety of

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ELEMENT	PERFORMANCE CRITERIA
	personnel and plant
2. Test the instruments and field equipment	2.1. Perform safety checks according to instrument and equipment manual and organisational procedures 2.2. Confirm equipment is calibrated and calibration label is within approved timeframes 2.3. Select appropriate traceable calibrated equipment where measurements are required to be traceable to the National Measurements Act 2.4. Label and report damaged or unsafe instruments and field equipment and send for service 2.5. Update operational log books
3. Operate instruments and field equipment	3.1. Optimise instrument and equipment settings for the particular measurement or analysis 3.2. Perform measurements with the optimum precision given field and technical constraints 3.3. Assess data for accuracy and precision against quality control information, known standards and references within ***measurement uncertainty***
4. Maintain instruments and field equipment	4.1. Use fault finding techniques to verify and rectify faults 4.2. Perform preventative ***maintenance*** within limits of authorisation and report equipment wear and faults 4.3. Replace defective parts and make adjustments according to equipment specifications 4.4. Seek expert help from appropriate colleagues where problems are encountered 4.5. Update maintenance and calibration records according to organisation procedures
5. Commission new instruments and equipment	5.1. Arrange commissioning procedures with manufacturer's agent 5.2. Unpack, check and assemble instruments and equipment according to manufacturer's warranty requirements 5.3. Check instrument and equipment performance against specifications prior to acceptance of item 5.4. Prepare operating instructions and make available to relevant personnel

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to analyse test results
- communication skills to liaise with internal and external personnel on technical, operational and legal site matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to:
  - check that equipment is calibrated
  - evaluate technical data
  - interpret results
  - take radio frequency (RF) measurements
- planning and organisational skills to organise and maintain a range of instruments and equipment
- problem solving skills to find simple equipment and instrument faults
- task management skills to work systematically with required attention to detail and adherence to safety requirements
- technical skills to:
  - operate radio communications test and diagnostic equipment
  - perform diagnostic and fault-finding procedures
  - use hand and power tools

Required knowledge

- features and operating requirements of calibrated equipment and test equipment:
  - digital radio communications measuring equipment
  - RF termination
  - spectrum analyser
  - power meter
  - modulation analyser
- features of instrument and equipment test methods and performance requirements
- legislation, codes of practice and other formal agreements that directly impact on operation and testing of radio communications instruments and equipment
- manufacturer's requirements for operation and testing of radio communications equipment and calibrated equipment
- measurements according to test specifications
- radio communications instruments and equipment
- specific OHS requirements that impact on the use and testing of radio communications instruments and equipment

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REQUIRED SKILLS AND KNOWLEDGE
• typical issues and challenges that occur with radio communications instruments and field equipment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare, operate and maintain a range of instruments and field equipment appropriate to a radio communications environment • comply with site risk control, OHS, environmental, quality and communication requirements • apply knowledge of technical procedures and requirements for different types of equipment.
Context of and specific resources for assessment	Assessment must ensure: • sites on which instruments and field equipment can be operated • use of field measurement equipment currently used in industry • relevant instrument and equipment manuals and other procedural documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate operating and maintaining radio communications equipment • evaluation of measurement results and reports produced by the candidate • evaluation of the candidate's oral or written reports on findings with recommendations.
Guidance information for	Holistic assessment with other units relevant to the

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EVIDENCE GUIDE	
assessment	industry sector, workplace and job role is recommended, for example: • ICTRFN4095A Conduct radio frequency measurements. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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RANGE STATEMENT	
Operating environment may include:	• day or night • dry or wet • field environment • heights or on roof tops • laboratory • old underground workings and voids • stable or broken ground • various natural landscapes.

Legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• Australian Communications and Media Authority (ACMA):
	  • assignment guidelines
	  • Business Operating Procedures (BOPs)
	  • CIs
	  • Radiocommunications Assignment and Licensing Instruction (RALIs)
	  • spectrum planning reports
	  • technical standards
	  • WI's
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) EMR standard
	• Australian building codes and regulations
	• Australian standards
	• enterprise standards
	• environmental protection
	• equipment standards
	• fire regulations
	• heritage legislation
	• international standards
	• intrinsically safe lightning protection
	• local government
	• OHS
	• Radcoms Act
	• site engineering standard
	• Telecoms Act.

Measurements may include:	• bandwidth • blocking • carrier frequency • cross modulation

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RANGE STATEMENT	
	• electric field strength (E field) • forward RF power • frequency deviation • harmonic and spurious levels • intermodulation distortion products (IMD) • intermodulation • magnetic field strength (H field) • 'mask' • modulation • noise level • occupied spectrum • receiver sensitivity • reflected RF power • return loss • RF power • VSWR.
Equipment may include:	• bit error rate tester (BERT) • constellation analyser • data logger • field strength meter • generators • gravity meter • internet protocol (IP) transmitter and receiver • memory magnetometer • mobile communications • modulation analyser • motors • personal protective equipment for RF • portable PC with testing and diagnostic software • return loss measurement set • RF power meter • satellite navigation system • spectrum analyser • transient electromagnetic (TEM) transmitter and receiver • theodolite • two-way radios.
Potential risks and hazards may include:	• adverse weather conditions: • electrical storms

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RANGE STATEMENT	
	• extreme heat • fires • floods • earth potential rise (EPR) • EMR • elevated plant • emissions • hazardous chemicals • hazardous gases • laser output • underground plant.
Environmental issues may include:	• dust • flora and fauna • materials • noise • run-off • spills • waste management and disposal • water quality.
Measurement uncertainty may include:	• intermittent faults • power supply fluctuations • temperature variations • uncalibrated equipment.
Maintenance may include:	• calibration of equipment • cleaning and storing • completing usage records • replacing 'remove and replace' components • working adjustments to tolerances.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN4095A Conduct radio frequency measurements

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to conduct and analyse radio frequency (RF) measurements. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field staff who install, maintain, upgrade and commission telecommunications RF systems apply the skills and knowledge in this unit. Systems that use RF include satellite and microwave, radio or TV broadcasting, pay TV, free to air TV, radio frequency identification (RFID), mobile radio, cellular and worldwide interoperability for microwave access (WiMAX) networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan to conduct RF measurements	1.1. Arrange access to the site according to required procedure 1.2. Determine type of ***measurements*** required based on the ***industry environment*** 1.3. Assess the impact of conducting measurements on the network and advise customers and ***appropriate person*** accordingly 1.4. Assess previous ***measurement data*** if available
2. Conduct RF measurements	2.1. Check that prescribed safety arrangements associated with RF radiation are in place otherwise take corrective action 2.2. Monitor work activity to ensure it meets site specifications, and ***relevant legislation***, ***codes***,

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ELEMENT	PERFORMANCE CRITERIA
	regulations and standards 2.3. Configure ***test equipment*** according to manufacturer's specifications 2.4. Conduct measurements according to planned requirements 2.5. Assess RF levels at occupational and non occupational distances 2.6. Record all measurements and test configurations
3. Analyse measurement outcomes	3.1. Verify measurements against relevant standards and vendor specifications 3.2. Assess problems and variance for corrective action and notify appropriate person according to enterprise procedures 3.3. Record processes and recommendations
4. Document measurement results	4.1. Complete customer documentations 4.2. Notify customer to obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to review and evaluate measurements
- communication skills to provide advice and guidance to others or to seek assistance
- literacy skills to interpret technical documentation
- numeracy skills to check that equipment is calibrated, to take RF measurements, interpret results and evaluate different types of technical data
- planning and organisational skills to organise and prepare for measurements
- problem solving skills to minimise measurement errors
- task management skills to work logically and systematically with required attention to detail when following complex test procedures
- technical skills to:
  - operate a range of specialised radio frequency test equipment and
  - perform diagnostic procedures
  - use hand and power tools

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REQUIRED SKILLS AND KNOWLEDGE
Required knowledge

• detailed knowledge of:
  • analog and digital modulation methods
  • logarithmic units
  • standard test procedures and test setups
  • transmitter and receiver architectures
• RF:
  • instrument and features and types
  • radiation hazards
  • safety practices

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and conduct RF test using RF test equipment and instruments • measure, record and interpret test results • monitor work to meet related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • site for RF measurements • a range of test equipment and items to test • relevant regulatory and equipment documentation that impact on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. the following examples are appropriate for this unit: • direct observation of the candidate setting up

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EVIDENCE GUIDE	
	equipment and performing RF measurements • review report of RF measurements prepared by candidate • oral or written questioning of the candidate to support the above measurement results • candidate report on findings and making recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN4158A Select an antenna system for radio communications • ICTRFN4159A Identify and test cellular network equipment • ICTRFN4174A Undertake radio communications signals monitoring • ICTRFN4177A Install radio communications base station equipment • ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network • ICTTEN4202A Install and test an radio frequency identification system • ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment • ICTCMP5176A Undertake radio communications site audit. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be

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EVIDENCE GUIDE	
	combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Measurements may relate to:	• antenna
	  • bandwidth
	  • beamwidth
	  • impedance
	  • radiation pattern
	  • return loss
	• bit error rate (BER) as a function of received signal level (RSL)
	• carrier to noise ratio
	• electric field strength
	• electromagnetic interference (EMI) and electromagnetic compatibility (EMC) measurements:
	  • conducted
	  • radiated
	• impedance
	• modulation error rate (MER)
	• receiver:

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RANGE STATEMENT	
	• 20 dB quieting • blocking • cross modulation • image frequency • intermodulation • sensitivity • SINAD • total harmonic distortion • RF amplifier: • gain • stability of RF amplifier when • operating at 10% higher or lower supply voltage • operating at extreme humidity • operating at extreme temperatures • operating into a complex load impedance noise figure • RF hazard measurements: • non-occupational worker • occupational worker • RF measurements on passive devices: • return loss • S parameters • transmission loss • spectrum surveillance • sweep measurements • transmission line measurements • transmitter: • adjacent channel power • carrier frequency • carrier frequency stability • carrier power level • deviation limiting • frequency deviation • harmonic power level • modulation depth • modulation response • occupied bandwidth

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RANGE STATEMENT	
	• out of band spurious emissions • phase deviation • phase noise • spectrum mask • transient frequency behaviour • two-tone intermodulation distortion • unwanted spurious emissions.

Industry environment may include:	• aeronautical
	• aerospace
	• broadcasting:
	  • AM in MW band
	  • analog
	  • cable
	  • digital DAB+
	  • digital DRM
	  • digital DVB
	  • FM stereo in VHF band
	  • global positioning system (GPS)
	  • short wave (HF)
	  • low power open narrowcasting (LPON)
	  • radio
	  • satellite
	  • television
	• Bluetooth
	• cellular mobile telephony
	• fixed service
	• industrial and scientific
	• land mobile
	• licence-free ISM
	• marine
	• medical
	• microwave point to point
	• radio paging systems
	• RFID
	• WiMAX IEEE 802.16
	• WiFi IEEE 802.11
	• ZigBee IEEE 802.15.4-2003.

Appropriate person may include:	• ACMA representative • consultant

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RANGE STATEMENT	
	• engineer • supervisor.

Measurement data may include:	• date
	• time
	• location
	• test configuration
	• measurement results
	• test equipment:
	  • manufacturer
	  • model
	  • serial number.

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • Australian Radiation Protections and Nuclear Safety Agency (ARPANSA (EMR) standard • AS/NZS 4268:2008 • AS/NZS 4295:2004 • AS/NZS 4415.1:2003 • AS/NZS 4582:1999 • AS/NZS 4583:1999 • AS/NZS 4769.1:2000 • AS/NZS 4770:2000 • Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • equipment standards • European Telecommunications Standards Institute (ETSI) EN 300 220-1 Year? • ETSI EN 301 406 Year? • fire regulations • heritage legislation • international standards • intrinsically safe lightning protection • local government • OHS • Radcoms Act • RSS-119

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RANGE STATEMENT	
	• site engineering standards • spectrum planning reports • Telecommunications Act • Telecommunications Industry Alliance and Electronic Industries Alliance (TIA/EIA) standards.
Test equipment may include:	• antenna analyser • BER tester • cellular radio test set • constellation analysers • digital signal level meter • digital transmission analyser • directional RF power meter • dummy load • termination • EMI test receiver • frequency counter • multimeter • noise and distortion meter • oscilloscope • RF connectors and adaptors • RF test cables • return loss measuring equipment • RF power meter • RF radiation meter • RF scalar network analyser • RF termination • RF vector network analyser • spectrum analyser • switched or variable attenuator.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN4158A Select an antenna system for radio communications

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required for the selection of an antenna system for radio communications to meet given performance requirements. This unit does not cover the estimation or analysis of radio signals within the desired area of coverage or over a specific radio path. This is covered in ICTRFN5179A Evaluate and analyse radio frequency (RF) signal coverage plots. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff from regulatory authorities or other private and public organisations apply the skills and knowledge in this unit. They combine technical radio communications skills with broader organisational and administrative skills to evaluate and select antenna systems in a range of commercial and community contexts. Technical staff may be responsible for small projects or parts of larger projects, and for the coordination and direction of small technical groups.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to select antenna system	1.1. Establish extent of project from design brief or specification within a team environment 1.2. Obtain and review plans and drawings of existing or proposed installation site 1.3. Determine whether ***antenna system*** hardware requires a secure hut or shelter

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Determine ***antenna requirements*** and antenna ***feedline requirements*** from design brief or specifications and research available commercial products 1.5. Determine earthing components to meet regulatory and earthing requirements of antenna system 1.6. Prepare the antenna feedline route to comply with job specifications and regulatory requirements 1.7. Identify installation options and assess against performance requirements and customer requirements
2. Select antenna system	2.1. Evaluate potential antenna system solutions which satisfy required performance, budgetary and regulatory requirements, and are suitable for installation in the specified environment 2.2. Make recommendations and select optimum antenna system
3. Document antenna system selection	3.1. Document calculations, final specifications and reasons for selection of antenna system 3.2. Prepare a final report, including documentation and drawings of selected antenna system and distribute to ***appropriate persons*** in accordance with enterprise policies and procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise with internal and external personnel on technical, operational and commercial matters
• literacy skills to:
  • interpret technical documentation
  • write final reports in required format
• numeracy skills to:
  • convert decibel gain values to ratios
  • evaluate and calculate effective isotropic radiated power (EIRP)

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REQUIRED SKILLS AND KNOWLEDGE
• evaluate different types of technical data • interpret results • planning and organisational skills to: • plan, prioritise and monitor own work • coordinate teamwork with others • problem solving and contingency management skills to adapt requirements of particular sites and customers, and modify activities depending on differing operational contingencies, risk situations and environments • research skills to examine and evaluate antenna patterns, specifications and data, and be able to synthesise antenna systems from commercially available products • spatial skills to interpret and convert between two-dimensional and three-dimensional antenna patterns • task management skills to work systematically with required attention to detail
Required knowledge
• antenna and propagation theory and industry practice • antenna array theory • transmission line theory and industry practice • specific issues related to antenna installations and the creation of particular radiation patterns

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • select an antenna system • justify and document antenna system selection.
Context of and specific resources for assessment	Assessment must ensure: • antenna resources such as manufacturers' data sheets, specifications and catalogues • transmission line resources such as manufacturers'

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EVIDENCE GUIDE	
	data sheets, specifications and catalogues.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate evaluating and selecting suitable antenna systems • review of reports completed by the candidate • oral or written questioning to assess knowledge of the selection of a radio communications antenna.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN4095A Conduct radio frequency measurements • ICTRFN5179A Evaluate and analyse radio frequency signal coverage plots. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Antenna system may include:	• antenna array
	• directional coupler
	• duplexer
	• earthing components
	• ferrite isolator
	• filter:
	  • cavity
	  • bandpass
	  • band reject
	  • low pass
	  • stub
	• lightning protection
	• multiple feedlines
	• phasing harness
	• single antenna
	• single feedline.

Antenna requirements may include:	• antenna height above ground
	• bandwidth:
	  • specified in MHz
	  • specified as % of centre frequency
	• beamwidth specifications in the:
	  • E plane
	  • H plane
	• front to back ratio:
	• gain:
	  • dB_i
	  • dB_d
	• minor lobes
	• mounting method
	• polarisation:

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RANGE STATEMENT	
	• circular • horizontal • vertical • radiation pattern coverage: • bi-directional • irregular pattern • omnidirectional • unidirectional • radiation pattern specifications in the: • E plane • H plane • radome • shroud.
Feedline requirements may include:	• allowable loss in dB • characteristic impedance • mechanical characteristics • method of securing • RF connector type • weatherproofing.
Appropriate persons may include:	• customer • engineer • project manager • supervisor.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN4159A Test and repair cellular network equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to test cell performance and perform diagnostic tests and repairs on sub-elements and subsystems within cellular networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers and technicians who perform diagnostic and repair tasks on cellular network equipment apply the skills and knowledge of this unit. They may be responsible under supervision for small projects or parts of larger projects and for the coordination of projects in sites remote from the organisational headquarters.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to test cellular network equipment	1.1. Produce an alarm list from ***cellular network*** subsystem which shows faults or ***disturbances*** 1.2. ***Reset sub-element*** according to manufacturer's specifications 1.3. Clear or block alarms and ***adjust alarm thresholds*** according to manufacturer's specifications
2. Test cellular network sub-element equipment	2.1. Test parameters influencing ***cell performance*** and record performance for a range of field settings 2.2. Test, record and report ***sub-element*** performance according to manufacturer's specifications 2.3. Run diagnostic test on sub-element 2.4. ***Swap*** the working or executing sub-element with the spare or idle unit to allow software upgrades

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ELEMENT	PERFORMANCE CRITERIA
	2.5. Swap the working or executing sub-element with the spare or idle sub-element to allow replacement of hardware
3. Rectify faults in cellular network equipment subsystems	3.1. Locate ***faulty sub-element*** within ***subsystem*** and identify fault 3.2. Identify faulty parts or equipment and ***replace or repair*** according to service agreement 3.3. Record fault details and rectification summary 3.4. Hand over and sign off with customer

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical requirements
- literacy skills to read, interpret and prepare technical documentation
- numeracy skills to read and interpret measurements and report to supervisors
- planning and organisational skills to plan the test in coordination with supervisors
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - install network equipment
  - perform fault clearance
  - select and use appropriate test equipment and practices to suit different network applications
  - recognising and interpreting alarms

Required knowledge

- anti static protection
- cellular antenna installation
- electrical concepts and measurements

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REQUIRED SKILLS AND KNOWLEDGE

• electromagnetic radiation (EMR) and mitigation
• network components and their basic functions
• occupational health and safety (OHS) relevant to work activity
• overview knowledge of:
  • 1st, 2nd and 3rd generations of cellular networks
  • features and operating requirements of test equipment
• procedures for repairs and swap activities
• test operation of cellular network equipment
• testing network components
• voltage levels and polarity

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • measure cell performance • measure output power received at around a cell • produce an alarm list and use this to locate faults • run diagnostic tests on sub-elements and subsystems • locate and repair faulty sub-elements and subsystems.
Context of and specific resources for assessment	Assessment must ensure: • site for mobile phone network tests and measurements • performance testing software • relevant legislation and documentation to test and repair network equipment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing

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EVIDENCE GUIDE	
	measurements and repairing faults • review of fault details, rectification summary and recommendations prepared by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3056A Install telecommunications network equipment • ICTTEN3089A Repair and replace telecommunications network hardware. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Cellular network may include:	• GSM (2G) • 2.5G GPRS • 2.75G EGPRS • 3G and associated 3GPRS • 4G.

Disturbances may relate to:	• common channel signalling unit
	• link performance or sub-elements:
	  • charging unit (CHU)
	  • statistical unit (STU).

Reset sub-element may include:	• hardware • software.

Adjust alarm thresholds may relate to:	• increasing or decreasing thresholds for:
	  • links between carriers
	  • links between elements
	  • subsystem units.

Cell performance may include:	• bit error rate (BER) of air interface • handover • hysteresis parameter • power measurements from neighbour cells • power measurements within a cell.
Sub-element may refer to:	• CHU • common channel signalling control unit (CCSCU) • group switch unit (GSU) • home location register unit (VLRU) • STU • visitor location unit (VLRU).

Swap may refer to:	• units in:
	  • faulty out of use mode
	  • spare or idle mode
	  • testing mode
	  • working or executing mode.

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RANGE STATEMENT	
Faulty sub-element may refer to:	• hardware • software.
Subsystem may include:	• authentication centre (AUC) • base station controller (BSC) • base transceiver station (BTS) • equipment Identity Register (EIR) • gateway GPRS Support Node (GGSN) • home Location Register (HLR) • media gateway (MGW) • mobile Switching Centre (MSC) • Node-B • Radio Network Controller (RNC) • Serving GPRS Support Node (SGSN) • Transcoder Rate Adapter Unit (TRAU) • visitor location register (VLR).
Replace or repair may refer to:	• cold swap procedure • hot swap procedure.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Radio frequency networks

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ICTRFN4174A Undertake radio communications signals monitoring

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to monitor radio communications signals for interference management, investigation, licence conditions intelligence and frequency occupancy purposes with discretion to determine appropriate action according to relevant Acts and regulations. Individuals must comply with radio communications transmitter licensing requirements and operator certificates for maritime and aeronautical services and occupational health and safety (OHS) electromagnetic radiation (EMR) licensing requirements as appropriate.

Application of the Unit

Application of the unit	Field officers from regulatory authorities or other private and public organisations apply the skills and knowledge in this unit. They combine technical skills with broader organisational and administrative skills to monitor and action non-compliance of radio communications. Field officers may be responsible for small projects or parts of larger projects, and for the coordination and direction of small groups working on sites remote from the organisational headquarters.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for radio communications signals monitoring	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards***, including OHS issues and possible ***hazards*** 1.2. Identify the specific ***triggers*** that lead to the need for ***monitoring activities*** 1.3. Determine monitoring coordinates as a result of a client complaint 1.4. Determine the extent and nature of the

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ELEMENT	PERFORMANCE CRITERIA
	communications problem through desktop research and relevant information 1.5. Enter necessary details into the appropriate work management system
2. Plan and organise monitoring activities	2.1. Determine monitoring activities and ***responsibilities*** according to organisational requirements 2.2. Determine ***procedures***, timeframes, ***resources and equipment*** requirements for self and others according to organisational and task requirements 2.3. Obtain resources and equipment and prepare according to organisational and task requirements 2.4. Identify communication strategies to make clients aware of their obligations under relevant legislation, codes, regulations and standards according to organisational policy and procedures 2.5. Update and review procedural and information guides as required 2.6. Implement ***risk management*** strategies as required according to set procedures and timelines
3. Undertake monitoring	3.1. Carry out monitoring activities according to organisational and legislative requirements, including OHS 3.2. Use and maintain resources and equipment according to organisational and task requirements 3.3. Identify and confirm communications and/or interference problems 3.4. Locate position and source of communications and/or interference problems 3.5. Identify the organisation responsible for the communications and/or interference problems 3.6. Undertake compliance analysis of unlicensed, unauthorised and non-standard equipment if appropriate 3.7. Provide advice to operational and technical subordinate officers according to organisational policy and procedures as required
4. Act on non-compliance	4.1. Provide information to client and take ***action*** as a result of failure to achieve compliance according to organisational guidelines and legislative requirements based on the seriousness of the possible breach 4.2. Identify contraventions of compliance requirements

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ELEMENT	PERFORMANCE CRITERIA
	and report recommended action according to organisational policy and procedures 4.3. Refer serious or complex situations for advice or resolution according to organisational policy and procedures 4.4. Use relevant ***collection methods*** to gain information and evidence about elements of each offence to be prosecuted and provide according to legislation, procedures and rules of evidence 4.5. Conduct and fulfil court attendance requirements in compliance with organisational guidelines as required 4.6. Ensure case is finalised according to court outcomes and organisational guidelines
5. Provide reports and information	5.1. Interpret requirements of relevant legislation and provide information and advice on technical and operational matters 5.2. Advise clients affected by outcomes within limits of privacy legislation 5.3. Maintain ***records*** and prepare and provide reports according to organisational requirements 5.4. Update any compliance management systems with relevant findings and outcomes

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with a diverse range of clients and staff to promote awareness and action on radio communications issues • information technology skills for word processing, using statistical data and desktop research • literacy skills to write reports using standard formats and to read and interpret a range of technical and legal information • oral presentation skills required for legal settings • problem solving skills to respond to typical challenges encountered in different

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REQUIRED SKILLS AND KNOWLEDGE

radio communications monitoring situations
• research and analysis skills to gather and interpret technical data
• safety skills to operate equipment and vehicles
• technical skills to:
  • operate receiving equipment, antenna systems, remote monitoring systems and workplace equipment
  • operate direction finding equipment
  • use HF, VHF, UHF and microwave receiving techniques
  • use triangulation techniques

Required knowledge

• legislation, codes of practice and other formal agreements that directly impact on monitoring of radio communications signals:
  • specifics of what constitutes an offence
  • responses for non-compliance
  • environmental requirements
  • privacy issues
• specific OHS requirements that impact on monitoring in terms of safety of self and public safety:
  • RF personal protective equipment
  • EMR at RF transmission sites
  • building site induction requirements
  • environmental conditions
• specific monitoring procedures for radio communications and relevant organisational policies and procedures
• characteristics of different environments and workplaces where monitoring takes place
• radio communications systems used in the relevant work context
• specific issues related to antenna performance:
  • directivity
  • gain
  • height
• effects of cable attenuation and impedance mismatch
• effects of ionosphere:
  • HF propagation
  • warning, fadeout, solar flares
  • ionospheric prediction service (IPS)
• modulation methods, AM, FM and digital formats
• field strength surveys and EMR measurements
• propagation properties of terrain

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REQUIRED SKILLS AND KNOWLEDGE
• RF awareness

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and conduct radio communications signals monitoring activities under general direction in a range of different contexts • comply with site risk control, OHS, environmental, quality and communication requirements • apply knowledge of appropriate procedures and techniques for efficient and effective preparation and operation, including calibration, maintenance and commissioning of instruments and field equipment appropriate to a communications environment site • respond effectively to different challenges and operational requirements for monitoring, including coping with difficulties, irregularities and breakdowns in routine.
Context of and specific resources for assessment	Assessment must ensure: • sites on which monitoring may be conducted • use of monitoring and testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on monitoring activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out monitoring activities • review of monitoring reports completed by the

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EVIDENCE GUIDE	
	candidate for different sites and equipment • oral or written questioning to assess knowledge of legislation and monitoring procedures • review of the candidate responses to a range of different situations likely to be encountered when conducting monitoring activities.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTRFN4095A Conduct radio frequency measurements • ICTCMP5176A Undertake radio communications site audit. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) standards
	• Commonwealth legislation and regulations
	• Crimes Act and Criminal Code Act
	• Interception Act
	• International ISO standards
	• International Telecommunications Union (ITU) regulations
	• National Measurements Act
	• OHS Act
	• Privacy Act
	• private property law
	• Radio Communications Act
	• spectrum management legislation
	• state, territory and local government legislation and regulations:
	  • building
	  • conservation and land management
	  • emergencies
	  • environmental protection
	  • international legislation/codes of behaviour
	• Telecommunications Act.

Hazards may include:	• environmental conditions:
	  • broken ground
	  • dust
	  • flora and fauna
	  • location involving working over old underground workings and voids
	  • materials
	  • natural landscapes
	  • noise
	  • run-off and spills

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RANGE STATEMENT	
	• waste management and disposal • water quality • wet conditions • working at heights or on roof tops • safety issues: • electromagnetic radiation • emissions • EMR based on site power • hazardous chemicals • laser output • underground plant • vehicle safety: • 4WD • driving in adverse conditions • winches.
Triggers may relate to:	• assisting frequency assigners prior to allocations • broadcast survey at head office request • complaints • complaints in writing • expired licences • field strength for low power open narrowcasting (LPONS) and digital action plan (DAP) • interference • investigations • monitoring to check complaint is legitimate or interference occurring may be intermittent interference • monitoring of high demand spectrum when a large user is requesting more spectrum whilst appearing to be using their existing inefficiently • noise floor measurements for spectrum planning • proactive compliance activity • site audits • special events monitoring under contract • task created as a result of monitoring.
Monitoring activities may include	• audio content

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RANGE STATEMENT	
or relate to:	• channel usage (orphans) • deviation • EMC issues • feed into investigation • field strength • focused and benchmark audit activities • frequency • modulation • occupancy • other compliance assurance activities • power • radiation patterns • radio communications audit • radio interference complaint • spectrum display • surveillance • transmitted data • unlicensed services or content • verification of adherence to licence conditions.
Responsibilities may relate to the roles of:	• inspection specialists • line managers • program managers • project managers • senior inspectors • senior policy officers • supervisors.

Procedures may include:	• broadcast tower safety
	• channel occupancy with transmitter operating
	• decisions to target certain sites:
	  • communal
	  • power level
	• emergency procedures
	• evacuation procedures
	• geographical considerations
	• handling procedures
	• incident reporting procedures
	• interference complaints
	• investigation of power measurement to ensure correct power
	• ITU monitoring handbook

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RANGE STATEMENT	
	• legislative requirements such as provisions of the • licence conditions regarding the operating frequency of transmitters • measurement procedures • monitoring instructions and policies • observation • OHS • organisational guidelines and code of conduct • power company requirements • RADCOM data purification • rejection procedures • safety procedures • sampling procedures • site visit compliance instruction procedure guide • statutory authority requirements (ACMA) • storage procedures.

Resources and equipment may include:	• antenna configuration
	• Argus monitoring - software
	• communication equipment
	• communications receivers
	• dedicated HF monitoring stations
	• desk monitor equipment, such as universal monitoring remote control system (UMRCS)
	• Doppler systems
	• electronic recording equipment - multi-track
	• entry authority or warrant
	• field strength measurement
	• global positioning system (GPS) equipment
	• hand-held equipment
	• portable monitoring equipment
	• Radphones
	• receiver protection:
	  • attenuators
	  • filters
	• recording equipment
	• remote access of carriers monitoring systems through software installed on a desktop and dialup number for monitoring
	• satellite imagery

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RANGE STATEMENT	
	• scanners • spatial data and information • spectrum analysers • storage equipment and facilities • vehicle mounted and mobile direction finding equipment • vehicles 2 or 4WD.
Risk management strategies may relate to:	• access • control • monitoring.
Action may include:	• advice • court prosecution • formal notification of intent • infringement notices • on-the-spot fines • warning.
Collection methods may include:	• determination of land ownership • interviewing • maintenance of case files • observation • recording • seizure.

Records may include:	• case files
	• forms:
	  • application,
	  • notification
	• invoices
	• notices:
	  • infringement
	  • seizure
	• receipts
	• statistics.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN4177A Install radio communications base station equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skill and knowledge required to install a radio communications base station in the VHF, UHF or microwave bands. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers from private or public organisations apply the skills and knowledge in this unit. They combine technical radio communications skills with organisational and administrative skills to install radio communications base station equipment in a range of commercial and community contexts. Base station installation generally includes data and voice equipment and wiring, transmitter, receiver, feedline and multicoupling equipment

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install radio communications base station equipment	1.1. Assess available installation options against customer requirements and relevant legislation, codes, regulations and standards 1.2. Arrange access to the site according to required procedure 1.3. Confirm equipment locations 1.4. Confirm base station equipment listings and manufacturer's and enterprise documents against the installation brief 1.5. Review installation briefs in consultation with the designers or manufacturers 1.6. Adjust tools and equipment to manufacturer's

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ELEMENT	PERFORMANCE CRITERIA
	specification
2. Install equipment and terminate voice and data cables, power cables and radio frequency (RF) cables	2.1. Observe ***anti-static precautions when handling circuit cards*** and conduct all work in a manner which is safe to self, fellow workers and the public at large 2.2. Install racks, frames, and shelves as required for data and voice frequency (VF) interface equipment, transmitter and receiver 2.3. Position equipment and install according to manufacturer's specifications and design detail 2.4. Label equipment, distribution frames and blocks according to enterprise policy 2.5. Strip cables and terminate conductors according to manufacturer's specifications 2.6. Clean optical fibre connectors using ***appropriate cleaning techniques*** 2.7. Connect network termination unit (NTU) cables to data and VF interface unit via distribution frame 2.8. Connect data and VF cables to radio equipment 2.9. Connect digital and analog ***alarm*** inputs and outputs to supervisory, control and data acquisition (SCADA) controller 2.10. Connect power cables to rectifier, battery rack, circuit breakers, and equipment according to manufacturer's and enterprise documents 2.11. Use computer or handheld device to program internal software in the data and VF interface equipment, and transmitter and receiver 2.12. Interconnect ***multicoupling equipment*** to antenna feedline and transmitter and receiver units. 2.13. Mount lightning protection equipment and earth wire according to specification
3. Connect receiver and transmitter multicoupling equipment to antenna feedline	3.1. Perform distance to fault measurement on antenna feedline 3.2. Perform return loss measurement of overall antenna system at transmitter and receiver connector points 3.3. Record test results
4. Finalise installation and complete preliminary tests and administrative tasks	4.1. Complete preliminary tests to verify transmitter and receiver operation prior to commissioning 4.2. Complete installation report, test results and administrative tasks and forward to the ***appropriate***

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ELEMENT	PERFORMANCE CRITERIA
	person according to enterprise policy 4.3. Dispose of packaging according to accepted environmental conditions 4.4. Notify appropriate person that base station is ready for commissioning and integration

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to question, listen and respond to subject matter experts on technical and operational matters related to performance of telecommunications networks and fault-finding
- literacy skills to interpret technical documentation and incorporate technical language into written tasks and basic reports
- numeracy skills to:
  - interpret technical data for specifications of telecommunications networks
  - use mathematical formulas to solve problems in AC circuits
- planning and organisational skills to plan, prioritise and monitor own work and coordinate the work of others
- problem solving skills to:
  - apply AC fault-finding techniques to different situations
  - apply network fault-finding techniques to fault find telecommunications network
- research skills to interrogate databases and other sources to investigate performance and systematic and logical fault-finding techniques of telecommunication networks
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - fibre optic connector cleaning techniques

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REQUIRED SKILLS AND KNOWLEDGE

• load software from computer to various devices
• select and use appropriate test equipment to undertake performance and fault-finding techniques in telecommunications networks including:
  • distance to fault measurement
  • return loss measurement
• terminate data and voice cable and RF cable

Required knowledge

• detailed knowledge of:
  • anti-static precautions
  • RF radiation hazard awareness
  • network termination unit
  • radio transmitter system
  • radio receiver system
  • multicoupler
  • SCADA system inputs and outputs
• operation and purpose of testing equipment and meaning of test results and network element and system specifications
• overview of telecommunications networks
• performance testing and fault finding techniques of telecommunications networks

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • install radio communications base station equipment • perform distance to fault measurement on feedline • perform return loss measurement on feedline • document and complete installation report.
Context of and specific resources for	Assessment must ensure:

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EVIDENCE GUIDE	
assessment	• sites on which base station installation can be conducted • tools and equipment required for installation • technical specifications, organisational documentation and requirements for installation and testing.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of an oral and written report with completed documentation • direct observation of the candidate installing and connecting base station equipment • oral or written questioning to assess knowledge of radio communications base station installation procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN4095A Conduct radio frequency measurements. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • fire regulations • industry drafting codes of practice • mining legislation • noise abatement and heritage legislation • OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Base station may include:	• analog modulation • digital modulation • repeater

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RANGE STATEMENT	
	• terrestrial trunked radio (TETRA).
Anti-static precautions may include:	• avoiding contact with static materials, such as plastics • circuit cards transported in anti-static bags or cartons • electrically conducting floor mats • use of conducting wrist strap earthed via high resistance path.
Appropriate cleaning techniques may include:	• alcohol swabs • dry type cleaning cassette for optical connectors • lint free dry wipes • microscope for examining optical connector face.
Alarm may include:	• forward power • over temperature • over voltage • PLL unlock • rack door • radio hut door • reverse power • time out.
Multicoupling equipment may include:	• cavity filter • ferrite isolator • hybrid multicoupler • receiver multicoupler • receiver preselect amplifier • transmitter multicoupler.
Appropriate person may include:	• consultant • customer • project engineer • supervisor • team leader.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN4178A Maintain hybrid fibre coaxial broadband cable network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to maintain a hybrid fibre coaxial (HFC) broadband cable network. It involves routine maintenance tasks, analysing results and initiating corrective action. Licensing, legislative, regulatory and certification requirements apply to working at heights, confined spaces, crane operation, rigging, driving and other operations involved in this unit. Users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers from telecommunications carriers, service providers and contractors apply the skills and knowledge in this unit. They combine a broad range of optical and radio frequency (RF) technical skills with organisational skills to maintain the HFC broadband cable network, generally with limited supervision and guidance. Relevant job roles involve adjustment of optical and RF power levels, investigating sources of RF and broadcast interference to the network and conducting specialised tests to determine the status of the HFC network.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for routine maintenance of broadband cable network	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for the given work 1.2. Determine the ***HFC network elements*** requiring ***maintenance*** and obtain maintenance details from the various HFC manufacturer's equipment manuals 1.3. Plan a detailed ***routine maintenance schedule*** and discuss with all relevant personnel 1.4. Notify the ***network operations centre*** (***NOC***) ***of the***

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ELEMENT	PERFORMANCE CRITERIA
	proposed maintenance details and maintenance schedule 1.5. Assess the ***potential impact*** of the proposed maintenance on customers and network, and plan for minimal possible ***outage*** or deferral of maintenance 1.6. Obtain necessary ***tools*** and ***resources*** and ***test equipment*** to undertake the maintenance 1.7. Ascertain and record recent ***network stability*** and network ***performance***
2. Undertake routine HFC network maintenance tasks	2.1. Conduct ***routine maintenance tasks*** according to documented enterprise instructions and following occupational health and safety (***OHS***) ***and environmental requirements*** and record results 2.2. Protect the network from excessive interference or degradation of service during maintenance routines 2.3. Monitor relevant alarms during the running of the maintenance tasks and report incidences to NOC 2.4. Escalate unresolved faults according to established enterprise procedure 2.5. Conduct ***performance measurements*** following routine maintenance schedule
3. Analyse results and initiate corrective action	3.1. Assess outcomes of performance measurements and maintenance routines to ensure they are according to specification 3.2. Analyse identified problems for likely impact and repair within capability and initiate or escalate repair action where repair is beyond capability 3.3. Undertake outage if required in conjunction with NOC and according to prescribed enterprise outage plan 3.4. Record problems and incidences in the maintenance log for future action as required by the maintenance agreement 3.5. Verify alarms to ensure maintenance routines did not generate further problems

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate impact of maintenance on customers and network
- communication skills to provide advice and guidance to others and to liaise with other technical staff on operational matters
- initiative and enterprise skills to identify improvements to maintenance procedures
- literacy skills to read technical data and interpret technical and non-technical information from a range of sources and write reports
- PC skills to upgrade installed software
- planning and organisational skills to plan for outage
- technical skills to:
  - identify noise and ingress
  - set up, operate and interpret results on complex test instruments:
    - optical instruments: optical time domain reflectometer (OTDR), optical power meter
    - RF instruments: digital signal level meter, RF sweep equipment, spectrum analyser
  - use hand and power tools to assemble and disassemble equipment in pits and in elevated situated situations

Required knowledge

- 16 QAM
- 256 QAM
- 64 QAM
- overview of AC and DC theory
- amplifier types and placement
- awareness of forward error correction (FEC) and Reed-Solomon Code
- bi-directional RF amplifier and unidirectional RF amplifier
- bit error ratio (BER) and acceptable values
- calculation of overall gain or loss when given signal levels in dBmv
- coaxial transmission line characteristics including cable tilt or slope
- constellation diagram interpretation
- digital modulation techniques
- DOCSIS cable modem characteristics
- eye diagram interpretation
- forward path from head end to subscriber showing expected signal levels at key points
- frequency spectrum and RF frequency plan HFC broadband cable network
- future BCN and migration to all-optical cable networks

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REQUIRED SKILLS AND KNOWLEDGE

• HFC broadband cable network principles, architecture and associated equipment
• measurement of optical power
• minimum standards allowable in the return path for ingress
• modulation error ratio (MER) and acceptable values
• optical fibre characteristics
• passive devices including filter, attenuator, power inserter, coaxial splitter, coupler, multitap, equaliser
• power supply requirements in a HFC broadband cable network
• quadrature phase shift keying (QPSK)
• return path from subscriber to head end showing expected signal levels at key points
• RF amplifier characteristics including gain and tilt adjustment, equalisation, overload
• services carried on HFC broadband cable network
• spectrum utilisation of the return path showing location of telephony and data channels and signalling and test frequencies
• forms of ingress and where they may fall in the return path
• video stream transport formats:
  • DVB-ASI
  • HD-SDI
  • MPEG-2
  • SD-SDI

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan, conduct and record HFC maintenance activities procedures and techniques • comply with site risk control, OHS, environmental, quality and communication requirements • perform RF and optical measurements

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EVIDENCE GUIDE	
Context of and specific resources for assessment	Assessment must ensure: • sites on which HFC maintenance may be conducted • use of maintenance tools and test instruments currently used in industry • relevant regulatory, enterprise and equipment documentation that impact on maintenance activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out HFC maintenance activities • review of maintenance reports completed by the candidate for different sites and equipment within the HFC network • oral or written questioning to assess knowledge of maintenance procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. • ICTTEN4085A Monitor, analyse and action telecommunications network alarms • ICTTEN4086A Undertake routine maintenance of the telecommunications network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those

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EVIDENCE GUIDE	
	required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • cable
	  • electrical
	  • elevated work platform (EWP)
	  • rigger
	• Australian Communications Industry Forum (ACIF) standards and codes
	• Australian Communications and Media Authority (ACMA) technical standards
	• Australian building codes and regulations
	• Australian standards
	• enterprise standards
	• environmental protection
	• equipment standards
	• fire regulations
	• heritage legislation
	• international standards
	• intrinsically safe lightning protection
	• local government
	• OHS
	• site engineering standard

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RANGE STATEMENT	
	• Telecommunications Act.

HFC network elements may include:	• headend
	• optical network:
	  • optical node
	  • optical or RF hub
	• RF network:
	  • customer tap
	  • global network amplifier (GNA) with reverse path amplifier
	  • isolator
	  • line extender (LE) with reverse path amplifier
	  • line power inserter
	  • splitter.

Maintenance may include:	• corrective maintenance • remote maintenance • routine maintenance.

Network Operations Centre may include:	• coordination of repairs or changes to the network
	• escalation of faults
	• monitoring:
	  • network alarms
	  • optical fibre cuts
	  • power failures
	• performing diagnostic tests
	• troubleshooting.

Maintenance schedule may be:	• details from service level agreement (SLA)
	• frequency:
	  • monthly
	  • quarterly
	• procedures
	• responsibilities and commitment
	• timings.

Potential impact may include:	• degradation of service to residential customers • disruption of service to residential customers • intermittent degradation of service to residential customers • intermittent performance • loss of service and revenue to enterprise

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RANGE STATEMENT	
	customers • outage • total loss of service to residential customers.
Outage may include:	• loss of service to customers due to a network fault or upgrade • planned in the case of network upgrades • unplanned in relation to faults.
Tools may include:	• anti-static wrist strap • PC board or sub-rack removal tool • pliers • power drill • screwdrivers • sockets • soldering iron • spanners.
Resources may include:	• elevated work platform hire • licensed cabler • licensed electrician • licensed rigger • optical fibre specialist • optical fibre splicer.

Test equipment may include:	• network profiler - spectrum analyser and digital modulation analyser fitted with:
	  • cable TV (CATV) module
	  • dual path sweep module
	• sweep ingress analyser
	• integrated sweep transmitter
	• laptop computer
	• multimeter
	• optical fibre power meter
	• OTDR
	• oscilloscope.

Network stability may include:	• reliability of the network:
	  • over time
	  • under varying load conditions
	  • under varying traffic conditions.

Routine maintenance tasks may include:	• adjusting pads and equalisers to obtain correct output signal levels in RF amplifiers • conducting:

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RANGE STATEMENT	
	• basic AC DC voltage and resistance measurements using a multimeter • constellation measurement • MER measurement and BER measurement (pre and post FEC) using a digital analyser • multi channel tests across the whole band • system ingress measurement • digital channel power • measuring: • hum modulation • optical power levels at: • head end • hub • node • RF carrier levels at: • GNA • Hub • LE • tap • performing RF level and frequency measurements: • level • tilt • remotely monitoring and recording customer broadband cable modem levels to assist in pinpointing network problems • sweep testing the RF coaxial portion of the network: • forward sweep test: • high frequency short circuits • standing waves • frequency 'suck-out' • flatness - peak to valley • reverse sweep test • using a network profiler instrument to troubleshoot faults in the HFC network • verifying and confirming: • forward optical transmitter output power and optical loss budget • reverse optical transmitter output power and

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RANGE STATEMENT	
	optical loss budget.

OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety barriers
	• safety equipment
	• warning signs and tapes
	• environmental considerations:
	  • clean-up
	  • noise and dust
	  • stormwater protection
	  • waste management.

Performance measurements may include:	• Proof of performance tests on the:
	  • forward path
	  • return path
	• optical power levels and confirm correct operation
	• RF BER and MER measurements using network profiler.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units	

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Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN5097A Test cellular handset enhancements and international roaming agreements

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to test the handset enhancements and international roaming capability of a subscriber's cellular phone service in a public land mobile network (PLMN) overseas. In order to guarantee the subscriber high quality and full availability, regular international roaming tests are necessary. Manual roaming testing has largely given way to fully automated testing due to the large number of PLMNs and tests required. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers and supervisors who test the international roaming capabilities of cellular mobile equipment apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to conduct roaming tests	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Identify ***need for tests*** from service provider mobile network deployment taskforce 1.3. Develop enterprise ***test procedure*** according to roaming arrangements and manufacturer test regime 1.4. Arrange access to the location where ***tests*** are to be conducted according to required procedure 1.5. Select ***resources*** needed to conduct tests complying to roaming arrangements 1.6. Confirm details of international roaming partners and agreements with partner mobile operators

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ELEMENT	PERFORMANCE CRITERIA
	1.7. Advise network operations centre of the test details and test schedule
2. Conduct tests and analyse test results	2.1. ***Conduct tests*** according to enterprise test procedure 2.2. Analyse recorded test results for roaming compliance and functionality of SIM card and phone enhancements
3. Document results	3.1. Document details of roaming tests, SIM card validity and functionality of ***phone enhancements*** and make recommendations to ***appropriate person*** 3.2. Report non-compliance to appropriate person for investigation with international roaming partners and mobile phone manufacturer

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to review and evaluate measurements
- communication skills to interact with enterprise personnel, international roaming partners and customers to maintain a customer focus and consider customer needs
- literacy skills to interpret technical documentation
- numeracy skills to:
  - check that equipment is calibrated
  - take measurements
  - interpret results
  - evaluate different types of technical data
- PC skills to:
  - control automated testing
  - load test files
  - store test results
- planning and organisational skills to organise and prepare for measurements
- problem solving skills to resolve technical issues within international roaming
- task management skills to work logically and systematically with required attention to detail when following complex test procedures
- technical skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• conduct test procedures • operate specialised roaming test equipment
Required knowledge
• features and operating requirements of specialised roaming test equipment • information required to operate equipment according to a test specification • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for safe operation of equipment • mobile phone network standards and specifications • specific OHS requirements relating to the activity and site conditions • test analysis

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • conduct tests on international roaming capability and functionality of handset enhancements • analyse results of testing • make recommendations based on test results.
Context of and specific resources for assessment	Assessment must ensure: • site where tests on handsets and international roaming agreements may be conducted • testing equipment currently used in industry • equipment, system manuals, specifications and relevant enterprise policy and documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. the following examples are appropriate for this unit: • direct observation of the candidate conducting

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EVIDENCE GUIDE	
	international roaming agreement tests • review of report prepared by the candidate outlining findings, interpretation of test results and recommendations • oral or written questioning of the candidate to assess knowledge of handsets and handset enhancements.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTRFN5148A Test and measure cellular phone and network equipment performance. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different

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RANGE STATEMENT	
work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications and Media Authority (ACMA) standards • GSM Association permanent reference documents: • International Standards ISO 9000 and ISO 9001 • International Telecommunications Union (ITU) recommendations • IR.22 SCCP Signalling aspects for roaming • IR.24 End-to-end functional capability specification for inter-PLMN roaming • IR.26 End-to-end functional capability specification for inter-PLMN roaming addendum for Phase 2 • IR.27 Functional capability test specification for inter-PLMN roaming phase 1 data services, fax services • IR.28 Specifications of the infrastructure in a PLMN to allow automatic testing • IR.29 Proposal of a minimum requirement on an automatic test equipment for roaming • IR.32 End-to-end functional capability specification for Inter-PLMN CAMEL-roaming • IR.35 End-to-end functional capability test specification for inter-PLMN GPRS roaming • IR.37 Guidelines and testing for optimal routing - Service definition Stage 1 testing • IR.50 2G/2.5G/3g roaming • IR.53 MMS inter-working tests • IR.60 Prepaid service roaming test • IR.62 End-to-end WLAN roaming test cases • IR.66 End-to-end interworking and roaming test specification for IMS • ITU Regulation 24 and standards • OHS • The International Roaming Expert Group

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RANGE STATEMENT	
	(IREG) of the GSM Association.
Need for tests may include:	• compatibility of frequency bands from one country to another • emergence of additional network services • modification of a software release by an operator • new mobile phone enhancements and features • new roaming agreements between service providers.
Test procedure may include:	• IREG tests • PLMN test data • test equipment.
Tests may include:	• additional test cases • billing tests • check against manufacturer's standards • compatibility with normal features provided by carriers • connectionless mobile originated call (MOC) and mobile terminated call (MTC) • email • general packet radio service (GPRS) and wideband code division multiple access (WCDMA) • IR35 including FTP and HTTP • IREG 24 Basic services and supplementary services • IREG 27 Data and fax services • IREG 28/29 Test with automatic answer circuits • IREG 32 CAMEL Phase 1 and 2 • MMS • P.862 standard • P.862.1 standard • phone enhancements • ping • prepaid tests • roaming functionality • SIM card validity • SMS • speech quality (PESQ)

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RANGE STATEMENT	
	• test cases.
Resources may include:	• PLMN test data stored in test files • roaming test equipment required locally • SIM card boards.
Conduct tests may include:	• inbound roaming • keynote SIGOS - GlobalRoamer • MILBORNE Roaming Verification tester • outbound roaming • test line interface and roaming and mobile service test system - Nexus 8620/8610.
Phone enhancements may include:	• data • email • fax • multimedia messaging service (MMS) • SMS • WiFi.
Appropriate person may include:	• account manager • international roaming partner • marketing manager • mobile phone manufacturer's representative • project manager.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Radio frequency networks

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ICTRFN5148A Test and measure cellular phone and network equipment performance

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to test, measure and document the performance of cellular mobile phone and network equipment. It also involves analysing test results and recommending modifications to the network. The integration of specialised optical devices into existing networks may be required as part of an upgrade required by services and applications of Next Generation Mobile Networks (NGMN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers and supervisors from telecommunications carriers, service providers, contractors and other public or private organisations apply the skills and knowledge of this unit. They perform measurements during equipment upgrades or during commissioning, acceptance testing and routine maintenance on cellular network equipment. The skills are mainly related to testing cellular sub-elements and subsystems. Field officers under supervision may be responsible for projects and for the coordination of projects in sites remote from the organisational headquarters. Technical officers also

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	participate in design activities.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to test cellular phone and network equipment	1.1. Obtain and follow ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Scope the work by obtaining ***work details*** from

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ELEMENT	PERFORMANCE CRITERIA
	appropriate personnel and arrange for site access to comply with security arrangements 1.3. Evaluate manufacturer's technical documentation and network procedures to plan a ***test schedule*** for the cellular network 1.4. Verify calibration of ***test equipment*** to ensure that tested cellular equipment is compliant 1.5. Prepare cellular equipment for testing according to manufacturer's test procedure 1.6. Notify operational staff of test and measurement schedule to ensure minimal impact on the cellular network
2. Test and measure cellular phone and network equipment	2.1. Work safely following occupational health and safety (***OHS***) ***and environmental requirements*** for the given work, identifying ***hazards*** and using ***personal protective equipment*** 2.2. Configure network equipment for testing and set ***options*** to record test results 2.3. Block or mask alarms that may be triggered and interfere with test programme 2.4. Run the performance measurement software with options set and record test results 2.5. Re-establish alarms and normal operational status at conclusion of tests and notify appropriate personnel of the completion of the test schedule
3. Analyse measurement and prepare an evaluation report	3.1. Analyse the results of the performance tests and measurements and determine the performance level of the cellular equipment and compatibility with the network 3.2. Prepare an evaluation report making recommendations on network modifications or changes to configurations settings for improved quality of service (QoS) 3.3. Present test results and evaluation report to appropriate personnel according to enterprise policy

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test results
- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to:
  - read and interpret technical documentation, such as equipment manuals, specifications and service orders
  - write reports using standard formats
- numeracy skills to:
  - interpret results
  - evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and that of others
- problem solving and contingency management skills to:
  - adapt testing procedures to requirements of particular situations
  - modify activities depending on operational contingencies, risk situations and environments
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities when dealing with radio frequency (RF) radiation
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - confront typical issues and challenges that occur in cellular network testing
  - prepare and interpret technical documentation
  - recognise and interrogate the network element alarms and record fault conditions
  - select and use appropriate test equipment following industry practices

Required knowledge

- features and operating requirements of cellular test equipment, including the digital cellular test set, spectrum analyser and RF power meter
- network components, their functions and approved specifications
- overview knowledge of transmission lines, transmitter and receiver architecture

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REQUIRED SKILLS AND KNOWLEDGE
and associated cellular network • specific knowledge related to cellular antenna and feedlines, and their impact on mobile spectrum interference • testing network components • types of adjustments that need to be made when measuring cellular transmission • types of networks that will influence the transmission either on the radio path and/or transmission line

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and coordinate test activities and equipment • test cellular phone and network equipment according to test procedure • analyse test results • report and make recommendations on performance.
Context of and specific resources for assessment	Assessment must ensure: • sites on which cellular network testing may be conducted • use of test equipment currently used in industry • manufacturer's and enterprise technical documentation • relevant regulations and standards.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing tests • review of test documentation and reports completed by the candidate • oral or written questioning to assess knowledge of

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EVIDENCE GUIDE	
	testing procedures and required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN5097A Test cellular handset enhancements and international roaming agreements. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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RANGE STATEMENT	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • Australia building codes and regulations • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Radiation Protection standard - Maximum Exposure Levels to Radio Frequency Fields - 3 kHz to 300 GHz • ACIF C564:2004 Deployment of mobile phone network infrastructure • Environmental Protection Acts • fire regulations • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Work details may include:	• cellular equipment type:
	  • base station equipment
	  • location registers
	  • network management module
	  • switching
	  • transmitter
	• cellular network type:
	  • 3G
	  • 4G
	  • GPRS
	  • GSM
	  • WiMAX
	• reasons for tests
	• service level agreement (SLA) details.

Appropriate personnel may refer to:	• design engineer • network manager • network operations centre • planning engineer.

Test schedule may include:	• cellular network equipment tests:
	  • blockage
	  • congestion
	  • interference

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RANGE STATEMENT	

	• latency
	• packet loss
	• path loss
	• QoS
	• cellular phone performance tests:
	  • firmware
	  • network connectivity
	  • roaming facilities
	  • SIM card test
	  • software
	  • transmitter tests.

Test equipment may include:	• built-in test equipment (BITE) • cable and antenna analyser • digital radio test set • E1 analyser • proprietary software • RF power meter • spectrum analyser • variable attenuator.

OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement
	• flashing lights
	• gas and other hazard detection equipment
	• identifying other services, including power and gas
	• safety barriers
	• safety equipment
	• safe working practices such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• special access requirements
	• suitable light and ventilation
	• trench guards
	• warning signs and tapes
	• witches hats

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RANGE STATEMENT	

	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management.

Hazards may include:	• activating equipment without notifying other staff who may be working remotely on the network
	• cleaning alcohol, epoxy resins and other solvents and chemicals may be carcinogenic, cause allergies or be dangerous to health in other ways
	• environmental hazards:
	  • air pollution
	  • dangerous gases
	  • heavy or noxious metals pollution
	  • noise
	  • petrochemical spillage
	  • release of hydrochlorofluorocarbons (HCFC)
	• flammable cleaning chemicals fluids and solvents
	• health hazards:
	  • electromagnetic energy (EME) exposure
	  • dangerous or harmful substances
	  • risk of sustained injury from repetitive tasks
	• laser damage to eyes.

Personal protective equipment may include:	• personal protective clothing:
	  • earmuffs
	  • gloves
	  • head protection
	  • knee pads
	  • mask
	  • safety boots
	  • safety glasses
	• safety harness
	• safety line.

Options may include:	• file setting • macro setting.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN5179A Evaluate and analyse radio frequency signal coverage plots

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to create radio frequency (RF) coverage plots and path profiles for point-to-point links and analyse data. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff from regulatory authorities, private and public organisations apply the skills and knowledge in this unit. They combine technical radio communications skills with organisational and administrative skills to generate and evaluate coverage maps in a range of commercial and community contexts. Technical staff may be responsible for small projects or parts of larger projects, and for the coordination and direction of small technical groups. This unit applies to radio and television broadcasting, radio base station coverage, and point-to-point links.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan and prepare for coverage prediction	1.1. Prepare for given work according to relevant legislation, occupational health and safety (OHS), codes, regulations and standards 1.2. Arrange access to the site according to required procedure 1.3. Establish ***type of coverage*** required 1.4. Determine specifications and the minimum acceptable signal level or timing signal delay within

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ELEMENT	PERFORMANCE CRITERIA
	the coverage area 1.5. Use ***prediction software*** specific to the enterprise 1.6. Verify ***mapping coordinate system*** to be used 1.7. Create custom antenna pattern files representative of the expected antenna type for the type of coverage required
2. Load data into the software program and create coverage plot	2.1. Select and load ***system parameters*** 2.2. Select and load ***antenna elements*** or antenna pattern files 2.3. Select suitable ***propagation model*** settings applicable to the study 2.4. Load appropriate ***clutter properties*** 2.5. Create the coverage plot using appropriate ***plot options*** settings
3. Analyse coverage plot outcomes	3.1. Evaluate the initial coverage plot against initial specifications 3.2. Adjust system parameters and antenna elements until coverage plot is within specifications 3.3. Compare measured signal strength at various locations with the predicted values 3.4. Use measured data to correct and fine tune the model 3.5. Evaluate a range of possible solutions and make appropriate recommendations to ensure transmission meets operational requirements
4. Complete documentation	4.1. Tabulate results 4.2. Prepare report with final recommendations

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to: • be able to synthesise antenna systems from commercially available products

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REQUIRED SKILLS AND KNOWLEDGE

• examine and evaluate antenna patterns, specifications and data
• communication skills to liaise with internal and external personnel on technical, operational and commercial matters
• literacy skills to:
  • interpret technical documentation
  • write final reports in required format
• numeracy skills to:
  • evaluate and convert RF field strength measurements
  • evaluate different types of technical data
  • interpret results
• planning and organisational skills to:
  • coordinate teamwork with others
  • plan, prioritise and monitor own work
• problem solving and contingency management skills to:
  • adapt requirements of particular sites and customers
  • modify activities depending on differing operational contingencies, risk situations and environments
• spatial skills to interpret and convert between two-dimensional and three-dimensional antenna patterns
• task management skills to work systematically with required attention to detail
• technical skills to select and use appropriate propagation models and practices to suit different situations

Required knowledge
• antenna and propagation theory • antenna array theory • overview of various mapping coordinate systems and their datums • propagation models and their limitations in various environments • specific issues related to antenna installations and the creation of particular radiation patterns

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• plan and coordinate activities to produce coverage plots using appropriate software settings
	• generate:
	  • an RF signal coverage plot
	  • a path profile for a point-to-point link
	• evaluate, analyse and make recommendations on antenna installation specifications.

Context of and specific resources for assessment	Assessment must ensure: • access to computer facility on which coverage plots and paths may be generated • use of propagation prediction software • access to digital terrain database.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate creating a coverage map and a point-to-point path profile • review of reports completed by the candidate • oral or written questioning to assess knowledge of the planning of terrestrial radio facilities using software.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN4095A -Conduct radio frequency measurements • ICTRFN4096A - Conduct field tests of radio and wireless networks • ICTRFN4158A Select an antenna system for radio communications. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Type of coverage may include:	• directional pattern • omnidirectional • point to point.
Prediction software may include:	• ATDI • Atoll • CRC Predict • EDX • Planet EV • Radio Mobile • TEMS.
Mapping coordinate system may	• AGD-66

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RANGE STATEMENT	
include:	• AGD-84 • GDA94 • WGS-84.
System parameters may include:	• 'k' value • feeder loss • frequency • latitude and longitude • nominal receive antenna height • polarisation • site elevation • transmit antenna height above ground • transmitter power • transmitter site name.
Antenna elements may include:	• antenna gain (dBi) • broadside array of dipoles • collinear array of dipoles • dipole • dipole panel • half power beamwidth.
Propagation model may include:	• Egli • FCC point-to-point • International Telecommunications Union Radiocommunications sector (ITU-R) 1546 • ITU-R 1812 • ITU-R 525 • Longley-Rice • Okumura-Hata.
Clutter properties may include:	• average clutter height • buildings and trees • open • reflection coefficient of the land • RMS roughness of an area • suburban • urban.
Plot options may include:	• 0.6 First Fresnel zone clearance • azimuth range or degrees • First Fresnel zone • first threshold level • path profile

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RANGE STATEMENT	
	• polar plot • radial range (km) • radio horizon map • rainbow colour plot • second threshold level • signal strength prediction map • third threshold level • threshold units • timing signal delay study map.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN6098B Monitor the capacity of and recommend changes to the cellular mobile network

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to make recommendations on cellular mobile network systems at the system design level.

Application of the Unit

Technical officers and engineers may apply the skills and knowledge in the unit. They undertake mobile network performance measurements and report on mobile capacity enhancement to senior management.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Monitor the capacity of the cellular mobile network	1.1 Monitor ***traffic levels*** from the network management system 1.2 Use approved enterprise plans to identify planned network growth 1.3 Obtain ***customer forecast*** data from marketing 1.4 Apply identified data against ***capacity trigger*** criteria 1.5 Determine ***coverage*** and cell parameters
2. Make recommendations relating to capacity changes	2.1 Identify ***requirements*** for additional capacity 2.2 Recommend changes or additions to ***frequency parameters*** and submit to planning personnel 2.3 Assess capacity of ***transmission path and switch resources*** and recommend improvements noting ***transmission medium*** 2.4 Manipulate traffic through ***switch parameter settings*** as a means of relieving traffic congestion 2.5 Determine cost of proposed changes and undertake studies of appropriate return on investment (RoI)
3. Assess capacity changes	3.1 Organise tests and studies to ensure that increased capacity adequately caters for traffic flow 3.2 Make recommendations for further change to network should the increase capacity not meet need

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytic skills to interpret capacity requirements
- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to:
  - interpret technical documentation, such as equipment manuals, specifications and service orders
  - write reports using standard formats
- numeracy skills to estimate costs and calculate return on investments
- planning and organisational skills to plan, prioritise and monitor own work and coordinate the capacity measurement process in liaison with others
- problem solving and ability to convey solutions to others
- task management skills to work systematically with required attention to detail
- technical skills to:
  - select and use appropriate tests to measure cell capacity usage
  - use teletraffic statistical data.
  -

Required knowledge

- blocking, non-blocking and grade of service
- Erlang B measurements
- features and operating requirements of test equipment
- field measurements for cell traffic capacity
- information required to:
  - analyse and interpret statistical data as applied to teletraffic measurement
  - prepare and conduct a capacity measurement
- legislation, codes of practice and other formal agreements that directly impact on radio communications site transmission
- overview knowledge of:
  - transmission lines
  - transmitter and receiver architecture and their impact on radio communications traffic
- switching architecture and in particular space and time switching
- types of adjustments that need to be made to procedures to meet the requirements of particular sites and environmental conditions

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- typical issues and challenges that occur in telecommunications cellular capacity design and how these may be addressed
- workplace and industry environment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • source and analyse relevant data to prepare a plan indicating growth potential and recommendations for meeting growth within timeframes • use tools and software packages for forecasting and measurement • identify site or channel capacity, relevant network growth and forecasting growth.
Context of and specific resources for assessment	Assessment must ensure: • access to sites with cellular mobile network • capacity monitoring data and equipment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking a practical monitoring exercise • evaluation of report prepared by the candidate outlining recommendations relating to capacity changes • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTRFN5148A Test and measure cellular phone and network equipment performance

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	• ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks • ICTPMG8149B Evaluate and use telecommunications management networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Traffic levels may be found in:	• Erlang or centum call seconds (CCS) form per site:
	  • circuit switching or packet switching networks hardware units
	  • network management tools.

Customer forecast may	• simulate decrease in traffic requirement

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include:	• simulate increase in traffic requirement.
Capacity trigger may include:	• ’no service‘ complaints • business plan targets or forecast method • decisions to target certain clients • decisions to target certain sites • geographical considerations • industry status • investigation for improvement of service.

Coverage includes:	• radio base station capacity parameters:
	  • available channels per cell
	  • available channels per sector.

Requirements may include:	• frequencies • hardware requirement • radio channels • transmission availability.
Frequency parameters may include:	• degree of separation • frequencies • frequency reuse • interference levels • signal levels.

Transmission path and switch resources may include:	• transmission capacities:
	  • between switching elements
	  • on radio path
	• group switch resources.

Transmission medium may include:	• coaxial cable • copper cable • microwave link • optical fibre cable • satellite.

Switch parameter settings may include:	• switching architecture for arrangements:
	  • routing tables
	  • switching routing
	  • time-space-time (TST).

Unit Sector(s)

Telecommunications - Radio frequency networks

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ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to specify the design of worldwide interoperability for microwave access (WiMAX) network architecture. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	ICT technical staff who design and operate WiMAX networks in wireless Core And Access Network implementation apply the skills and knowledge in this unit. Wireless convergence technology in telecommunications particularly applies to the deployment of fast wireless broadband access.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to produce architecture designs for wireless broadband	1.1. Review WiMAX specification 802.16 protocol structure for point-to-point (backhaul) and point-to-multipoint (end user) topologies and identify ***requirements*** of the ***network*** 1.2. Assess ***technical characteristics*** and functions of ***network elements*** in a WiMAX network 1.3. Evaluate advantages of modulation techniques used in wireless access technologies 1.4. Compare characteristics and operating principles of ***multiplexing techniques*** used at the physical layer of wireless access technologies
2. Design architectures	2.1. Develop a proposed network topology for a fixed

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ELEMENT	PERFORMANCE CRITERIA
for a proposed fixed and a mobile WiMAX network	(802.16d) WiMAX network showing the relationship of network elements 2.2. Develop a proposed network topology for a mobile (802.16e) WiMAX network showing the relationship of network elements 2.3. Evaluate ***design considerations*** between a fixed and mobile WiMAX network and produce ***design specifications*** 2.4. Determine appropriate ***multiple-antenna system*** in WiMAX design by considering their ***benefits*** 2.5. Produce a report on the architecture design for a WiMAX network
3. Evaluate network management products	3.1. Research, analyse and evaluate current ***network management products*** 3.2. Produce an evaluation report on the effectiveness of network management products that could be used to manage WiMAX network elements
4. Produce network designs for possible implementation	4.1. Compare WiMAX with other ***competing wireless technologies*** and their interoperability 4.2. Investigate inclusion of wireless fidelity (WiFi) in the design architectures as a complementary technology 4.3. Obtain latest technical ***specifications*** and pricing by contacting possible vendors 4.4. Determine support and training requirements needed 4.5. Produce an ***implementation document*** on WiMAX ***architecture configurations*** and designs and present to ***appropriate person*** for approval

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to evaluate documentation on competing wireless technologies • communication skills to liaise with vendors • numeracy skills to use financial modelling to evaluate a range of architecture

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REQUIRED SKILLS AND KNOWLEDGE

design solutions
• literacy skills to read and interpret technical information
• problem solving skills for a defined range of anticipated problems:
  • when predicting line traffic
  • impact on input and output devices
  • processors from current and future demand requirements
• project planning skills to plan, prioritise and organise work required
• research skills to source, analyse and evaluate broad features of current security issues and best practice in security devices, products and procedures

Required knowledge

• client business domain
• current industry accepted network hardware and software products and their general features and capabilities
• detailed knowledge of:
  • current industry-accepted WiMAX network protocols
  • remote user issues
  • the management systems
  • WiMAX network design
  • WiMAX network traffic evaluation
• current industry security products, devices and procedures and their general features and capabilities
• theoretical concepts of current industry network development and design methodologies

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • apply knowledge of WiMAX communication architecture, hardware, protocols and networking systems

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EVIDENCE GUIDE	
	• integrate other wireless technologies • analyse and evaluate competing wireless technologies • design viable WiMAX network solutions • assess network performance.

Context of and specific resources for assessment	Assessment must ensure:
	• documents detailing:
	  • IEEE 802.16 standards for WiMAX
	  • client requirements
	  • technical specifications
	  • expected traffic volume
	  • vendors and vendor offerings and pricing
	  • information on a range of IT business solutions
	  • future organisational business processes
	  • budget for architecture designs for WiMAX networks.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate assessing network requirement • evaluation of implementation document prepared by the candidate outlining WiMAX architecture designs • oral or written questioning of the candidate to assess knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN6206A Produce an ICT network architecture design • ICTTEN5204A Produce technical solutions from business specifications. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Requirements may refer to:	• application • network • people in the organisation • system • the business.
Network may include:	• data and voice • local area network (LAN) • private lines • internet • use of the public switched telephone network (PSTN) for dial up modems only

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RANGE STATEMENT	
	• wide area network (WAN) • wireless networks.
Technical characteristics may include:	• data rate • frequency bands and classes • modulation techniques • power requirements • range of coverage.
Network elements may include:	• access points • antenna arrays • base stations • gateways • USB adapters.
Multiplexing techniques refer to:	• orthogonal frequency division multiplexing (OFDM) • scaleable OFDM access (SOFDMA).
Design considerations may include:	• capacity planning • cell planning • link budget • positioning and types of antennas • processors • required protocols and architecture • terminals.
Design specifications may include:	• antenna systems • channel sizes • convergence layer • duplex methods • modulation techniques • multiplexing techniques • standards • uploads and downloads.
Multiple-antenna system may include:	• diversity schemes • smart antenna systems (SAS), also known as adaptive antenna and multiple input-multiple output (MIMO) systems.
Benefits may refer to:	• array gain • diversity gain • interference reduction • power combination • spatial multiplexing.

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RANGE STATEMENT	
Network management products may include:	• vendor products • open source (e.g. Netspan) products that could be used to manage WiMAX network elements.
Competing wireless technologies may include:	• 3G/4G cellular networks • WiFi and mobile broadband wireless access (MBWA - IEEE 802.20) • 802.11n
Specifications may include:	• current system functionality • technical requirements • user problem statement.
Implementation document may include:	• audit trails • European Conference of Postal and Telecommunications Administrations (CEPT) standards • client training • European Telecommunications Standards Institute (ETSI) standards • evaluation report • Institute of Electrical and Electronics Engineers (IEEE) standards • implementation plan • ISO standards • naming standards • network topologies • satisfaction reports.
Architecture configurations may include:	• point-to-point or back haul topology • point-to-multipoint or end user topologies.
Appropriate person may include:	• authorised business representative • client • network designer • network planner • project manager.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks

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ICTRFN7182B Produce a radio link budget

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to analyse the technical performance of fixed and mobile radio systems and to plan and calculate link budgets.

Application of the Unit

Telecommunications engineers apply the skills and knowledge in this unit as part of their work with radio systems for a telecommunications service provider.

The job role includes responsibility for establishing the layout of the digital radio system to minimise transmission loss and optimise the system performance.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Analyse suitability of radio systems	1.1 Analyse the spectral efficiency of ***functional elements*** of mobile ***radio systems*** for determining optimal frequency utilisation 1.2 Analyse the features of radio systems to evaluate the effectiveness of a particular application 1.3 Compare the features and specifications of antennas used in radio systems to assist with radio link budget 1.4 Report on the suitability of radio systems, including recommendations to improve network performance
2. Calculate a radio link budget	2.1 Calculate ***path loss*** using ***variables*** in appropriate propagation models for a power link budget 2.2 Evaluate the power link budget against allowable power margins specifications 2.3 Evaluate ***modulation types*** and spectral efficiency 2.4 Confirm radio power link budget achieves ***specified reliability***
3. Complete evaluation and planning documentations	3.1 Complete an evaluation report on performance of radio systems with recommendations on improvements to the system 3.2 Document the processes carried out to determine the optimal power link budget for a radio system

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to review complex information to make judgements
- communication skills to work effectively within a group and present information
- information technology skills for word processing and desktop research
- literacy skills to prepare reports given a specific format
- numeracy skills to:
  - calculate link budgets
  - gather and record data from measurements
- research skills to gather data and information
- technical skills to operate test equipment.
-

Required knowledge

- HF, VHF, UHF and microwave receiving techniques
- modulation methods:
  - AM
  - FM
  - digital formats
- multiplexing systems
- operation of transmitters and receivers
- organisational policy and procedures
- personal safety issues
- propagation methods
- radio communications systems
- radio frequency (RF) losses
- RF technologies
- workplace and industry environment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of	

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assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse the signal degradation characteristics of radio paths and calculate power budgets for various distances and antenna heights versus transmitted power • research the constraints imposed by mobile phone frequency allocations and simulate carrier to interference radiation patterns around a cell site • complete evaluation report on radio system performance and document processes used to determine power link budget.
Context of and specific resources for assessment	Assessment must ensure: • telecommunications operations site • mobile telephony devices and equipment • networked computers and relevant software.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning to assess required knowledge • review of link budget reports completed by the candidate for different communication scenarios • direct observation of the candidate analysing radio systems and calculating link budgets.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTPMG7145B Underatke a telecommunications project • ICTTEN7193B Plan a transmission network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Functional elements may include:	• code division multiple access (CDMA) • frequency division multiple access (FDMA) • time division multiple access (TDMA) • wideband code division multiple access (WCDMA).
Radio systems may include:	• 3G • 4G • CDMA • GPRS • Global system for mobiles (GSM) • trunked • WCDMA • worldwide interoperability for microwave access (WiMAX).

Path loss refers to:	• received power to transmitted power ratio and may depend on:
	  • antenna height
	  • atmospheric absorption

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	• distance • rain • reflection coefficient.
Variables may include:	• clutter factor • Doppler effect on mobile transmission • frequency • Fresnel distance and absorption • K factor • point-to-multipoint • point-to-point • Raleigh fading and counter measures • reflection coefficient.
Modulation types may include:	• FM • AM • orthogonal frequency division multiplex (OFDM) • COFDM • quaternary phase shift keying (QPSK) • 16 quadrature amplitude modulation (QAM) • 256 QAM.
Specified reliability may include:	• drop outs • outage time • power margin • signal fading.

Unit Sector(s)

Telecommunications - Radio frequency networks

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ICTRFN8180B Analyse a cellular mobile network system

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to analyse the detailed architecture and operation of individual cellular mobile elements and develop a plan to integrate emerging cellular technologies.

Application of the Unit

Telecommunications engineers and senior technical officers apply the skills and knowledge in this unit to analyse and manage cellular mobile networks and prepare to upgrade to Next Generation Mobile Networks (NGMG).

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Research mobile network systems and interfaces to interconnected networks	1.1 Analyse the ***interfaces*** between a cellular mobile network and customers, including the public switched telephone network (PSTN) and internet to validate the interoperability of the individual systems 1.2 Research the ***latest generation*** of mobile radio systems and develop a plan for integration of ***emerging cellular technologies*** to meet future demands and customer expectations
2. Analyse constraints imposed by frequency spectrum allocations	2.1 Analyse techniques to ***increase system capacity*** for a fixed spectrum bandwidth 2.2 Plan the ***frequency allocation*** for a cellular network from the derived specifications 2.3 Develop a simulation that plots the ***carrier to interference radiation*** pattern for a given cell geometry in a reflective environment
3. Analyse the operations of the major subsystems of a cellular network	3.1 Evaluate the major ***subsystem functions*** of the cellular network and analyse the ***subsystem components*** to determine capability for upgrades 3.2 Research and report how the major subsystems ***interface to other network subsystems*** 3.3 Simulate the transmission path for a cellular network
4. Analyse system capability	4.1 Simulate traffic flow measurements in a microcellular environment

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	4.2 Produce an analytical report on cellular mobile convergence with a plan for cellular mobile system integration to existing networks

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with internal and external personnel on technical issues
  - work effectively within group
- literacy skills to:
  - interpret technical documentation
  - prepare documents in agreed format
- numeracy skills to:
  - take measurements
  - interpret results
- PC skills to:
  - carry out desktop research
  - do word processing
  - use statistical data
- planning and organisational skills to plan simulations to aid analysis
- problem solving and contingency management skills to:
  - adapt testing procedures to requirements of particular sites
  - modify activities depending on differing operational contingencies, risk situations and environments
- research skills to:
  - evaluate different types of technical data and compare with theoretical values and approved specifications
  - gather and record data from measurements
  - gather data, observe and analyse interfacing issues
- task management skills to:
  - adhere to all safety requirements
  - work systematically with required attention to detail
- technical skills to:
  - enable ’login‘ into cellular network elements for tests and analysis

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- recognise and interrogate cellular network elements alarms
- recognise different transmission techniques
- record fault conditions
- select and use appropriate test equipment and practices to suit different network applications.
-

Required knowledge

- allocations and bandwidth requirements of cellular systems
- approved specifications
- efficiency and system capacity given the spectrum allocation, number of channels required and Grade of Service
- equipment subsystem diagnosis and repair procedures
- features and differences between major frequency bands and their allocation of licenses
- features and operating requirements of cellular test equipment
- interworking with existing systems
- key features of cellular mobile radio systems
- major element functions of a mobile radio system
- major frequency bands and their allocation of licenses
- microcellular systems
- minimising latency
- network components and their functions
- overview knowledge of transmission lines, transmitter and receiver architecture
- radio spectrum in use, specifying restrictions and characteristics
- radio frequency (RF) and electromagnetic energy (EME) hazards
- specific knowledge related to antenna performance and mobile components and their impact on mobile spectrum interference
- spectrum efficiency
- system configuration procedures
- testing network components
- the types of adjustments that need to be made when measuring cellular transmission
- the types of networks that will influence the transmission either on the radio path and/or transmission line.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of	

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assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan a frequency allocation for a cellular network • analyse techniques to increase system capacity for a fixed spectrum bandwidth • develop a plan for integration of emerging cellular technologies • analyse the interfaces between a mobile network and customers • research and report the interfacing of major subsystems to other network subsystems • produce an analytical report on cellular mobile convergence with a plan for cellular mobile system integration to existing networks.
Context of and specific resources for assessment	Assessment must ensure: • sites on which cellular network analysis, research and simulation may be conducted • use of test equipment currently used in industry • manufacturer's and enterprise technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • evaluation of reports prepared by the candidate • review of test documentation and reports completed by the candidate • oral questioning or written questioning to assess required.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG8143B Manage a telecommunications project. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Interfaces may include:	• A • Abis • Iu • Iur • Iub • Iu-CS (circuit switch) • Iu-PS (packet switch) • S1
Latest generation may include:	• 3G • high speed packet access (HSPA)
Emerging cellular technologies may include:	• 2 x 2 multiple input-multiple output (MIMO) • 4 x 4 MIMO • 4G • long term evolution (LTE)

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	• SF-frequency division multiple access (FDMA)
Increase system capacity may include:	• cellular re-use • orthogonal frequency division multiple access – multiple input-multiple output (OFDM – MIMO) • OFDMA • overlay • underlay.

Frequency allocation may include:	• patterns:
	  • 7/21
	  • 4/12
	  • 3/9
	  • 1/1.

Carrier to interference radiation may include:	• carrier interference:
	  • carrier to adjacent (C/A)
	  • carrier to interference (C/I)
	  • carrier to reflection (C/R).

Subsystem functions may include:	• cellular elements:
	  • AUC
	  • base station controller (BSC)
	  • base transceiver station (BTS)
	  • eNode B
	  • node B
	  • home location register (HLR)
	  • HSS
	  • mobile station (MS)
	  • mobile services switching centre (MSC)
	  • SAE
	  • transcoder
	  • visitor location register (VLR)
	• burst timing and content
	• logical channels
	• multiplexing
	• radio path
	• signal protocols.

Sub-systems components may include:	• alarm gathering unit • charging unit • clocking unit • common channel signalling unit • gateway gprs support node (GGSN) • HSS

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	• MME • operation and maintenance unit • SAE gateway • serving GPRS support node (SGSN) • statistical unit.

Interface to other network sub-systems may include:	• application parts:
	  • Base Station System Application Part (BSSAP)
	  • integrated services user parts (ISUP)
	  • managed application provider (MAP)
	• SYGTRAN.

Unit Sector(s)

Telecommunications - Radio frequency networks

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ICTRFN8181B Analyse a satellite communications system

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to analyse the performance of a satellite communications system.

The analysis may be required for a new installation project or an upgrade of capacity or technology in an existing network or as a result of convergence to Next Generation Networks (NGN).

Application of the Unit

Supervisors and engineers who analyse satellite communications systems apply the skills and knowledge in this unit when writing specifications, planning, designing and implementing satellite communications systems.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Research satellite communication systems	1.1 Research ***satellite applications*** with various ***orbit*** types for assessing their spatial positioning for specific purpose 1.2 Analyse and report on the architecture, major subsystems and critical components in the communication systems of a recently launched commercial satellite 1.3 Research and report on ***multiple access techniques*** and their typical applications
2. Analyse uplink and downlink variables	2.1 Determine ***uplink and downlink criteria*** that impact on carrier to noise ratio 2.2 Determine up/down link criteria that impact on baseband signal to noise ratio 2.3 Determine the critical parameters of a satellite system 2.4 Research common types of baseband signal processing, their spectral and noise improvement parameters for determining criteria for link budget evaluations
3. Conduct a link budget analysis	3.1 Produce a satellite link budget and calculate link margin for a satellite system with ***specified modulation types*** 3.2 Analyse the relationship between the bit error ratio (BER) for a given energy per bit per noise power density (Eb/No) and forward error correction (FEC) parameter for determining the operational performance of the link
4. Analyse properties of	4.1 Calculate the ***look angles*** for a geostationary satellite from

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geostationary satellites	any receiving location 4.2 Research and report on ***frequency re-use*** in conjunction with polarisation selection and the use of spot beams 4.3 Analyse and specify the major features of ***very small aperture terminal (VSAT)*** systems, and calculate link reliability in high rainfall regions

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to solve complex problems by making informed judgements and assumptions
- literacy skills to prepare reports following an analysis or evaluation
- planning and organisational skills to develop systems and procedures in solving complex mathematical formulas
- problem solving and contingency management skills to manage unforeseen issues
- research skills to gather and record data from measurements
- technical skills to visualise radio frequency (RF) systems on board operational satellite platforms.
-

Required knowledge

- antenna calculations:
  - gain
  - beamwidth
  - polarisation
  - effective isotropic radiated power (EIRP)
- BER
- carrier/noise ratio
- constellation and eye diagrams
- decibels, dB, dBm, dBW
- distance to satellite and typical delays
- frequency spectrum (satellite bands)
- G/T ratio
- geostationary orbit
- link budget calculation

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- look angle calculations
- low earth orbiting (LEO) satellites
- modulation types:
  - n-FSK:
    - 2FSK
    - 4FSK
  - n-PSK:
    - 2PSK
    - 4PSK
    - 8PSK
    - 16PSK
  - n-QAM:
    - 16 QAM
    - 256QAM
  - spread spectrum:
    - direct sequence
    - frequency hopping.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse satellite communications system architecture • produce a satellite link budget and calculate link margin for a range of digital modulation types • calculate the look angles for a geostationary satellite from any receiving location • analyse and specify the major features of (VSAT) systems.
Context of and specific resources for assessment	Assessment must ensure: • site on which satellite analysis may be conducted • data, calculators and appropriate software tools.

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Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing analysis • review of link budget documentation completed by the candidate • review of look angle calculation reports • oral or written questioning to assess knowledge of satellite communications systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN7182B Produce a radio link budget. Aboriginal people and other people from a non English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Satellite applications may include:	• broadcasting:
	  • broadcast satellite service (BSS)
	  • fixed service satellite (FSS)
	• defence
	• domestic communications
	• earth observation:
	  • mapping
	  • meteorology
	• international communications:
	  • Intelsat
	• global positioning system (GPS)
	• navigational.

Orbit may include:	• geostationary
	• inclined orbit
	• low earth orbiting (LEO):
	  • polar
	  • non-polar
	• Molniya highly elliptical orbit.

Multiple access techniques may include:	• code division multiple access (CDMA) • frequency division multiple access (FDMA) • hybrid multiple access schemes: • FDMA/time division multiple access TDMA • polarisation division multiple access (PDMA) • space division multiple access (SDMA) • time division multiple access (TDMA).
Uplink and downlink criteria may include:	• antenna gain • bandwidth • error correction bits • modulation type • path loss • transmitter power.
Specified modulation	• m-PSK:

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types may include:	• 8PSK • OQPSK • QPSK • M-QAM: • 16QAM • spread spectrum: • direct sequence • frequency hopping.
Look angles include:	• azimuth • elevation.
Frequency re-use may include:	• orthogonal polarisation • spatial discrimination directional beams.
Very small aperture terminal may include:	• availability • latency • multicast • topology.

Unit Sector(s)

Telecommunications - Radio frequency networks

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ICTSMB4160A Set up and operate a contractor business

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to operate a small scale contractor operation involving an owner operator and employees installing telecommunications services. Specific legal requirements apply to small business. Requirements should be confirmed with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to telecommunications installers who operate their own contracting business delivering installation services to major service providers.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Set up a business operation	1.1. Develop a ***business plan*** for a small business operation according to business planning guidelines 1.2. Follow the statutory and legal requirements to register a ***business*** 1.3. Ensure adequate ***business insurance*** policies are held according to business plan and to mitigate risks 1.4. ***Provide and maintain a vehicle*** through purchase, lease or hiring purchase, including managing fringe benefits tax (FBT) liabilities according to business plan
2. Provide customer service	2.1. Determine and maintain a ***customer*** base to support the business plan 2.2. Analyse and determine customer expectations in relation to industry standards 2.3. Provide customer service that meets customer expectations according to enterprise standards 2.4. Monitor and evaluate performance on installations completed against industry standards
3. Perform simple financial management tasks	3.1. Record income and expenditure using bookkeeping tools and software according to normal accounting standards 3.2. Construct a simple financial balance sheet using

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ELEMENT	PERFORMANCE CRITERIA
	banking records or supply information to accountant according to normal accounting standards 3.3. Calculate simple taxation and superannuation requirements or supply information to accountant according to normal accounting standards 3.4. Complete a Business Activity Statement (BAS) or supply data to accountant according to normal accounting standards
4. Cost and quote an installation	4.1. Establish the extent of work to be completed through professional and personable discussions with customer 4.2. Complete a job specification for the ***quote*** with cost estimates of time required to complete work 4.3. Estimate and include cost of materials to be used using supplier quoted prices 4.4. Determine and include a ***margin for profit and ongoing costs*** for installation according to business plan 4.5. Check finalised quote for accuracy according to established policies and procedures 4.6. Submit quote to customer within agreed timeframe

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to relate to customers, employees and government officers
• literacy skills to:
  • develop plans using a set format
  • interpret relevant regulatory, taxation and insurance information
• planning and organisational skills to schedule own work
• problem-solving skills to develop solutions unique to a customer
• numeracy skills to:
  • interpret financial information
  • prepare quotes

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REQUIRED SKILLS AND KNOWLEDGE

• technical skills to:
  • estimate telecommunications work
  • operate simple computer software packages

Required knowledge

• business banking principles
• business registration and licensing requirements
• cash or accrual accounting principles
• Commonwealth, state, territory and local government legislative requirements relating to business operation:
  • anti-discrimination
  • environmental issues
  • equal employment opportunity
  • industrial relations
  • OHS
  • taxation requirements
• costs associated with running a business
• current tax rates
• industry codes of practice
• industry standard:
  • materials and labour costs
  • rates of pay
• nature of legal responsibility
• OHS responsibilities and procedures
• sources of advice and specialist services
• sources of information about regulatory, taxation and insurance requirements and issues

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce a business plan and set up a business • define and meet customer needs • perform simple financial management tasks including completing BAS, FBT and insurance documentation • quote for installation jobs that cover all aspects of costing.

Context of and specific resources for assessment	Assessment must ensure:
	• resources:
	  • Australian Taxation Office (ATO) guides
	  • financial management record keeping software
	  • access to industry standard labour rates and material suppliers
	  • general office bookkeeping procedures
	  • customer service guides.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing business tasks • review of business plans, records and quotes prepared by the candidate • oral or written questioning on required knowledge and skills.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSMB4161A Operate a contractor business with employees. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication

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EVIDENCE GUIDE	
	skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Business plan may include:	• capital investment • cash flow projection • costing for labour • margins for materials • objectives • personnel • products • profit margins • statement of vision or mission • values.
Business may include:	• company • partnership • sole trader.
Business insurance may include:	• equipment

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RANGE STATEMENT	
	• income protection • professional indemnity • public liability • vehicle • workers compensation.
Business planning guidelines may include:	• customer enterprise guidelines • guidelines provided by the Australian Government Initiatives project titled 'business.gov.au'
Provide and maintain a vehicle may include:	• fitting out for business operations • garaging • organising payments • registration • servicing and maintenance.
Customer may include:	• companies • external • individuals • internal • small businesses.
Quote may include:	• detailed costing • job description of work to be undertaken • single price • statement of costs for work.

Margin for profit and ongoing costs may be:	• ongoing costs:
	  • accounting
	  • insurances
	  • registration
	  • tools
	  • vehicle
	• set in the business plan
	• set on a job-by-job basis.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Small and micro business

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ICTSMB4161A Operate a contractor business with employees

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to operate a developing business involving employees in a competitive installation environment. It involves recruiting and managing employees as well as promoting the business and maintaining business compliance. Specific legal requirements apply to small business. Requirements should be confirmed with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit is relevant to installers who operate or are establishing a business employing support staff or installers. It may also apply to a business that uses subcontractors. It does not apply to novice installers and would not be appropriate in a pre-employment training program.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Recruit employees	1.1. Define and document ***employee roles*** 1.2. Locate and tap ***sources of employees*** 1.3. ***Evaluate and select*** candidates for employment based on documented employee roles 1.4. Provide ***induction*** to employees
2. Manage employees	2.1. Assign work to employees in line with employee roles 2.2. Develop a strategy for retention of employees with ***rewards and incentives*** 2.3. Apply a ***payroll operation*** 2.4. Maintain and manage ***employee on-costs*** using a manual or computer-based system 2.5. Monitor and evaluate ***employee performance*** against

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ELEMENT	PERFORMANCE CRITERIA
	business policies and standards
3. Promote the business	3.1. Identify ***growth*** opportunities for the business 3.2. Design and develop advertising material to stimulate growth of the business, including evaluating the process for establishing a ***website*** 3.3. Research the availability of a ***network*** to promote the business
4. Maintain compliance	4.1. Research and identify ***compliance*** requirements for the business 4.2. Develop and implement procedures to ensure compliance 4.3. Implement a system to monitor compliance 4.4. Implement actions to improve compliance performance

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to relate to customers, employees and contractors
- literacy skills to:
  - develop plans using a set format
  - interpret business reports
- problem solving skills to address common business problems
- numeracy skills to check and interpret financial information
- technical skills to:
  - deliver contracting services within timelines and budgets
  - manage human resources within the limits of a small contracting business
  - manage telecommunications work

Required knowledge

- Commonwealth, state, territory and local government legislative requirements relating to business operation:
  - anti-discrimination

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REQUIRED SKILLS AND KNOWLEDGE
• environmental issues • equal employment opportunity • industrial relations • occupational health and safety (OHS) • compliance requirements within the limits of an installation service business • OHS responsibilities and procedures • sources of advice and specialist services

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • recruit employees and document roles • maintain payroll management records • promote business by identifying growth opportunities and advertising • monitor and maintain technical compliance performance.

Context of and specific resources for assessment	Assessment must ensure:
	• resources:
	  • Australian Taxation Office (ATO) guides
	  • financial management record keeping software
	  • human resource texts
	  • recruitment guides
	  • performance management tools
	  • compliance legislation, codes and policies.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing

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EVIDENCE GUIDE	
	business tasks • review of business plans, records and quotes prepared by the candidate • oral or written questioning on required knowledge and skills.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSMB4160A Set up and operate a contractor business. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT

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RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Employee roles may include:	• agreed duties • job role title • documented job description.
Sources of employees may include:	• advertising in public or industry magazines • job agencies • using industry networks and associations.
Evaluate and select may include:	• assessment of on-the-job performance or simulated activities • interview • review of application details.
Induction may include instruction in:	• job role • other workplace conditions • relationship to other employees • safety.
Rewards and incentives may include:	• cash payments • in-kind payments.
Payroll operation may include:	• arrangement of payment to employees • documentation of agreed rates of pay • recording of hours worked.
Employee on-costs may cover costs for:	• allowances for annual and sick leave • sundry other costs of employment • tools and other equipment costs • workers' compensation and other insurances.
Employee performance should include:	• adjusting performance • measuring performance • setting agreed performance expectations.
Growth may include:	• expansion into new regions • more work and employees • wider diversity of clients.
Website may include:	• capabilities • contact details • examples of work

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RANGE STATEMENT	
	• testimonials.
Network may include:	• community groups • government agencies • industry associations • local business • other specialist services • past customers • subcontractors • suppliers.

Compliance may include:	• technical standards:
	  • installation
	  • maintenance.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Small and micro business

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ICTSUS4183A Install and test renewable energy system for ICT networks

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install a renewable energy system and integrate it into the network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit is for technical staff who install ICT networks powered by renewable energy solutions. This results in more efficient systems with cost reduction while meeting sustainability targets.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan to install renewable energy system	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Arrange access to site according to required procedure
	1.3. Assess extent of system implementation using feasibility report and ***organisational guidelines***
	1.4. Produce a report to meet the ***customer*** and ***organisational requirements***
	1.5. Liaise with ***appropriate person*** to obtain approval for the plans with recommendations
	1.6. Determine and source ***renewable energy components*** according to the agreed plan
2. Install and test renewable energy system	2.1. Install and configure components according to occupational health and safety (***OHS***) ***and environmental requirements***, plan, manufacturer's and organisational requirements
	2.2. Identify and resolve problems
	2.3. Integrate the renewable system into the network
	2.4. Test and enhance system performance to meet

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ELEMENT	PERFORMANCE CRITERIA
	organisational requirements
3. Complete documentation and clean up worksite	3.1. Produce an evaluation report on the actual cost-benefits of implementing the renewable energy system to the organisation 3.2. Provide a support manual for the customer 3.3. Record all test results and records for the customer 3.4. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate information from reports
- communication skills to liaise with internal and external personnel on technical, operational and business related matters
- literacy skills to:
  - interpret technical renewable energy systems' installation manuals
  - process and present written and verbal information to a diverse range of people
  - write reports, design solutions and recommendations in required formats
- numeracy skills to assess cost benefits and renewable energy options
- problem solving skills to resolve installation problems
- research skills to determine requirements
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to evaluate alternate energy systems and their compatibility with existing power sources

Required knowledge

- broad knowledge of systems diagnostic features
- business processes

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REQUIRED SKILLS AND KNOWLEDGE

• client business domain, business function and organisation
• compatibility issues and resolution procedures
• configuration of internet protocol (IP) networks
• current industry accepted hardware products and renewable energy system products
• customer and business liaison
• documenting technical specifications
• linkage between processes
• technologies:
  • alternate energy, such as solar, wind, chemical
  • areas of the hardware relevant to configuration and testing
  • installation procedures
  • renewable energy system relevant to configuration and testing
  • renewable energy systems' functionality
  • set-up and configuration procedures
• vendor specifications and requirements for component installation

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • ascertain and meet client requirements for installation of a renewable energy system hardware • plan and connect the hardware components according to vendor and technical specifications.
Context of and specific resources for assessment	Assessment must ensure: • site on which renewable energy solutions can be implemented • renewable energy system currently used in industry • relevant documentation, feasibility studies, equipment manuals and other site related

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EVIDENCE GUIDE	
	documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out installation and testing activities • review of plans completed by the candidate for different sites • oral or written questioning to assess knowledge of legislation and safety procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS5187A Implement server virtualisation for a sustainable ICT system • ICTSUS4185A Install and test power management software • ICTSUS4184A Install and test power saving hardware • ICTSUS4186A Install thin client applications for Power over Ethernet. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • contract law • National Association of Testing Authorities (NATA) requirements • OHS • regulated or industry codes of practice including appropriate Australian Communications and Media Authority (ACMA) technical standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Trade Practices Act.

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RANGE STATEMENT	
Organisational guidelines may include:	• budget constraints • communication methods • dispute resolution • documenting procedures and templates • financial control mechanisms • infrastructure • operational costs.
Customer may include:	• department within the organisation • government department • person within a department • private organisation • third party.
Organisational requirements may include:	• diagnostic policy • preventative maintenance • problem solution processes • roles and technical responsibilities in the IT department • vendor and product service level support agreements • work environment.
Appropriate person may include:	• authorised business representative • infrastructure administrator • network administrator • power systems manager • property manager • supervisor.
Renewable energy components may include:	• converter • deep cycle gel cells • inverter • regulator • solar cells • solar panels • wind generator.

OHS and environmental requirements relate to:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services, including power and gas
	• safety equipment
	  • flashing lights
	  • gas and other hazard detection equipment

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RANGE STATEMENT	
	• safety barriers • trench guards • warning signs and tapes • witches hats • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • special access requirements • suitable light and ventilation • environmental considerations: • clean-up management • clean-up protection • dust • noise • stormwater protection • waste management.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Sustainability

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ICTSUS4184A Install and test power saving hardware

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and test power saving hardware components in servers, motherboards and other networking equipment installed in ICT applications. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who specify, install or upgrade ICT networks apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan to install and test power saving hardware	1.1. Arrange access to site according to required procedure 1.2. Assess extent of system implementation using feasibility report and ***organisational guidelines*** 1.3. Produce a report to meet the ***customer*** and ***organisational requirements*** 1.4. Liaise with ***appropriate person*** to obtain approval for the plans with recommendations 1.5. Determine and source ***power saving hardware components*** according to the agreed plan
2. Install, test and evaluate power saving hardware	2.1. Install and configure components and according to occupational health and safety (OHS) and environmental requirements, plan, manufacturer's and industry standards 2.2. Resolve identified problems 2.3. Test and enhance system performance to meet organisational requirements
3. Complete documentation and clean up worksite	3.1. Produce an evaluation report on the actual cost-benefits of implementing the power saving hardware to the organisation 3.2. Provide a support manual for the customer 3.3. Record all test results and records for the customer

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ELEMENT	PERFORMANCE CRITERIA
	3.4. Restore any changes made to the worksite to customer's satisfaction and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical, operational and business related matters
- literacy skills to:
  - read technical documentation
  - write reports with design solutions and recommendations in required formats
- numeracy skills to assess cost benefits of power saving hardware
- planning and organisational skills to plan, prioritise and monitor own work
- problem solving skills to resolve installation issues
- research skills to interrogate vendor databases and websites to identify solutions to meet client business specifications
- technical skills to evaluate low power devices and methodologies

Required knowledge

- broad knowledge of systems diagnostic features
- business processes
- client business domain, business function and organisation
- compatibility issues and resolution procedures
- configuration of internet protocol (IP) networks
- current industry accepted hardware products
- customer and business liaison
- documenting technical specifications
- linkage between processes
- set-up and configuration procedures
- technologies such as:
  - areas of the hardware relevant to configuration and testing
  - installation procedures
  - power saving hardware functionality
- vendor specifications and requirements for component installation

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • ascertain and meet client requirements for installation and testing of power saving hardware • plan and connect the hardware components according to vendor and technical specifications.
Context of and specific resources for assessment	Assessment must ensure: • site on which energy saving solutions can be implemented • use of current power saving hardware currently used in industry • relevant documentation, feasibility studies, equipment manuals and other site related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out installation and testing activities • review of feasibility report and plans completed by the candidate for different sites • oral or written questioning to assess knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS4183A Install and test renewable energy system for ICT networks • ICTSUS4185A Install and test power management software • ICTSUS4186A Install thin client applications for

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EVIDENCE GUIDE	
	Power over Ethernet • ICTSUS5187A Implement server virtualisation for a sustainable ICT system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Organisational guidelines may	• budget constraints • communication methods

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RANGE STATEMENT	
include:	• dispute resolution • documenting procedures and templates • financial control mechanisms • infrastructure • operational costs.
Customer may include:	• department within the organisation • government department • person within a department • private organisation • third party.
Organisational requirements may include:	• preventative maintenance and diagnostic policy • problem solution processes • roles and technical responsibilities in the IT department • vendor and product service level support agreements • work environment.
Appropriate person may include:	• authorised business representative • infrastructure administrator • network administrator • power systems manager • property manager • supervisor.

Power saving hardware components may include:	• extremely low power motherboards
	• memory devices:
	  • compact flash
	  • electronic drives
	  • flash drives
	  • USB
	• power supply
	• processor.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Sustainability

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ICTSUS4185A Install and test power management software

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and test power management software in network elements. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit is for technical staff who specify, install or upgrade ICT networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan to install power management software	1.1. Arrange access to site according to required procedure 1.2. Assess extent of software implementation using feasibility report and ***organisational guidelines*** 1.3. Liaise with ***appropriate person*** to obtain approval for the plans 1.4. Determine and source new software required
2. Install software	2.1. Bench test software for performance utilising available technology 2.2. Install and configure software according to occupational health and safety (OHS) and environmental requirements, plan, installation procedures and ***organisational requirements*** 2.3. Resolve identified technical problems
3. Complete documentation and sign off procedures	3.1. Document the installation and configuration process according to organisational guidelines 3.2. Provide user documentation 3.3. Notify ***customer*** and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to use information to meet organisational needs in a defined range of areas
• communication skills to:
  • interact with others
  • present information
  • question and actively listen to customers and vendors
• literacy skills to:
  • interpret technical installation manuals for renewable energy systems
  • process and present written information to a diverse range of people
• problem solving skills to meet a defined range of unpredictable problems

Required knowledge
• areas of the hardware relevant to configuration and testing • current industry-accepted software products, with general features and capabilities • installation procedures • OHS requirements in relation to work safety, environmental factors and ergonomic considerations • power saving software functionality • set-up and configuration procedures • systems diagnostic features • vendor specifications and requirements for component installation

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • ascertain and meet client requirements for installation

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EVIDENCE GUIDE	
competency in this unit	and testing of power management software • plan and connect the software components according to vendor and technical specifications across a variety of situations.
	Assessment must ensure: • site on which energy saving solutions can be implemented • use of current power saving software currently used in industry • relevant documentation, feasibility studies, equipment manuals and other site related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out installation and testing activities • review of plans completed by the candidate for different sites • oral or written questioning to assess methodology used.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS5187A Implement server virtualisation for a sustainable ICT system • ICTSUS4183A Install and test renewable energy system for ICT networks • ICTSUS4184A Install and test power saving hardware • ICTSUS4186A Install thin client applications for Power over Ethernet. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Organisational guidelines may include:	• communication methods • documenting procedures and templates • measures to save power.
Appropriate person may include:	• authorised business representative • client • supervisor.
Organisational requirements may include:	• preventative maintenance and diagnostic policy • problem solution processes • roles and technical responsibilities in the IT department • vendor and product service level support

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RANGE STATEMENT	
	agreements • work environment policies and practices.
Customer may include:	• department within the organisation • person within a department • third party.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Sustainability

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ICTSUS4186A Install thin client applications for power over ethernet

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and configure thin client applications to enable power over ethernet (PoE) on a low powered workstation. Thin client refers to a remote office with low band width. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who specify, install or upgrade ICT networks apply the skills and knowledge in this unit. This unit applies to energy and cost efficient installations to meet sustainability targets by remotely feeding PoE.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan to install thin client applications	1.1. Assess extent of applications to be implemented using feasibility report and ***organisational guidelines*** 1.2. Highlight issues associated with adoption of Web 2.0 applications 1.3. Produce an implementation plan and present to ***customer*** 1.4. Liaise with ***appropriate person*** to obtain approval for the plans with any recommendations 1.5. Notify customer for site access
2. Evaluate appropriate applications	2.1. Develop criteria for Web 2.0 applications to satisfy enterprise needs

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ELEMENT	PERFORMANCE CRITERIA
	2.2. Test and evaluate Web 2.0 applications according to agreed criteria 2.3. Present findings to the customer with recommendations on Web 2.0 applications
3. Install hardware components and applications	3.1. Follow occupational health and safety (OHS) and environmental requirements according to plan and manufacturer's specifications 3.2. Develop implementation plans with prioritised tasks and contingency arrangements for minimum disruption to customer 3.3. Install ***hardware components*** and ***thin client software*** needed for the work according to network and ***organisational requirements*** 3.4. Bench test performance of applications 3.5. Resolve identified problems
4. Complete work and document activities	4.1. Document the installation and integration process according to organisational guidelines 4.2. Provide user documentation 4.3. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical, operational and business related matters
- literacy skills to:
  - interpret technical installation manuals
  - process and present written and verbal information to a diverse range of people
  - write reports, design solutions and recommendations in required formats
- planning and organisational skills to plan, prioritise and monitor own work
- problem solving skills to resolve installation issues
- research skills to interrogate vendor databases and websites to identify solutions to meet client business specifications
- technical skills to evaluate thin client software and methodologies

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REQUIRED SKILLS AND KNOWLEDGE
Required knowledge

• business processes
• client business domain, business function and organisation
• compatibility issues and resolution procedures
• configuration of internet protocol (IP) networks
• customer and business liaison
• documenting technical specifications
• linkage between processes
• set-up and configuration procedures
• systems diagnostic features
• Web 2.0:
  • applications and functionality
  • areas of the Web 2.0 relevant to configuration and testing
  • current industry accepted Web 2.0 products
  • vendor specifications and requirements for Web 2.0 applications
  • Web 2.0 application procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine and meet client requirements for thin client applications • install and configure the components according to vendor and technical specifications.
Context of and specific resources for assessment	Assessment must ensure: • site on which remote power feeding applications can be implemented • relevant documentation, feasibility studies and equipment manuals.

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EVIDENCE GUIDE	
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out installation and configuring • review of plans completed by the candidate for different sites outlining resources required • oral or written questioning to assess required knowledge and methodologies used.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS5187A Implement server virtualisation for a sustainable ICT system • ICTSUS4183A Install and test renewable energy system for ICT networks • ICTSUS4184A Install and test power saving hardware • ICTSUS4185A Install and test power management software. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include

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EVIDENCE GUIDE	
	equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Organisational guidelines may include:	• budget allocations • operational costs • organisational cost • projected growth • security.
Customer may include:	• banks • government department • hospitals • private organisation • small and medium enterprises.
Appropriate person may include:	• network administrator • network manager • supervisor.
Hardware components may refer to:	• cards • power feeding • management of desktop systems and screens.

Thin client software may include:	• lockdown configuration software
	• management software:
	  • Axel technologies
	  • Citrix
	  • IGEL Technology
	  • Wyse
	  • Symantec
	• OS X Terminal server software
	• virtualisation software

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RANGE STATEMENT	
	• windows based thin client software.
Organisational requirements may include:	• work environment • problem solution processes • roles and technical responsibilities in the IT department • vendor and product service level support agreements.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Sustainability

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ICTSUS5187A Implement server virtualisation for a sustainable ICT system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and integrate a virtual server in a network to replace multiple physical servers. This is done to reduce power requirements of individual servers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to ICT technical staff who install server networks with energy and cost-efficient systems to meet sustainability targets.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan to implement server virtualisation	1.1. Assess extent of virtualisation to be implemented using feasibility report and ***organisational guidelines*** 1.2. Analyse existing server infrastructure utilisation 1.3. Research and analyse alternative virtualisation scenarios including a risk analysis and relative comparisons of each consideration 1.4. Provide a brief report of proposed preferred plan and describe resources required 1.5. Liaise with ***appropriate person*** to obtain approval for the plans with any recommendations
2. Design virtual server specification	2.1. Confirm network operating system, ***server applications*** and server design with ***customer*** 2.2. Determine product and vendor architecture and ***equipment*** specifications 2.3. Determine technology and resources within ***business requirements*** and budget
3. Install virtual server	3.1. Follow occupational health and safety (OHS) and environmental requirements according to plan and

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ELEMENT	PERFORMANCE CRITERIA
	manufacturer's specifications 3.2. Notify customer for site access 3.3. Create a detailed ***task*** list specifying stages and sequence of work required 3.4. Review hardware and ***software*** to ensure compatibility 3.5. Install the required operating system, additional tools or third-party software as specified in design 3.6. Patch the operating system and applications to ensure maximum security and reliability
4. Integrate and test virtual server	4.1. Determine tests to ensure virtual server ***integration*** 4.2. Develop the test plan referring to resources and network impact 4.3. Run the system tests according to test plan and record outcomes 4.4. Analyse the error report and make changes as required 4.5. Test required changes or additions 4.6. Validate changes or additions against specifications
5. Complete work and document activities	5.1. Document the installation and integration process according to organisational guidelines 5.2. Provide user documentation 5.3. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise with internal and external personnel on technical, operational and business related matters
• literacy skills to:
  • interpret technical installation manuals
  • process and present written information to a diverse range of people
  • write reports, design solutions and recommendations in required formats

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REQUIRED SKILLS AND KNOWLEDGE
• planning and organisational skills to plan, prioritise and monitor own work • problem solving skills to resolve installation issues • research skills to interrogate vendor databases and website to identify different solutions to meet client business specifications • technical skills to evaluate virtual servers and methodologies
Required knowledge

• business processes
• client business domain, business function and organisation
• compatibility issues and resolution procedures
• configuration of internet protocol (IP) networks
• current industry-accepted products
• customer and business liaison
• documenting technical specifications
• linkage between processes
• systems diagnostic features
• technologies:
  • power supply requirements and management
  • registered random access memory (RAM)
  • server design and network architecture
  • set-up and configuration procedures
  • single and multiple processors
  • vendor specifications and requirements for software installation
  • virtual server functionality

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine and meet client requirements for installation and testing of virtual server

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EVIDENCE GUIDE	
	• install, integrate and test virtualisation components according to vendor and technical specifications.
Context of and specific resources for assessment	Assessment must ensure: • site and equipment on which servers can be virtualised • server virtualisation currently used in industry • relevant documentation, feasibility studies, equipment manuals and other site-related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out installation, integration and testing of virtual server • review of plans completed by the candidate for different sites outlining design and resources required • oral or written questioning to assess knowledge of methodologies used.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS4183A Install and test renewable energy system for ICT networks • ICTSUS4184A Install and test power management software • ICTSUS4185A Install and test power saving hardware • ICTSUS4186A Install thin client applications for Power over Ethernet. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the

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EVIDENCE GUIDE	
	candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Organisational guidelines may include:	• budget allocations • operational costs • organisational cost • projected growth • security.
Appropriate person may include:	• IT consultant • IT specialist • network administrator • network manager.
Server applications may include:	• database and data warehousing • directory services • file sharing • line of business applications • management • messaging • network and remote access

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RANGE STATEMENT	
	• printer sharing • server virtualisation • terminal services • web services.
Customer may include:	• company representative • government department • private organisation.
Equipment may include:	• digital subscriber line (DSL) modems • hard drives • hubs • modems and other connectivity devices • monitors • peripheral devices • personal computer • personal digital assistant (PDA) • printers • switches • workstations.
Business requirements may relate to:	• application • network • people • system.
Task may include:	• activities • function • job • work.
Software may include:	• customised • in-house • open source software applications • organisation-specific software • packaged software.
Integration may involve:	• power supply requirements and management • registered RAM • requirements for software installation • server design and network architecture • set-up and configuration procedures • single and multiple processors • vendor specifications.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Sustainability

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ICTSUS6233A Integrate sustainability in ICT planning and design projects

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to integrate sustainability concepts and policies into ICT planning and design projects. It involves accessing industry information and applying legislative and occupational health and safety (OHS) guidelines. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical managers, supervising technicians, project managers, consultants or contractors in organisations conducting ICT planning or design projects apply the skills and knowledge in this unit. Typical ICT projects involve upgrades of equipment hardware and software or new installations of Next Generation Networks (NGN) using emerging technologies.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to integrate sustainability into the planning and design stages of an ICT project	1.1. Evaluate suitable ICT ***projects*** into which sustainability can be integrated 1.2. Negotiate with the ***stakeholders*** to establish the extent to which sustainability is to be integrated 1.3. Research and identify suitable technology solutions applicable to the project 1.4. Gather power consumption data on ***ICT equipment*** required for an ***energy audit*** based on an ***agreed standard***
2. Devise strategies for incorporating sustainability into an	2.1. Determine and oversee implementation of ***short term technology solutions*** to achieve reduction of power consumption

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ELEMENT	PERFORMANCE CRITERIA
ICT project	2.2. Initiate and progress ***sustainable management principles*** which result in reduced environmental impact 2.3. Establish, regularly review and improve ***key performance indicators*** (KPI) on sustainability performance 2.4. Incorporate innovative planning and design rules for ICT projects which foster sustainability and environmental best practice
3. Analyse energy audit data	3.1. Identify ***energy usage*** within the scope of the ICT project and provide a ***detailed report*** 3.2. Estimate potential energy savings and payback periods for recommended actions 3.3. Estimate the carbon dioxide ($CO_{2)}$ emissions for the nominated project 3.4. Evaluate the estimated CO_2 emissions with comparable ***benchmarks*** 3.5. Make recommendations in order of priority and give estimates of implementation costs on integration of sustainability for other ICT projects

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - compare and evaluate effective technical solutions involving integration of sustainability
  - interpret technical specifications and related sustainability documentation
- communication skills to:
  - adjust communication to suit different audiences
  - liaise with customers to outline sustainability strategy benefits and how they can be incorporated into the project within specified timeframes
  - negotiate approvals and contract arrangements with suppliers and contractors
  - respond effectively to diversity

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REQUIRED SKILLS AND KNOWLEDGE

- to consult on and validate policy
- work as a member of a team

- literacy skills to:
  - document technical requirements and procedures
  - evaluate complex and formal documents such as policy and legislation
  - prepare written reports requiring precise expression, language and structures suited to the intended audience
- numeracy skills to:
  - analyse and confirm capacity requirements
  - calculate budget requirements and limitations
  - determine workforce requirements
  - estimate CO_2 emissions
- organisational skills to arrange relevant documentation and approvals
- planning and organisational skills to:
  - set out project requirements and priorities
  - make site access and equipment delivery arrangements
- problem solving skills to account for unexpected variations to requirements, and to effectively manage different points of view and dissenting stakeholders
- research skills to:
  - research and present information
  - gain and maintain relevant and current technical product knowledge
- technical skills to integrate sustainability into a technical project

Required knowledge

- best practice approaches relevant to own work area
- environmental or sustainability legislation, regulations and codes of practice applicable to industry and organisation
- equal employment opportunity, equity and diversity principles and OHS safety implications of policy being developed
- estimated CO_2 emissions
- ICT power consumption calculations
- policy development processes and practices
- power consumption audit methodology
- principles, practices and available tools and techniques of sustainability management relevant to the telecommunications industry
- quality assurance systems relevant to own organisation
- relevant industry competence
- relevant organisational polices, procedures and protocols
- systems and procedures to aid in the achievement of workplace sustainability

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and integrate sustainability into ICT projects by devising strategies to conserve resources • analyse energy audit data on enterprise resource consumption • develop and monitor policies for review and improvements, benchmarking against industry best practice and attempting new approaches continuously over time.

Context of and specific resources for assessment	Assessment must ensure:
	• sites on which planning, design and integration of sustainability may be carried out
	• relevant legislation, standards, guidelines, reports and equipment specifications and drawings
	• range of workplace documentation, personnel, information and resources:
	  • compliance obligations
	  • organisational plans
	  • work responsibilities.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate analysing energy audit data • review of policy developed and procedural documentation completed by the candidate outlining the approach taken • review of implementation strategy, plans and work plans completed by the candidate • evaluation of methods used to involve stakeholders in policy development, implementation and review.

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EVIDENCE GUIDE	
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG6033A Develop project management plan • ICTPMG6034A Prepare a detailed design brief • ICTTEN6206A Produce an ICT network architecture design. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

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RANGE STATEMENT	
regional contexts) may also be included.	
Projects may include:	• advanced meter infrastructure (AMI) • alternative energy cellular base station sites • equipment upgrades • introduction of new technology • passive optical network (PON) technology for fibre to the premises (FTTP) • smart grid partnerships • software upgrade.
Stakeholders may include:	• competitors • customers • employees • investors • media • regulators • society.
ICT equipment may include:	• data storage • firewall • multiplexer • printer • router • server • switch • telephone system • workstation.

Energy audit may refer to:	• AS/NZ 3598:2000:
	  • Level 1 consumption benchmark
	  • Level 2 preliminary assessment
	  • Level 3 economic analysis.

Agreed standard may include:	• AS/NZ 3598:2000 (or latest revision) • BS EN 16001:2009 Energy Management Systems • ISO 14001:2004 Environment.

Short term technology solutions may include:	• energy efficient hardware
	• hibernation of:
	  • hard drive
	  • LCD monitor
	  • workstation
	• multifunction devices

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RANGE STATEMENT	
	• remote energy management • replacing desktop PCs with thin clients • server virtualisation • use of videoconference technology.

Sustainable management principles may include:	• audit waste management procedures
	• improving the energy efficiency of ICT network equipment:
	  • reducing the need for air conditioning
	  • shutting down equipment during low demand
	• supply chain:
	  • driving ethical values through the supply chain
	  • engaging supplier's involvement in emissions reporting and continual improvement
	  • engaging suppliers who provide information on energy consumption and product lifecycles
	  • influencing suppliers to provide energy efficient products and services
	• procurement strategies:
	  • assessment of suppliers' environmental policies and procedures
	  • lowering of energy consumption or environmental impact of replacement products or services
	  • managing the environmental impacts of electrical and electronic equipment
	  • use of energy consumption and environmental impact as criteria in the process of awarding contracts.

Key performance indicators (***KPIs***) may include:	• kg CO_2 emitted per floor area occupied in permanent buildings • kg CO_2 emissions from company car fleet • percentage of timber used in construction from well managed, sustainable sources • percentage volume of material from sustainable sources • reduction of quantity (in 1000's kg) of ozone depleting gases used in air-conditioning

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RANGE STATEMENT	
	equipment.
Energy usage may include:	• a percentage of overall energy use in this project • individual equipment • location.
Detailed report may include:	• details of energy efficiency improvements • energy consumption records • energy saving practices and financial returns • energy use in graphical form • executive summary with recommendations • implementation costs • payback periods • review process • timelines.
Benchmarks may include:	• AccountAbility AA1000 Assurance Standard (2008) • BSI BenchMark • Carbon Disclosure Project (CDP) • Dow Jones Sustainability Index (DJSI) • Global Reporting Initiative (GRI) G3 guidelines (telecommunications sector supplement).

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Sustainability

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ICTSUS6234A Establish a business case for sustainability and competitive advantage in ICT projects

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to establish a business case to justify innovative implementation of sustainability in ICT projects. Organisations may gain competitive and operational advantage by developing sustainability plans which meet customer and stakeholder expectations and public and regulatory demands. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical managers, supervising technicians, project managers, consultants or contractors who have responsibility for conducting or managing ICT projects apply the skills and knowledge in this unit. This unit will prepare the participant in planning and conducting cost benefit analysis and return on investment for the implementation of sustainable schemes at the enterprise level

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare information for establishing a business case	1.1. Evaluate the proposed ICT project to determine the scope and potential of sustainability integration 1.2. Research ***appropriate sources of information*** relevant to the project to prepare the business case 1.3. Analyse and evaluate the ***expected goals*** of the project and relate the business case to broader organisational goals 1.4. Identify and consult with ***stakeholders*** to plan and

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ELEMENT	PERFORMANCE CRITERIA
	validate options 1.5. Identify and report on any assumptions and known ***constraints*** that can impact on the project
2. Produce the Business Case for the ICT sustainability project	2.1. Evaluate the ***critical success factors*** to determine the vital strategy for the project to successfully implement sustainability and gain competitive advantage 2.2. Prepare a cost-benefit analysis and estimate ***overall benefit*** obtained by introducing or improving sustainability in the project 2.3. Prepare an ***estimate of costs*** over an appropriate time period and determine the potential the ***return on investment*** (***RoI***) 2.4. Evaluate and analyse ***alternative options*** to determine the benefits, disadvantages, costs and risks
3. Produce business case documentations	3.1. Validate the options with stakeholders and determine the recommended option 3.2. Prepare an implementation plan for the recommended option for the ICT project 3.3. Produce an ***executive summary*** of the proposal including the consequences of not implementing the sustainability activity

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to compare and evaluate effective technical solutions involving introduction or improvement of sustainability
- research and writing skills to research and present information, and to prepare written business cases requiring precise expression, language and structures suited to the intended audience
- communication skills to:
  - prepare a press release regarding the level of achievement of sustainability benchmarks, environmental targets and performance highlights
  - liaise with customers to outline the resulting sustainability benefits

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REQUIRED SKILLS AND KNOWLEDGE

- adjust communication to suit different audiences
- respond effectively to diversity
- work as a member of a team
- consult on and validate policy

- literacy skills to:
  - prepare a business case
  - evaluate complex and formal documents, such as government policy and legislation
  - interpret technical specifications and related sustainability documentation
  - document technical requirements and procedures
- numeracy skills to:
  - determine workforce requirements
  - analyse and confirm capacity requirements
  - calculate budget requirements and limitations
  - perform calculations related to life cycle assessment (LCA)
- organisational skills to arrange relevant documentation and approvals
- planning and organisational skills to:
  - set out project requirements and priorities
- problem solving skills to account for unexpected variations to requirements, and to effectively manage different points of view and dissenting stakeholders
- research skills to gain and maintain relevant and current technical product knowledge
- technical skills to utilise sustainability software tools
- project management skills to undertake or manage a complex project

Required knowledge

- best practice approaches relevant to sustainability
- environmental and sustainability legislation, regulations and codes of practice applicable to industry and organisation
- equal employment opportunity, equity and diversity principles and occupational health and safety (OHS) implications of policy being developed
- policy development processes and practices
- principles, practices and available tools and techniques of sustainability management relevant to the ICT industry
- quality assurance systems relevant to own organisation
- relevant industry competency
- relevant organisational polices, procedures and protocols
- relevant systems and procedures to aid in the achievement of workplace sustainability
- ICT power consumption calculations

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REQUIRED SKILLS AND KNOWLEDGE
• energy consumption and energy audit methodology • environmental impacts of products, processes, systems and services

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • candidate's involvement as a key person in establishing a business case to introduce or improve sustainability in an ICT project • implementation strategy, as part of the policy, that has been devised, implemented and reviewed showing a measurable improvement utilising the chosen benchmark indicators • communicating with stakeholders to discuss approaches to sustainability improvements development and implementation, and contributing to the resolution of disputes among stakeholders • using software systems for recording and filing documentation for measurement of current usage and using word processing and other basic software for interpreting charts, flowcharts, graphs and other visual data and information • reviewing and improving policies by identifying improvements and benchmarking against industry best practice and attempting new approaches continuously over time.
Context of and specific resources for assessment	Assessment must ensure: • sites on which preparation of a business case for introducing or improving sustainability in an ICT project may be carried out • access to relevant legislation, standards, guidelines, reports and equipment specifications and drawings

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EVIDENCE GUIDE	
	• access to a range of workplace documentation and personnel, information and resources, such as compliance obligations, organisational plans, work responsibilities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third-party workplace reports of on the job performance by the candidate • review of policy developed and procedural documentation outlining the approach taken • review of implementation strategy, plans and work plans • analysis of methods used to involve stakeholders in policy development, implementation and review • evaluation of participation in sustainability work practices and programs • observation over time in relation to review of work area relating to policy and procedures being developed to assess measurement of resources used, hazards and compliance.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG6033A Develop project management plan • ICTPMG6034A Prepare a detailed design brief • ICTTEN6206A Produce an ICT network architecture design Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Appropriate sources of information may include:	• International standards for environmental management - Life cycle assessment
	  • AS/NZS ISO 14040:1998
	  • AS/NZS ISO 14041:1999
	  • AS/NZS ISO 14042:2001
	  • AS/NZS ISO 14043:2001
	  • AS/NZS ISO 14048:2003
	• AS/NZS 3598:2000
	• BS EN 16001:2009
	• United States Environmental Protection Agency (EPA) - Life Cycle Assessment: Principles and Practice EPA/600/R-06/060 May 2006
	• Dow Jones Sustainability Index (DJSI).

Expected goals may include:	• achieving best practice in products, processes or services while protecting the environment without sacrificing profitability • enhancing company reputation

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RANGE STATEMENT	
	• guiding new product development to reduction of resources and emissions • improving public perception • providing information on trade-offs of alternative processes, products and materials.
Stakeholders may include:	• business partners • community • customers • government organisations • shareholders • staff • technical experts.
Constraints may include:	• existing business partnerships and arrangements • existing contracts or service level agreements • reluctance to accept change.
Critical success factors may include:	• customer satisfaction • increase in customers • new sources of business • positive cash flow • profit margin • quality of products and services • revenue growth.
Overall benefit may include:	• better use of workspace • employee satisfaction • enhanced brand value • enhanced company reputation • improved public perception • more reliable service to customers • tangible benefits and intangible benefits.
Estimate of costs may include:	• annual operating costs • capital costs • detailed breakdown of costs • recurring costs • summary of costs by category.
Return on investment (***RoI***) may include	• carbon trading • project life • rate of depreciation • simple RoI calculation.

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RANGE STATEMENT	
Alternative options may include:	• a range of approaches • an option that achieves same result as preferred option • collaborative delivery • in-house delivery of the project • innovative approaches.
Executive summary may include:	• background to the proposal • introduction to the proposal • past and current environment • rationale for establishing the business case at this time.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Sustainability

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ICTSUS7235A Use ICT to improve sustainability outcomes

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to improve sustainability outcomes through the reduction of environmental, economic and social impacts for a range of industries using ICT based solutions. It involves meeting the requirements for monitoring and reporting of greenhouse gas emissions and using ICT for creating opportunities to improve sustainability by addressing products, services and processes specific to specific enterprises and industries. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit is applies to individuals employed as an ICT consultant or with an ICT related role in an organisation. Work normally involves a high degree of autonomy or is within a management team with a high level of responsibility.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Design and manage a sustainability audit	1.1. Use an audit tool reflects criteria of benchmark, nature of risks, relevant information and data types, evaluation of performance and legislative requirement 1.2. Define the scope, objectives and benchmarks for the audit in consultation with relevant stakeholders 1.3. Use an ***audit tool*** to reflect criteria of benchmark, nature of risks, relevant information and data types, evaluation of performance and legislative requirement 1.4. Document requirements for audit resources, timing, schedule and responsibilities consistent with industry

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ELEMENT	PERFORMANCE CRITERIA
	best practice and relevant standards 1.5. Ensure ***collection strategies*** are objective, systematic and that information and data is valid and reliable 1.6. Report outcomes clearly and concisely, including benefits to be achieved by adoption of audit report recommendations
2. Monitor energy consumption and emissions	2.1. Analyse requirements of the National Greenhouse and Energy Reporting System (NGERS) and other relevant ***legislation*** and industry standards in relation to a range of ***industries*** and the needs of specific organisations 2.2. Identify links with functional areas and environmental management systems to ensure comprehensive information and data collection 2.3. Determine ***hardware*** and ***software*** required for collecting, collating, analysing and reporting emissions related information and data 2.4. Factor requirement for an external audit into the monitoring proposal 2.5. Critically evaluate energy consumption and emissions data 2.6. Develop improvement strategies based on the review of data 2.7. Use industry ***best practice*** as a quality benchmark
3. Develop ICT solutions to improve sustainability outcomes	3.1. Research and analyse ***mitigation and adaptation strategies*** appropriate for a range of industries 3.2. Benchmark and document performance expectations in consultation with relevant stakeholders 3.3. Develop and document technical specifications including hardware, software, networking, interface and security requirements 3.4. Determine timelines, resources and costs for implementation and ongoing monitoring and maintenance 3.5. Analyse the impact of ICT solution in relation to performance benchmarks 3.6. Analyse opportunities and develop recommendations to improve sustainability of enterprise products, services and processes 3.7. Present report for client sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to read and evaluate complex and formal documents such as legislation and technical reports
• communication skills to consult with stakeholders and liaise with clients
• literacy skills to prepare written reports and other documentation requiring precision of expression and language and structures suited to the intended audience
• research skills to analyse and present information
• technical skills to:
  • conduct an ICT sustainability audit
  • quantify sustainability objectives, targets, achievements and measures
  • use relevant systems and procedures to aid in the achievement of emissions reduction

Required knowledge
• auditing sustainability processes and practices • corporate social responsibility • development processes and practices • hazard identification and control • industry standards • legislation framework underpinning sustainability • principles, practices and available tools and techniques of sustainability management relevant to a range of industries • relevant ISO standards • sustainability from a local, national and international perspective • sustainability including ecological, economic and social issues • technical performance measurement

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the

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EVIDENCE GUIDE	
performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • audit and analyse patterns of energy use • develop monitoring and reporting systems that comply with regulatory requirements • develop a workable implementation strategy • formulate solutions using ICT to reduce emissions • develop benchmarks for reviewing and improving performance.

Context of and specific resources for assessment	Assessment must ensure:
	• relevant reports:
	  • government
	  • Intergovernmental Panel on Climate Change (IPCC)
	  • scientific
	• conference papers
	• vendor white papers
	• resources, tools and networking equipment
	• suitable hardware and software
	• suitable bandwidth for internet connections
	• relevant legislation and regulations
	• manufacturers' technical specifications
	• relevant ISO standards.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate managing organisation sustainability • review of analyses, plans and reports completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS7236A Manage improvements in ICT

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EVIDENCE GUIDE	
	sustainability. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Stakeholders may include:	• clients and customers • Federal Government • local government • management • non-government organisations (NGOs)

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RANGE STATEMENT	
	• shareholders • staff • state government • suppliers.
Audit tool may include:	• National Carbon Accounting System Data Viewer • National Carbon Accounting Toolbox.
Collection strategies may include:	• electricity billing information • hardware sensor devices.
Legislation may include:	• Australian Government White paper • Australian Government Green paper • Carbon Pollution Reduction Scheme (CPRS) • Emissions Trading Scheme (ETS).
Industries may include:	• building • electricity • logistics • motor.
Hardware may include:	• sensors • wireless sensor networks.
Software may include:	• avoiding mass extinctions engine (AMEE) • carbon footprint calculators • logica carbon reporting software • online system for comprehensive activity reporting (OSCAR) • statistical analytic software (SAS) carbon reporting software • sustainability SCO2 (Software CO2).
Best practice information may be found in:	• 2020 Report • company case studies • vendor white papers.
Mitigation and adaptation strategies may include:	• broadband or telepresence • carbon capture and storage (CCS) • geosequestration • household monitoring • monitoring sources of energy that produce CO2 • remote workstation solutions • The Intelligent Office.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Sustainability

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ICTSUS7236A Manage improvements in ICT sustainability

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to reduce the sustainability related impacts of ICT operations through energy conservation, energy efficiency and changing user behaviour. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to individuals employed as an ICT consultant or in an ICT related role in planning and design of networks in an organisation. Work normally involves a high degree of autonomy or is within a management team with a high level of responsibility.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Critically analyse an organisation's ICT assets energy footprint	1.1. Audit and assess level and type of use across the range of ***ICT devices***, ***infrastructure*** and ***software*** 1.2. Audit and establish baselines of ICT energy consumption and other elements contributing to the organisation's carbon footprint 1.3. Assess ICT usage in relation to its contribution to the organisation's business goals and priorities 1.4. Determine critical issues for the organisation relevant to ICT usage and carbon footprint 1.5. Assess current ICT usage in relation to sustainable ***asset management*** 1.6. Apply industry ***best practice*** where appropriate
2. Develop ICT sustainability strategies and policy	2.1. Include goals for reduction of ***sustainability impacts*** and equipment ***life cycle management*** approaches in organisational policy 2.2. Check policy scope is consistent with ***industry standards and benchmarks*** and amend where necessary 2.3. Ensure policy reflects the organisation's commitment

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ELEMENT	PERFORMANCE CRITERIA
	to sustainability as an integral part of business planning and as a business opportunity 2.4. Consult with ***stakeholders*** as an integral part of policy development, implementation and review processes 2.5. Recommend policy options based on effectiveness, timeframes and cost 2.6. Develop and produce strategies for implementation, monitoring, review and audit as part of the policy documentation.
3. Formulate technical and behavioural solutions to improve ICT sustainability	3.1. Determine and document hardware, software, network and interface requirements of solutions 3.2. Develop ***strategies*** to improve sustainability outcomes including for example energy efficiency and ***alternative energy sources*** 3.3. Develop guidelines for improving ***sustainability*** through asset management 3.4. Document requirements, resource allocations, training needs and implementation timelines for selected strategies and obtain sign off from relevant stakeholders
4. Monitor and evaluate sustainability data	4.1. Develop criteria for measuring performance improvement 4.2. Identify trends that may indicate the need for remedial action and use to promote continuous improvement of performance 4.3. Modify policy and technical solutions in response to data analysis to ensure improvements are made 4.4. Determine scope, frequency and method of monitoring and reporting in consultation with stakeholders 4.5. Review data to ensure compliance with the management of sustainability and legislative requirements 4.6. Document findings and present to stakeholders

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to research, analyse and present information
- communication skills to consult with stakeholders
- literacy skills to:
  - read and evaluate complex and formal documents, such as legislation and technical reports
  - prepare written reports and other documentation requiring precision of expression and language and structures suited to the intended audience
- safety awareness skills to implement enterprise occupational health and safety (OHS) policy and procedures
- technical skills to:
  - quantify sustainability objectives, targets, achievements and measures
  - use relevant systems and procedures to aid in the achievement of ICT sustainability

Required knowledge

- energy efficiency and alternative energy sources
- hazard identification and control
- industry standards
- IT:
  - hardware
  - interfacing
  - networking
  - software
- legislation framework underpinning sustainability
- policy development processes and practices
- principles, practices and available tools and techniques of sustainability management in the ICT industry
- relevant ISO standards
- sustainability from a local, national and international perspective
- sustainability including ecological, economic and social issues

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse patterns of ICT use • develop policy that complies with regulatory requirements • develop a workable implementation strategy • formulate solutions to reduce ICT-based emissions • develop measurable criteria for reviewing improvement.

Context of and specific resources for assessment	Assessment must ensure access to reference materials, resources and equipment updated regularly to meet rapid changes to technology:
	• relevant reports:
	  • government
	  • Intergovernmental Panel on Climate Change (IPCC)
	  • scientific
	• conference papers
	• vendor white papers
	• resources, tools and networking equipment
	• suitable hardware and software
	• suitable bandwidth for internet connections
	• relevant legislation and regulations
	• manufacturers' technical specifications
	• relevant ISO standards.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate formulating and carrying out sustainability measures in operations • review of analyses and solutions developed by the candidate • review of monitoring and evaluations completed by the candidate • oral or written questioning to assess required

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EVIDENCE GUIDE	
	knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS7235A Use ICT to improve sustainability outcomes. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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RANGE STATEMENT	
ICT devices may include:	• copies or multi-functional devises (MFDs) • laptops • PC peripherals • PCs • printer.
Infrastructure may include:	• air-conditioned • cabling • data centre and IT facilities • data storage • power supply and distribution • router • server • switches.

Software may include:	• business systems software:
	  • customer relationship management (CRM)
	  • environmental resource management (ERM)
	• in-house software
	• operating system
	• sink wrapped applications
	• web services.

Asset management may include:	• deployment
	• disposal
	• operation
	• procurement:
	  • product evaluation
	  • product specification
	  • purchasing cycles
	  • vendor selection..

Best practice information may be found in:	• publications • reports • research papers • white papers.
Sustainability impacts may include:	• greenhouse gas emissions • resource consumption and disposal • social impacts.
Life cycle management may include:	• asset management: • product evaluation

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RANGE STATEMENT	
	• product specification • purchasing cycles • vendor selection • supplier chain: • design • manufacture • transportation.
Industry standards and benchmarks may include:	• AS/NZ 3598:2000 (or latest revision) • BS EN 16001:2009Energy Management Systems • BSI BenchMark • Carbon Disclosure Project (CDP) • Dow Jones Sustainability Index (DJSI) • Global Reporting Initiative (GRI) G3 guidelines (telecommunications sector supplement) • ISO 14001 Environment AccountAbility AA1000 Assurance Standard (2008) • AS/NZ 3598:2000: • Level 1 consumption benchmark • Level 2 preliminary assessment • Level 3 economic analysis.
Stakeholders may include:	• customers • federal government • local government • management • non-government organisations • shareholders • staff • state government • suppliers.
Strategies may include:	• broadband networking • energy efficiency and conservation • location of facilities • power management • virtualisation.
Alternative energy sources may include:	• cogeneration • fuel cells • other renewable sources

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RANGE STATEMENT	
	• solar • wind.
Sustainability may include:	• maximising utilisation • maximising value to business • reducing consumption.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Sustainability

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ICTSUS8237A Lead applied research in ICT sustainability

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan, conduct and report on applied research to influence strategic practices on ICT sustainability and outcomes within an organisational context. The unit also covers constructing an applied research strategy, using a range of applied research techniques, and analysing and presenting findings. The competitive context and the evolution of technologies in the ICT sector mean that the capacity to innovate is important. Energy and climate change strategies, supply chain and product responsibility and innovation are key factors in achieving sustainability targets. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to leaders or enterprise managers using applied research to enhance individual, team and organisational performance in sustainability. The intended purpose and approach to applied research may vary across a range of contexts and organisations. In this unit, the focus is on applied research to attain improved organisational outcomes. It involves leading a

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	range of research activities and techniques that, in combination, can provide quality information to enhance the development of capabilities in an enterprise to reach sustainability targets.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Not Applicable

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
1. Provide	1.1 Provide vision for the ***applied research strategy*** to meet the

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direction for the development of an applied research strategy for ICT sustainability	sustainability requirements of the identified research purpose 1.2 Clarify and confirm ***applied research purpose*** and needs of the ***target group*** 1.3 Facilitate the development of policies and procedures in relation to conducting applied research for the enterprise 1.4 Guide the development of mechanisms for collecting and maintaining data in a systematic manner 1.5 Review ***factors affecting the reliability and validity*** **of data** 1.6 Review relevant research ethics and codes of conduct
2 Control the use of a range of applied research techniques and resources	2.1 Review and evaluate a range of ***applied research methods and theories*** and ***data collection techniques*** 2.2 Guide the selection of appropriate methods to gather and analyse data on sustainability relevant to the research project 2.3 Authorise access to ***appropriate sources of information*** relevant to the research project 2.4 Select ***sustainable management principles*** that will have the most sustainable impact on the project 2.5 Ensure ***relevance of the research*** through integrity of the data collected and analysis tools used
3 Promote findings	3.1 Ensure accuracy of data and research details and adherence to any ***legal requirements*** 3.2 Evaluate the relevance of collated and analysed data against the original applied research strategy 3.3 Evaluate the impact of findings 3.4 Recommend implementation strategies 3.5 Ensure documentation and presentation of ***research findings*** is in a clear and logical manner consistent with audience needs 3.6 Identify the need for and an appropriate approach to, further research 3.7 Promote research findings and the approach to further research

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to: • analyse and interpret structurally intricate information in the area being

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REQUIRED SKILLS AND KNOWLEDGE

researched
    - evaluate effective technical solutions in sustainability implementation
- communication and teamwork skills to:
    - consult with target groups using a range of communication techniques
    - develop written texts which deal with complex ideas and concepts
    - present research findings creatively to meet audience needs
- literacy skills to:
    - document technical requirements and procedures
    - evaluate complex and formal documents such as policy and legislation
    - prepare written reports requiring precise formats and structures to suit target audience
- numeracy skills to:
    - analyse and confirm research findings such as carbon dioxide (CO_2) emissions and carbon footprint
    - perform statistical analysis of trends and changes
- initiative and enterprise skills to discover and source appropriate information, and to identify future implication of information and data collected
- planning and organising skills to:
    - construct an applied research strategy
    - initiate and design research methodology
    - manage an applied research project
- problem solving skills to:
    - analyse research
    - check the integrity of data collected
    - collect, organise, analyse and present data
    - conduct trend analyses
    - develop and examine the validity of the applied research strategy using a range of applied research techniques
    - evaluate a range of sustainable management principles
- self-management and learning skills to:
    - conduct research to develop capabilities and learning related activities
    - manage own time and determine priorities
    - review and adhere to relevant ethics and codes of conduct
    - store data to maintain privacy and confidentiality of information
- technical skills to:
    - select suitable technology and technical services
    - use a range of software tools to analyse technical data
    - use technology and web media to discover, access, collect and store data, information and research in a systematic manner

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REQUIRED SKILLS AND KNOWLEDGE

• leadership skills to:
  • set research directions, make decisions and solve problems
  • manage, guide and influence research team members
  • communicate, motivate and facilitate research team interactions

Required knowledge
• environmental and sustainability legislation, regulations and codes of practice applicable to industry and organisation • audit methodology on ICT energy, waste, product life cycles and CO_2 emissions • principles, practices and available tools and techniques of sustainability management relevant to the telecommunications industry • communication processes and methods • data collection methods • legislation, regulations, policies, procedures and guidelines relating to handling or storing data, including privacy and freedom of information • presentation techniques • reporting methods • research ethics and codes of conduct • research tools and methods • selection of appropriate applied research techniques • leadership strategies relevant to a research environment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• lead the formulation of a research proposal or plan which includes:
	  • specific research questions on sustainability
	  • valid population or sample size
	  • description of the geographical, cultural, social or institutional context within which the research

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EVIDENCE GUIDE	
	will be carried out • full description of the data collection methods • analysis of the limitations to research design • lead the design of an applied research project using appropriate tools and techniques • design a research report with analysis of data, and valid and reliable findings • evaluate relevance of the research results • apply knowledge of applied research techniques.
Context of, and specific resources for assessment	Assessment must ensure: • research activity that relates to an actual workplace or simulated context and topic • range of tools and techniques appropriate to the given situations and research topic.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • review of projects relating to conducting applied research conducted by the candidate • direct observation of the candidate applying research skills • oral or written questioning to assess knowledge of applied research.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS8238A Conduct and manage a life cycle assessment for sustainability. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally

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EVIDENCE GUIDE	
	appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Applied research purpose may be contained in documents such as:	• agreements • research brief • research contracts • research guidelines • research statement.
Target group may include:	• community • content and media provider • end users • equipment vendor • government authority • investors • regulator • society • statutory authority • sustainability auditors

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RANGE STATEMENT	
	• telecommunications service provider • user groups.
Factors affecting reliability and validity may include:	• access appropriate population • authenticity and reliability of data sources • capacity to generalise findings across the whole population • sample size • type or survey used to increase validity.
Applied research strategy may cover:	• analysis of industry specific trends, statistics and issues • collection of data to assist informed decision making, planning or risk management • data and information relating to strategy, policy, practices, or work processes developed and implemented by an organisation • formation of solutions to complex problems • information and analysis needed to develop a campaign, strategic plan, industry or sector plan and strategy, or to bargain effectively with employers • information and analysis to conduct a strategic or community campaign or activity • relationship or relevance of a theory, principle or practice to an immediate practical problem, issue or to test a proposed solution.

Applied research methods and theories may cover:	• methods such as:
	  • action research
	  • case study
	  • experience and intuition
	  • experiments
	  • interviews
	  • mathematical models and simulations
	  • participant observation
	  • surveys
	  • statistical data analysis
	  • statistical surveys
	• content, textual analysis, theories and techniques, which will vary upon consideration of:
	  • application of statistical methods
	  • causal factors and dependant or

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RANGE STATEMENT	
	independent variables • critical analysis • experimental, quasi-experimental, non-experimental • mathematical calculations • problem solving • qualitative or quantitative research • sampling and sample size.
Data collection techniques may include:	• collaboration with other experts or mentors • desk research • document research • field study • observation • physical items analysis • interviews • questionnaires • surveys.

Appropriate sources of information may include:	• Carbon Pollution Reduction Scheme (CPRS)
	• discussions with current industry practitioners and manufacturers
	• energy and climate change reports and policies
	• government departments
	• industry associations and organisations
	• industry standards
	• AS/NZ3598:2000 (or latest revision):
	  • Level 1 consumption benchmark
	  • Level 2 preliminary assessment
	  • Level 3 economic analysis
	• BS EN 16001:2009 Energy Management Systems
	• ISO 14001:2004 Environment
	• industry journals
	• Kyoto protocol documentation
	• organisational policies, procedures and journals
	• personal observations and experience
	• professional organisations
	• research papers, technical publications and manuals
	• web data from research establishments and universities.

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RANGE STATEMENT	

Sustainable management principles may include:	• audit waste management procedures
	• improving efficiency of ICT network equipment:
	  • reducing air conditioning requirements
	  • shutting down of equipment during low demand and prolonged idle times
	• procurement strategies:
	  • assessment of suppliers' environmental policies and procedures
	  • lowering of energy consumption or environmental impact of replacement products or services
	  • managing the environmental impacts of electrical and electronic equipment
	  • use of energy consumption and environmental impact as criteria in the process of awarding contracts
	• supply chain:
	  • driving ethical values through the supply chain
	  • engaging supplier's involvement in emissions reporting and continual improvement
	  • engaging suppliers who provide information on energy consumption and product life cycles
	  • influencing suppliers to provide energy efficient products and services
	• total life cycle (TLC) analysis of product, processes and services.

Relevance of the research may be based on:	• available time and resources • feasibility of implementing the recommendations • findings of previous and current research • original research parameters and brief • quality and credibility of the methodology • value of its usefulness • value of the information and data.
Legal requirements may include:	• agreements with third parties that supply research or data • competency standards

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RANGE STATEMENT	
	• contracts • copyright and privacy laws relating to physical materials and electronic technology • licensing • plagiarism • privacy • relevant commonwealth, state and territory legislation, policy, codes of practice and national standards • security of information.
Research findings may include:	• circulating publications for comment and critique on the internet • contributing to strategic policy • drafting publications or reports • presentations at seminars and conferences • providing data, plans, specifications and reports resulting in changed work practice/s or design/s • providing internal reports verbally, in writing or via presentations • publishing papers and articles for expert review and audiences • publishing reports and articles for lay audiences.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Sustainability

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ICTSUS8238A Conduct and manage a life cycle assessment for sustainability

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to conduct a life cycle assessment (LCA) to investigate and evaluate the human health and environmental impacts arising from the provision of a product, process or service. A LCA is a systematic process that provides an estimation of the cumulative impacts and trade-offs resulting from all stages in the entire life cycle of the product, process or service, thereby facilitating informed decision-making to improve performance. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical managers, supervising technicians, project managers, consultants or contractors who have responsibility for conducting a LCA or managing those who conduct an LCA apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Define and scope project goal	1.1. Access ***appropriate sources of information*** relevant to the LCA project 1.2. Define the ***goal*** of the project 1.3. Specify ***information*** needed to inform decision-makers 1.4. Determine required level of ***specificity*** 1.5. Determine ***data organisation*** and display of results 1.6. Define ***scope of the study*** 1.7. Determine ***ground rules*** for performing the work
2. Conduct a life cycle	2.1. Generate a life cycle ***flow diagram***

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ELEMENT	PERFORMANCE CRITERIA
inventory (LCI)	2.2. Develop a ***data collection plan*** for the LCI 2.3. ***Collect the actual data*** 2.4. ***Evaluate and document*** the LCI results
3. Conduct a life cycle impact assessment (LCIA)	3.1. Select and define ***impact categories*** 3.2. ***Classify LCI results*** to the impact categories 3.3. Model LCI impacts within impact categories using science-based conversion factors 3.4. Normalise potential impacts in ways that can be compared 3.5. Assign impact categories by ***grouping*** into one or more sets to facilitate the interpretation of the results 3.6. Assign ***weighting*** factors to emphasise the most important potential impacts
4. Interpret and evaluate results from the LCI and the LCIA and communicate them	4.1. Identify the ***significant issues*** based on the LCI and the LCIA 4.2. Evaluate ***completeness check***, ***consistency check*** and ***sensitivity check*** 4.3. Make recommendations for improving the product, process or service life cycle
5. Report results of the LCA study	5.1. Document the ***results of the LCA study*** 5.2. Finalise the report with a conclusion and make recommendations as a result of the LCA study

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to compare and evaluate effective technical solutions involving life cycle aspects of sustainability, and to critically evaluate data quality
• communication skills to:
  • prepare a press release regarding the level of achievement of sustainability benchmarks, environmental targets and performance highlights
  • liaise with customers to outline the resulting sustainability benefits
  • adjust communication to suit different audiences

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REQUIRED SKILLS AND KNOWLEDGE

- respond effectively to diversity
- work as a member of a team
- consult on and validate policy

- literacy skills to:
  - evaluate complex and formal documents such as policy and legislation
  - interpret technical specifications and related sustainability documentation
  - document technical requirements and procedures
  - prepare written reports requiring precise expression, language and structures suited to the intended audience
- numeracy skills to:
  - determine workforce requirements
  - analyse and confirm capacity requirements
  - calculate budget requirements and limitations
  - perform calculations related to LCA
  - estimate carbon dioxide (CO_2) emissions
- planning and organisational skills to:
  - set out project requirements and priorities
  - make site access and equipment delivery arrangements
  - arrange relevant documentation and approvals
- problem solving skills to account for unexpected variations to requirements, and to effectively manage different points of view and dissenting stakeholders
- research skills to:
  - research and present information
  - examine statistical databases
  - gain and maintain relevant and current technical product knowledge
- technical skills to utilise life cycle assessment software
- project management skills to undertake or manage a complex LCA project

Required knowledge

- best practice approaches relevant to own work area
- environmental and sustainability legislation, regulations and codes of practice applicable to industry and organisation
- equal employment opportunity, equity and diversity principles and occupational health and safety (OHS) implications of policy being developed
- policy development processes and practices
- principles, practices and available tools and techniques of sustainability management relevant to the telecommunications industry
- quality assurance systems relevant to own organisation
- relevant industry competency
- relevant organisational polices, procedures and protocols

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REQUIRED SKILLS AND KNOWLEDGE
• relevant systems and procedures to aid in the achievement of workplace sustainability • ICT power consumption calculations • power consumption and energy audit methodology • CO2 emissions estimation • environmental impacts of products, processes, systems and services

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • undertake a LCA for sustainability • undertake scoping and definition of goals of a LCA for sustainability • produce a LCI using relevant software and data collection strategies • use life cycle assessment and other software for researching and interpreting charts, flowcharts, graphs and other visual data and information • evaluate LCI and LCIA results, using completeness, consistency and sensitivity checks • make recommendations based on the results of the LCA study.
Context of and specific resources for assessment	Assessment must ensure: • sites on which planning, design and integration of sustainability may be carried out • relevant legislation, standards, guidelines, reports and equipment specifications and drawings • a range of workplace documentation and personnel, information and resources (such as compliance obligations, organisational plans, work responsibilities).

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EVIDENCE GUIDE	
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • review of projects relating to conducting applied research conducted by the candidate • direct observation of candidate applying research skills • oral or written questioning to assess knowledge of applied research.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS8237A Lead applied research in ICT sustainability. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Appropriate sources of information may include:	• AS/NZS 3598:2000
	• BS EN 16001:2009
	• Dow Jones Sustainability Index (DJSI)
	• International standards for environmental management - Life cycle assessment
	  • AS/NZS ISO 14040:1998
	  • AS/NZS ISO 14041:1999
	  • AS/NZS ISO 14042:2001
	  • AS/NZS ISO 14043:2001
	  • AS/NZS ISO 14048:2003
	• United States Environmental Protection Agency (EPA) - Life Cycle Assessment: Principles and Practice EPA/600/R-06/060 May 2006.

Goal may include:	• establishing baseline information for a process • guiding new product development to reduction of resources and emissions • identifying gaps in data • providing information on trade-offs of alternative processes, products and materials • ranking relative contribution of individual processes • selecting best product, process or service with least effect on human health and the environment • supporting product certification.
Information may include:	• changes to be made to reduce specific environmental impacts • impacts relevant to stakeholders and interested parties • products or processes which cause the least environmental impact

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RANGE STATEMENT	

	• technologies or processes which cause least detrimental impact:
	  • smog
	  • acid rain
	  • particulates
	  • aquatic pollution.

Specificity may relate to:	• enterprise-specific versus generic products • internal enterprise use or public purposes • product-specific data versus generic data • product-specific versus generic study.
Data organisation may include:	• equivalent use as the basis for comparison • a functional unit that appropriately describes the function of the product or process being studied • volume or weight as the basis for comparison.

Scope of the study may include:	• manufacturing
	• materials manufacture
	• packaging and distribution
	• product fabrication
	• raw materials acquisition
	• recycling and waste management
	• use, re-use and maintenance
	• variants:
	  • cradle-to-grave
	  • cradle-to-gate
	  • economic input-output life cycle assessment (EIOLCA)
	  • gate-to-gate
	  • well-to-wheel.

Ground rules may include:	• define the systems analysed
	• documenting assumptions or decisions made throughout the project
	• methodology used
	• quality assurance procedures:
	  • available time and level of resources
	  • internal review
	  • external review
	  • formal review process
	• reporting requirements
	• setting of boundaries

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RANGE STATEMENT	

	• software used for modelling:
	  • EcoLab
	  • GaBi Software
	  • SimaPro
	• stating the basis for comparison.

Flow diagram may include:	• all alternatives under consideration:
	  • baseline system
	  • alternative systems
	• boundaries
	• mapping inputs and outputs (material and energy) to a process or system
	• subsystems.

Data collection plan may include	• defining the data quality goals
	• developing a data collection worksheet or spreadsheet:
	  • data collection procedures
	  • data quality measures
	  • geographic scope
	  • presentation of results
	  • purpose of the inventory
	  • system boundaries
	  • types of data used
	• identifying data sources and types:
	  • equipment and process specifications
	  • equipment logs
	  • journals
	  • laboratory test results
	  • meter readings from equipment
	• identifying data types:
	  • measured
	  • modelled
	  • non-LCI data (data not intended for use in LCI)
	  • non-site specific
	  • sampled
	  • vendor data
	• identifying data quality indicators:
	  • completeness

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RANGE STATEMENT	
	• consistency • precision.

Collect the actual data may include:	• atmospheric emissions
	• conversion of fuel units into energy units
	• co-product allocation
	• data categories:
	  • CO_2 emissions
	  • reporting emissions required by regulatory agencies
	  • reporting of all emissions
	• direct contact with experts
	• efficiency of transportation mode:
	  • conversion of tonne-kilometres into fuel units
	  • litres (gallons) of diesel fuel
	• emissions generated from combustion of the fuels
	• energy input data
	• energy sources
	• illegal waste disposal included if data is available
	• industrial scrap
	• ISO 14041:6.5.3 (2004) allocation procedure
	• obtain non-specific inventory data
	• products
	• purchase LCI data
	• research
	• specific data versus composite data
	• site visits
	• solid wastes
	• transportation data:
	  • conversion to ton-miles or tonne-kilometres
	  • distance shipped
	  • weight of shipment
	• waterborne wastes.

Evaluate and document may include:	• air emissions • data parameter groups within a category • data parameters within a group: • carbon dioxide (CO_2)

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RANGE STATEMENT	
	• chlorine (Cl) • sulphur dioxide (SO_2) • define boundaries set • define systems analysed • describing the methodology used in analysis • presentation of information: • graphical format • tabular format • water borne waste solid wastes.
Impact categories may include:	• acidification • aquatic toxicity • global warming • resource depletion • stratospheric ozone depletion • terrestrial toxicity.
Classify LCI results may include:	• assigning LCI results to impact categories: • CO_2 emissions attributed to global warming • NO_2 emissions attributed to ozone formation • SO_2 emissions attributed to acidification.
Grouping may include:	• sorting of indicators by characteristics, such as: • emissions: • air • water • location: • global • local • regional • sorting of indicators by a ranking system, such as: • high priority • medium priority • low priority.
Weighting may include:	• determining weights to place on impacts • identifying the underlying values of the stakeholders • weighting methods: • analytic hierarchy process • modified Delphi technique

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RANGE STATEMENT	
	• decision analysis using multi-attribute theory.
Evaluate and report LCIA results may include:	• definition of systems analysed • description of methodology used in the analysis • description of the boundaries that were set • documentation of limitations • verify accuracy of LCIA results.

Significant issues may include:	• essential contributions for life cycle stages to LCI or LCIA results:
	  • individual unit processes
	  • groups of processes
	• impact category indicators:
	  • emissions
	  • resource use
	  • waste
	• inventory parameters:
	  • emissions
	  • energy use
	  • waste.

Completeness check may include:	• all relevant information and data needed for the interpretation are available and complete
	• develop checklist to indicate each significant area represented in results
	• organise data by:
	  • life cycle stage
	  • processes
	  • type of data represented:
	  • environmental release to air
	  • raw materials energy
	  • transportation.

Consistency check may include:	• comparisons made on inconsistent data sources
	• comparisons made on data from different eras
	• data from plants using different technologies
	• data from technology based on different standards:
	  • European
	  • US.

Sensitivity check may include:	• evaluation of the reliability of results using:

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RANGE STATEMENT	
	• contribution analysis • sensitivity analysis • uncertainty analysis.

Results of the LCA study may include:	• administrative Information
	• details of the practitioner who conducted the LCA study
	• date of report
	• definition of goal and scope
	• life cycle inventory analysis:
	  • data collection
	  • calculation procedures
	• life cycle impact assessment:
	  • methodology
	  • results of the impact assessment performed
	• life cycle interpretation:
	  • results
	  • assumptions and limitations
	  • data quality assessment
	• critical review (internal and external):
	  • details of reviewers and their affiliation
	  • critical review reports
	  • responses to recommendations.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Sustainability

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ICTTCR2188A Use rigging practices and systems on telecommunications network structures

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to perform **rigging work on telecommunications radio** structures. A licensed rigger is required for the installation of some rigging equipment. The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels. CPCCLDG3001A Licence to perform dogging CPCCLRG3001A Licence to perform rigging basic level CPCCLRG3002A Licence to perform rigging intermediate level CPCCLRG4001A Licence to perform rigging advanced level. If operation of an elevated work platform (EWP) is required, a licence may be required. Users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Technical staff who work in rigging and install systems for telecommunications radio structures apply the skills and knowledge in this unit. They may make use of rigging plant and equipment, fall arrest, fall guarding and fall constraint and team communications. This unit applies to standard telecommunications structures.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare rigging systems	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Arrange access to the site and confirm ***customer requirements***
	1.3. Inform appropriate personnel of existing and potential site hazards
	1.4. Select ***tools*** and ***safety equipment*** required for safe rigging practice
	1.5. Use ***rigging systems*** in a telecommunications environment according to ***specifications***
	1.6. Identify the proposed position of equipment to be mounted on telecommunications radio structures according to specifications and industry practice
	1.7. Estimate safe working loads for rigging systems and equipment according to specifications
	1.8. Select and inspect rigging equipment to ensure that it is fit for purpose according to specifications
2. Set up and carry out rigging work on telecommunications radio structures	2.1. Set up rigging and dogging equipment following ***safe working practices and procedures*** according to the occupational health and safety (OHS) Act
	2.2. Operate rigging equipment and install telecommunications antenna and associated equipment according to specifications
	2.3. Use ***internationally recognised communication signals and protocols*** with crane drivers and helicopter crews according to the Crane Association Crane Safety Manual for Operators/Users
3. De-rig and complete documentation	3.1. De-rig and lower rigging equipment according to specifications
	3.2. Restore site to customer expectations following completion of installation according to industry practice
	3.3. Complete documentation and notify customer for sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with other personnel, including the use of radio devices
- literacy skills to interpret technical documentation, plans and specifications
- planning and organisational skills to prioritise and monitor own work and OHS responsibilities
- problem solving and contingency management skills to adapt rigging activities and requirements to particular sites and conditions
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - apply remote area first aid
  - prevent and treat hypothermia
  - select and use required personal protective equipment for rigging projects to suit different applications and for working at height conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to select and use rigging equipment and practices to suit different applications

Required knowledge

- features and operating requirements of rigging equipment
- hypothermia symptoms and methods of prevention and treatment
- licensing and regulatory issues applying to rigging practices and systems on telecommunications radio structures
- overview knowledge of meteorology and weather prediction
- remote area first aid
- specific knowledge related to:
  - electromagnetic radiation (EMR) safety practices
  - optical fibre cabling and equipment safety practices
  - personal protective equipment for rigging projects
  - requirements of the OHS Act, relevant regulations, and applicable site and company OHS procedures
  - rigging practices and systems to telecommunications radio structures
  - working at heights safety practices

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • apply OHS requirements and work practices associated with rigging • carry out basic dogging skills • carry out basic rigging skills • set up a mobile crane • use specialised hand or power tools and equipment normally used in rigging.
Context of, and specific resources for assessment	Assessment must ensure: • site on which rigging operations may be conducted • rigging and safety equipment • relevant regulations, standards specifications and manuals.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate setting up and carrying out rigging work on a telecommunications radio structure • oral or written questioning of the candidate to assess OHS requirements and work practices associated with rigging.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTCR2189A Use operational safety in a telecommunications rigging environment • ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • appropriate licences that may be required:

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RANGE STATEMENT	
	• crane • dogging • rigging • scaffolding • winch • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) electromagnetic radiation (EMR) standard • AS 1353.1:1997 • AS 1353.2:1997 • AS 1657:1992 • AS 2089:2008 • AS 2319:2001 • AS 2626: replaced by AS/NZS 1891.4:2000 • AS 3775.1:2004 AS 3775.2:2004 Chain AS 3777:2008 • AS 4497.2:1997 AS/NZS 1891.1:2007 AS/NZS 1891.4:2000 • AS/NZS 4801:2001 • AS/NZS ISO 14001:2004 Australian building codes and regulations • Australian standards • CE, American National Standards Institute (ANSI) equipment standards • enterprise standards • environmental protection • equipment certifications: • NFPA 1983 (2006 edition) • NFPA/UL G-rated (General Use) • equipment standards: • intrinsically safe lightning protection • site engineering standard • fire regulations • heritage legislation • international standards • local government • OHS • Radcoms Act • related publications • Telecoms Act

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RANGE STATEMENT	
	• WI's, CI's, Business Operating Procedures (BOP), Radiocommunications Assignment and Licensing Instruction (RALI), assignment guidelines.
Customer requirements may include:	• availability of asset owner site personnel • compatibility with rest of network • timelines • type of equipment • type of structure.
Tools may include:	• crane • hand • load/tension gauge • mechanical • power.

Safety equipment may include:	• aerial safety belts and lines
	• anchor straps
	• earmuffs
	• elevated platform
	• equipment guards
	• fall arrest systems
	• fall constraint systems
	• fall guarding systems
	• flashing lights
	• gloves
	• guards
	• helmets
	• pulleys
	• rigging plates
	• rope clamps
	• safety cages
	• safety glasses
	• safety harnesses:
	  • basic
	  • full body fall arrest
	  • sit harness
	• scaffold deck
	• warning signs and tapes.

Rigging systems may include:	• knots • mechanical lifting • ropes and connectors:

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RANGE STATEMENT	
	• anchor points • connectors • jointing splices • karabiners • rigging screws • shackles • slings • snatch blocks • strops • synthetic ropes • turn buckles • wire rope grips • wire ropes • safe working loads: • effort • force • load • reaction • torque • splices: • back • eye • short.
Specifications may relate to:	• direction on equipment tensioning: • load cells • temporary anchors • terminations: • bulldog grips • preformed dead ends • directions on carrying out rigging work • earthing of plant on network structures • installation of equipment on telecommunications radio structures • specification of bolts: • high strength • high tensile • mild • stainless

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RANGE STATEMENT	
	• torque limits.

Safe working practices and procedures may include:	• climbing telecommunications network structures safely
	• fall arrest:
	  • fixed
	  • temporary
	• identifying electrical hazards for working safely on telecommunications radio structures
	• identifying hazards associated with wearing a safety harness
	• lifting methods
	• load calculation
	• personal protective equipment
	• radio frequency (RF) EMR including:
	  • methods of detecting and reporting EMR hazards
	  • sources and types of RF EMR and its associated risks
	  • verifying and maintaining the EMR hazard management plan against an on site situation
	• safety issues in:
	  • roof work
	  • fall arrest
	  • fall guarding
	• site hazard identification and control measures:
	  • potential EMR hazards
	  • potential optical fibre and laser equipment hazards.

Internationally recognised communication signals and protocols may include:	• communication and signal methods used to coordinate the load movement with safety and signals • signals given within sight and out of sight of equipment operator.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications Rigging Installation

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ICTTCR2189A Use operational safety in a telecommunications rigging environment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to demonstrate and apply knowledge of fall arrest, fall guarding and fall restraint when working at heights in a telecommunications rigging environment. A licensed rigger is required for the installation of some rigging equipment. The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels. CPCCLDG3001A Licence to perform dogging CPCCLRG3001A Licence to perform rigging basic level CPCCLRG3002A Licence to perform rigging intermediate level CPCCLRG4001A Licence to perform rigging advanced level. If operation of an elevated work platform (EWP) is required, a licence may be required. Users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Technical staff who work in fall arrest, fall guarding and fall restraint when working at height in a telecommunications rigging environment apply the skills and knowledge in this unit. They may make use of rigging plant and equipment, fall arrest, fall guarding and fall constraint and team communications. This unit applies to standard telecommunications structures.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent

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	with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to use operational safety in a telecommunications rigging environment	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** and applicable to fall arrest, fall guarding and fall restraint systems 1.2. Select ***tools*** and ***safety equipment*** required for safe rigging practice
2. Assess hazards associated with wearing safety equipment	2.1. Inform appropriate personnel of ***potential faults and non-compliances*** in ***personal equipment*** 2.2. Inform appropriate personnel of primary hazards associated with the use of a ***safety harness and associated equipment and control strategies***
3. Check and fit a safety harness	3.1. Use correct ***safety harness fitting method*** 3.2. Confirm that the **lanyard** is appropriate for the task and check lanyard and harness for faults according to manufacturer's specifications and workplace procedures 3.3. Fit the safety harness according to manufacturer's instructions
4. Use a safety harness in a telecommunications environment	4.1. Minimise risks to self and others while using a safety harness and lanyards using identified safety principles associated with effective ***fall arrest***, fall guarding and fall restraint systems 4.2. Confirm the safety of possible hook-on points and select the optimum hook-on points 4.3. Attach and detach lanyards in a safe manner to and from anchor points
5. Verify the rescue plan to be activated in the event of a fall	5.1. Confirm the ***rescue plan*** is in place with work supervisor 5.2. Notify individuals of their roles in the rescue plan 5.3. Provide a report to the supervisor on the application of operational safety in rigging practice in a telecommunications environment

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to properly and adequately assess risk on telecommunications network structures
- communication skills to liaise with other personnel, including the use of radio devices
- literacy skills to interpret manufacturer's operating instructions, technical documentation, plans and specifications
- numeracy skills to:
  - take measurements
  - interpret results
  - evaluate different types of technical data
- planning and organisational skills to prioritise and monitor own work and occupational health and safety (OHS) responsibilities
- problem solving and contingency management skills to adapt rigging activities to particular sites and conditions
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - check and fit a safety harness
  - use a safety harness where a fall hazard exists at height in a telecommunications context
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - prevent and treat hypothermia
  - select and use required personal protective equipment for rigging projects to suit different applications and for work at heights conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to select and use appropriate equipment and practices to suit different applications

Required knowledge

- electromagnetic radiation (EMR) safety practices
- fall arrest, fall guarding and fall restraint when working at heights in a telecommunications rigging environment

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REQUIRED SKILLS AND KNOWLEDGE

• features and operating requirements of rigging equipment
• government and local government legislation, regulations, and by-laws including:
  • applicable site and company OHS procedures
  • OHS Act
  • relevant codes of practice
  • subsequent amendments in regards to fall arrest, fall guarding and fall restraint when working at heights in a telecommunications rigging environment
• hazards associated with wearing a safety harness and associated equipment
• licensing and regulatory issues applying to rigging practices and systems on telecommunications radio structures
• optical fibre cabling and equipment safety practices
• personal protective equipment for rigging projects
• rescue plan to be activated in the event of a fall
• risks present when working on telecommunications radio structures
• safe rigging practices and systems to telecommunications radio structures
• suspension trauma
• working at heights safety practices
• workplace operational procedures.

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use fall arrest, fall guarding and fall restraint systems when working at heights in a telecommunications rigging environment • check and fit a safety harness according to industry practice • use a safety harness where a fall hazard exists at height in a telecommunications context • demonstrate knowledge of the rescue plan to be

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EVIDENCE GUIDE	
	activated in the event of a fall • apply related OHS requirements and work practices associated with fall arrest, fall guarding and fall restraint when working at heights in a telecommunications rigging environment.
Context of, and specific resources for assessment	Assessment must ensure: • site on which rigging operations may be conducted • rigging and safety equipment • relevant regulations, standards specifications and manuals.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate checking and fitting a safety harness using correct method • direct observation of the candidate using a safety harness in a telecommunications environment • review of report prepared by the candidate outlining a rescue plan in the event of a fall • oral or written questioning of the candidate to assess OHS requirements and work practices associated with rigging.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTCR2188A Use rigging practices and systems on telecommunications network structures • ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication

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EVIDENCE GUIDE	
	skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• Australian Communications and Media Authority (ACMA) technical standards
	• appropriate licences that may be required:
	  • crane
	  • dogging
	  • rigging
	  • scaffolding
	  • winch.
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) electromagnetic radiation (EMR) standard
	• AS 1353.1:1997

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RANGE STATEMENT	

	• AS 1353.2:1997
	• AS 1657:1992
	• AS 2089:2008
	• AS 2319:2001
	• AS 2626: replaced by AS/NZS 1891.4:2000
	• AS 3775.1:2004
	• AS 3775.2:2004
	• AS 3777:2008
	• AS 4497.2:1997
	• AS/NZS 1891.1:2007
	• AS/NZS 1891.4:2000
	• AS/NZS 4801:2001
	• AS/NZS ISO 14001:2004
	• Australian building codes and regulations
	• Australian Standards
	• CE, American national standards Institute (ANSI) equipment standards
	• enterprise standards
	• environmental protection
	• equipment certifications:
	  • NFPA 1983 (2006 edition)
	  • NFPA/UL G-rated (General Use)
	• equipment standards:
	  • intrinsically safe lightning protection
	  • site engineering standard
	• fire regulations
	• heritage legislation
	• international standards
	• local government
	• OHS
	• Radcoms Act
	• related publications
	• Telecoms Act
	• WI's, CI's, Business Operating Procedures (BOP), Radiocommunications Assignment and Licensing Instruction (RALI), assignment guidelines.

Tools may include:	• crane • hand • load and tension gauge

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RANGE STATEMENT	
	• mechanical • power.

Safety equipment may include:	• aerial safety belts and lines
	• anchor straps
	• earmuffs
	• elevated platform
	• equipment guards
	• fall arrest systems
	• fall constraint systems
	• fall guarding systems
	• flashing lights
	• gloves
	• guards
	• helmets
	• pulleys
	• rigging plates
	• rope clamps
	• safety cages
	• safety glasses
	• safety harnesses:
	  • basic
	  • full body fall arrest
	  • sit harness
	• scaffold deck
	• warning signs and tapes.

Potential faults and non-compliances may relate to:	• assessing condition of personal equipment and inspecting for:
	  • abrasions
	  • chemical damage
	  • cracks
	  • deformities
	  • heat damage
	  • mechanical failure
	  • wear
	• determining appropriate:
	  • anchors
	  • ascenders
	  • climbing equipment for network structures
	  • descenders

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RANGE STATEMENT	
	• karabiners • lines • non-registered equipment and damage to: • connectors • fall arrestor • harnesses • lanyards • shock absorbers • using climbing equipment and fall arrest systems • using: • anchor points • connectors • jointing splices • karabiners • rigging screws • shackles • slings • snatch blocks • strops • synthetic ropes • turn buckles • wire rope grips • wire ropes.
Personal equipment may include:	• personal protective equipment for: • carrying out rigging work • work at a telecommunications site with potential optical fibre and laser equipment hazards • personal monitor for detecting and reporting RF EMR hazards.
Safety harness and associated equipment and control strategies may include:	• aerial safety belts and lines • anchor straps • crane cage • elevated platform • equipment guards • fall arrest devices and systems • fall constraint systems • fall guarding systems

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RANGE STATEMENT	

	• flashing lights
	• guards
	• helmets and other personal safety equipment:
	  • earmuffs
	  • gloves
	  • safety glasses
	• lanyards, static lines and anchors
	• pulleys
	• rescue harness
	• rigging plates
	• rope clamps
	• safety cages
	• safety harness, basic to full body fall arrest and sit harness
	• safety issues:
	  • in roof work
	  • installation of fall arrest
	  • fall guarding
	  • fall restraint systems
	  • free fall
	  • suspension trauma
	  • unprotected edge
	  • working at heights
	• scaffold deck
	• suspension trauma, fall restraint verses fall arrest, pendulum effect
	• verifying and maintaining the EMR hazard management plan against an on site situation
	• warning signs and tapes.

Safety harness fitting method includes:	• fitting components:
	  • attachment point
	  • front buckle
	  • lanyard
	  • leg straps
	  • non-fall arrest attachment points
	  • shock absorber and inspection tags
	  • shoulder straps
	• checking and fitting a safety harness:
	  • visual inspection

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RANGE STATEMENT	

	• functionality assessment
	• currency of inspection records
	  • tags
	  • logs
	• correct fitting and adjustment sequence:
	  • straps untwisted
	  • evenness on shoulders
	  • tightened to 'flat hand space' comfort
	  • objects in pockets are no hazard
	  • lanyard secured
	• types and application of different safety harnesses.

Lanyard may relate to:	• types:
	  • single
	  • double
	  • retractable
	  • twin tail
	• situations with two or more people working together and people working below
	• checking:
	  • connection to harness
	  • functionality assessment
	  • length
	  • visual inspection.

Fall arrest may include:	• arrest of:
	  • free fall
	  • limited free fall
	  • restrained free fall
	  • total restrained fall
	• fall factors 1 and 2, maximum allowable fall distances
	• fixed and temporary
	• systems with:
	  • abseil lines
	  • attachment devices
	  • double lanyards
	  • harnesses
	  • pole straps

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RANGE STATEMENT	
	• rails • static lines.

Rescue plan may relate to:	• abseil rescue
	• performing rescues from telecommunications network structures
	• personal and team safety
	• raise and lower systems
	• stabilising a casualty
	• treating suspension trauma
	• roles:
	  • emergency services
	  • equipment operators
	  • trained specialists
	  • your own
	• using appropriate first aid in rescue situations on telecommunication network structures.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications Rigging Installation

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ICTTCR2190A Use safe rigging practices to climb and perform rescues on telecommunications network structures

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to use rigging to assess risk, climb and perform rescue on telecommunications network structures. This unit applies to standard telecommunications structures. A licensed rigger is required for the installation of some rigging equipment. The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels. CPCCLDG3001A Licence to perform dogging CPCCLRG3001A Licence to perform rigging basic level CPCCLRG3002A Licence to perform rigging intermediate level CPCCLRG4001A Licence to perform rigging advanced level. If operation of an elevated work platform (EWP) is required, a licence may be required. Users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Technical staff who use rigging on telecommunications radio structures apply the skills and knowledge in this unit. They may make use of rigging plant and equipment, fall arrest, fall guarding and fall constraint and work in teams.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to use safe rigging practices	1.1. Notify appropriate personnel and take necessary precautions to minimise, control or eliminate hazards that may exist during work activities 1.2. Prepare for given work according to minimum approach distances for hazards on telecommunications network structures as prescribed in ***relevant legislation***, ***codes***, ***regulations and standards***
2. Assess the status and condition of telecommunications network structures and identify climbing route	2.1. Inspect and assess the ***status and condition of telecommunications structures*** according to industry practice 2.2. Plot optimum climbing route to avoid hazards and the most effective use of selected equipment according to manufacturer's instructions and industry practice
3. Prepare climbing equipment	3.1. Select ***climbing equipment*** in keeping with the structures to be climbed according to industry practice 3.2. Inspect climbing equipment for damage according to ***specifications*** and industry practice
4. Climb telecommunications network structures	4.1. Use safe climbing practices when ascending telecommunications network structures according to the occupational health and safety (OHS) Act 4.2. Maintain permanent attachment when more than three metres from the ground adhering to ***safety requirements when working at heights*** 4.3. Maintain three points of contact at all times according to industry practice while climbing telecommunications network structures 4.4. Manage ropes to avoid entanglement or fouling on the structure 4.5. Maintain safe working and minimum approach distances from hazards on ***telecommunications network structures*** at all times according to standards and regulations
5. Use climbing and working fall arrest systems	5.1. Perform transfers to and from the climbing system and the working system using fall prevention practices according to industry practice 5.2. Use the working fall arrest system according to specifications

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ELEMENT	PERFORMANCE CRITERIA
6. Perform rescues	6.1. ***Perform rescues*** according to situation, industry practice and local instruction 6.2. Obtain medical treatment if required 6.3. Report accidents or incidents according to company procedures and local instructions

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to accurately assess risk on telecommunications network structures
- literacy skills to interpret technical documentation, plans and specifications
- communication skills to liaise with other personnel, including the use of radio devices
- numeracy skills to:
  - take measurements and interpret results
  - evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and OHS responsibilities
- problem solving and contingency management skills to adapt rigging activities and requirements to particular sites and conditions
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment for rigging projects to suit different applications and for work at height conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - select and use appropriate equipment and practices to suit different applications
  - assess the status and condition of telecommunications network structures to be climbed

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REQUIRED SKILLS AND KNOWLEDGE

- identify climbing route according to industry practice

Required knowledge

- falls:
  - fall factors according to the Guidelines for the Prevention of Falls
  - fall prevention
  - fall types according to Australian standards and regulations
- features and operating requirements of rigging equipment
- optical fibre cabling and equipment safety practices
- personal protective equipment
- radio frequency electromagnetic radiation (EMR):
  - associated risks
  - methods of detecting
  - need to verify and maintain the EMR hazard management plan against an on-site situation
  - preparing for work at a telecommunications site with potential EMR hazards
  - reporting EMR hazards safety practices
  - sources and types of radio frequency (RF) EMR
- rescue methods and practices
- safe rigging principles
- suspension trauma:
  - cause
  - effect
  - prevention
  - treatment
- using a safety harness:
  - hazards associated with wearing a safety harness
  - how to check, fit and use a safety harness
  - the types and application of different safety harnesses
- licensing and regulatory issues applying to rigging practices and systems on telecommunications radio structures
- risks present when working on telecommunications radio structures
- specific OHS issues that affect rigging:
  - relevant regulations, and applicable site and company OHS procedures
  - rigging practices and systems for telecommunications radio structures
  - safe climbing practices including maintaining three points of contact while climbing
  - safe working and minimum approach distances for hazards on telecommunications network structures according to standards and regulations

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REQUIRED SKILLS AND KNOWLEDGE
• safety requirements when working at heights according to the OHS Act

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use safe rigging practices according to OHS requirements, regulations and standards • assess the status and condition of telecommunications structure to be climbed and plot climbing route according to industry practice • select climbing equipment and climb telecommunications network structure • work safely on telecommunications network structures using climbing and working fall arrest systems • perform rescues from telecommunications network structures to industry standards.

Context of, and specific resources for assessment	Assessment must ensure:
	• a mentor or supervisor appropriately experienced and certified in rigging and rescuing for telecommunications radio structures
	• a workplace conducting rigging operations with:
	  • rigging equipment
	  • safety equipment.

Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate climbing and performing a rescue on a telecommunications

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EVIDENCE GUIDE	
	network structure • oral or written questioning of the candidate to assess OHS requirements associated with rigging.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTCR2188A Use rigging practices and systems on telecommunications network structures • ICTTCR2189A Use operational safety in a telecommunications rigging environment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT

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RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• Australian Communications and Media Authority (ACMA) technical standards
	• appropriate licences that may be required:
	  • crane
	  • dogging
	  • rigging
	  • scaffolding
	  • winch
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) EMR standard
	• AS 1353.1:1997
	• AS 1353.2:1997
	• AS 1657:1992
	• AS 2089:2008
	• AS 2319:2001
	• AS 2626: replaced by AS/NZS 1891.4:2000
	• AS 3775.1:2004
	• AS 3775.2:2004
	• AS 3777:2008
	• AS 4497.2:1997
	• AS/NZS 1891.1:2007
	• AS/NZS 1891.4:2000
	• AS/NZS 4801:2001
	• AS/NZS ISO 14001:2004
	• Australian building codes and regulations
	• Australian standards
	• CE, American National Standards Institute (ANSI) equipment standards
	• enterprise standards
	• environmental protection
	• equipment certifications:

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RANGE STATEMENT	
	• NFPA 1983 (2006 edition) • NFPA/UL G-rated (General Use) • equipment standards: • intrinsically safe lightning protection • site engineering standard • fire regulations • heritage legislation • international standards • local government • OHS • Radcoms Act • related publications • Telecoms Act • WI's, CI's, Business Operating Procedures (BOP), Radiocommunications Assignment and Licensing Instruction (RALI), assignment guidelines.
Status and condition of telecommunications structures may relate to:	• hazardous areas • potential optical fibre and laser equipment hazards • safety issues in roof work • structural integrity.
Climbing equipment may include:	• anchor points • anchors • climbing and working fall arrest systems • connectors • descenders • jointing splices • karabiners • lines • rigging screws • ascenders • shackles • slings • snatch blocks • strops • synthetic ropes • turn buckles • wire rope grips • wire ropes.

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RANGE STATEMENT	

Specifications may include:	• bolts:
	  • mild
	  • high tensile
	  • stainless
	  • high strength
	  • torque
	• installation of equipment
	• load cells
	• range tensioning
	• temporary anchors
	• terminations:
	  • bulldog grips
	  • preformed dead ends.

Safety requirements when working at heights may include:	• personal protective equipment:
	  • hazards associated with wearing a safety harness
	  • to suit different applications
	• risk assessment and methods:
	  • assess the status and condition of telecommunications network structures to be climbed
	  • climbing equipment for network structure
	  • falls and fall prevention.
	  • identify climbing route according to industry practice
	  • industrial climbing on telecommunications network structures for maintenance
	  • performing rescues
	  • rescue planning
	  • safe climbing practices
	  • safe working methods
	• safe working practices:
	  • lifting methods
	  • load calculation
	  • site hazard identification and control measures
	• use of fall arrest systems:
	  • double lanyards
	  • pole straps

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RANGE STATEMENT	

	• static lines
	• use of safety equipment:
	  • aerial safety belts and lines
	  • anchor straps
	  • anchors
	  • ear muffs
	  • equipment guards
	  • fall arrest devices and systems
	  • fall constraint systems
	  • fall guarding systems
	  • flashing lights
	  • gloves
	  • guards
	  • helmet
	  • lanyards
	  • pulleys
	  • rescue harness
	  • rigging plates
	  • rope clamps
	  • safety cages
	  • safety glasses
	  • safety harnesses:
	  • basic
	  • full body fall arrest
	  • sit harness
	  • static lines
	  • warning signs and tapes
	• tools:
	  • crane
	  • hand
	  • load and tension gauge
	  • mechanical
	  • power.

Telecommunications network structures may include:	• antennae above ground level • buildings • concrete poles • guyed masts • lattice towers

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RANGE STATEMENT	
	• monopoles • masts • rooftops • steel poles • support for RF emitting feeders • wooden poles.

Perform rescues may include:	• abseil rescue
	• first aid
	• internationally recognised communication signals and protocols:
	  • hand signals
	  • radio communications
	• personal and team safety
	• raising and lowering systems
	• stabilising a casualty
	• treating suspension trauma.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications Rigging Installation

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ICTTCR3062A Build a telecommunications radio structure

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to build the foundation, assemble and mount a telecommunications radio structure. A licensed rigger may be required for the installation of some structures. The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels. CPCCLDG3001A Licence to perform dogging CPCCLRG3001A Licence to perform rigging basic level CPCCLRG3002A Licence to perform rigging intermediate level CPCCLRG4001A Licence to perform rigging advanced level. If operation of an elevated work platform (EWP) is required, a licence may be required. Users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Technical staff who build telecommunications radio structures apply the skills and knowledge in this unit. They have a dual specialist classification as rigger installers and may install radio structures for worldwide interoperability for microwave access (WiMAX) wireless broadband Access Networks, antenna installation for radio and TV broadcasting and cellular mobile communications.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		
	ICTTCR2188A	Use rigging practices and systems on telecommunications network structures
	ICTTCR2189A	Use operational safety in a telecommunications rigging environment
	ICTTCR2190A	Use safe rigging practices to climb and perform rescues on telecommunications network structures

Employability Skills Information

Employability skills	This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare materials and secure site	1.1. Notify appropriate personnel and take necessary precautions to minimise, control or eliminate hazards that may exist during work activities 1.2. Determine nature and location of structure from construction design plans, ***relevant legislation***, ***codes***, ***regulations and standards*** 1.3. Determine materials, ***tools and equipment*** required from construction design plans 1.4. Check ***steel for assembly*** against construction design plans to ensure no parts are missing 1.5. Secure and clean site according to ***site security instructions*** for public safety
2. Construct foundations for radio structure	2.1. Locate ***other services*** according to industry practice, and arrange for relocation of services if required 2.2. Excavate foundation according to engineering specifications and construct ***foundations*** according to construction design plans 2.3. Install earthing according to construction design plans, enterprise occupational health and safety (OHS) guidelines and industry practice 2.4. Provide samples of concrete for analysis according to enterprise guidelines and manufacturer's specifications, relevant standards and regulations
3. Assemble and mount a telecommunications radio structure	3.1. Select an area free of interference and close to the construction site suitable for structure assembly 3.2. Assemble radio structure in sections on the ground according to engineering specifications and using ***personal protective equipment*** following ***safety guidelines***

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ELEMENT	PERFORMANCE CRITERIA
	3.3. Mount and secure preassembled sections to tower construction according to plans, specifications and enterprise OHS guidelines 3.4. Maintain a vertical positioning of the structure and within twist tolerances during construction phase 3.5. Secure and tension guy wires according to construction design plans, enterprise OHS guidelines and industry practice
4. Complete administrative duties	4.1. Update the original design plan with approved amendments and return to design section 4.2. Secure and clean up site to original condition in an environmentally safe manner 4.3. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - interpret technical documentation, such as equipment manuals and specifications
  - read and interpret drawings related to layouts, design, construction and project management
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - organise and maintain equipment
  - plan, prioritise and monitor own work and OHS responsibilities
- problem solving skills to solve equipment and logistics problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - apply remote area first aid
  - prevent and treat hypothermia

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REQUIRED SKILLS AND KNOWLEDGE

- select and use required personal protective equipment for rigging projects to suit different applications and for work at height conforming to industry and OHS standards
- work systematically with required attention to detail without injury to self or others, or damage to goods or equipment

- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - assist problem rectification
  - operate plant and machinery
  - use diagnostic equipment
  - use hand and power tools
  - use meteorology awareness and prediction

Required knowledge

- basic knowledge of:
  - meteorology
  - remote area first aid
- features and operating requirements of:
  - construction equipment
  - rigging equipment
- hypothermia symptoms and methods of prevention and treatment
- information required to build a telecommunications radio structure
- rigging practices and systems to telecommunications radio structures
- legislation, codes of practice and other formal agreements that impact on the work activity
- licensing and regulatory issues applying to rigging practices and systems on telecommunications radio structures
- manufacturer's requirements for safe operation of equipment
- OHS:
  - Act and regulations
  - company procedures
  - requirements relating to the activity and site conditions
- specific knowledge of:
  - electromagnetic radiation (EMR) safety practices
  - personal protective equipment for rigging projects
  - working at heights safety practices
- test methods and performance requirements
- typical issues and challenges that occur on site

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • undertake pre construction checks to ensure safe working environment • construct foundations according to engineering specifications • select site for hoisting equipment ensuring location is safe for the operator and the construction • preassemble structure at ground level ensuring completion of each assembled component • assemble and mount a telecommunications radio structure, including temporary and permanent guy anchors • install functional and protective earthing systems following security and safety procedures.
Context of and specific resources for assessment	Assessment must ensure: • site where telecommunications radio structures may be constructed • rigging and safety equipment currently used in industry • relevant regulations, standards specifications and manuals.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate assembling and mounting a telecommunications radio structure • oral or written questioning of the candidate to assess OHS requirements and work practices associated with constructing a telecommunications radio structure.

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EVIDENCE GUIDE	
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3020A Construct aerial cable supports. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***,	• appropriate licences that may be required:

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RANGE STATEMENT	
regulations and standards may include:	• crane • dogging • rigging • scaffolding • winch • Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS Communications Cabling Manual (CCM) Volume 1 • Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • fire regulations • heritage legislation • industrial relations agreements including awards and enterprise • international standards • local government • manufacturer's enterprise operating policy and procedures • national codes • OHS Act • other services and utilities codes of practice and standards: • electricity • gas • water • power company requirements • Privacy Act • spectrum management regulations • statutory requirements • Trade Practices Act • traditional land owners.
Tools and equipment may include:	• cable locater • earth testers • fall arrest systems • hand tools

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RANGE STATEMENT	

	• hoisting equipment:
	  • crane
	  • helicopters
	  • jury and winch
	• power tools
	• safety equipment:
	  • aerial safety belts and lines
	  • equipment guards
	  • flashing lights
	  • guards
	  • helmets
	  • safety cages
	  • traffic signs
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• survey instruments.

Steel for assembly may include:	• guy wires and anchors • pre-cut and pre-drilled steel for construction • steel braces.
Site security instructions may relate to:	• cleaning site daily • ensuring that no hazards remain on tower during construction • security fence during construction • security fence and anti-climbing devices at the completion of the construction.
Other services may include:	• gas • other telecommunications • power • sewerage • water.

Foundations may include:	• constructions:
	  • grillage
	  • pad
	  • pier-type
	  • rock anchors.

Personal protective equipment may include:	• earmuffs • eye protection

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RANGE STATEMENT	

	• gloves:
	  • leather
	  • plastic
	  • rubber
	• gumboots
	• hard hats
	• overalls
	• personal reflecting jackets
	• riggers' gloves
	• safety boots
	• vests.

Safety guidelines may refer to:	• antenna principles for working safely on telecommunications radio structures
	• devices to support construction personnel at heights:
	  • elevated personnel vehicles
	  • non-metallic ladders
	  • platforms
	• earth protection
	• external factors affecting works:
	  • concentration of other services
	  • terrain
	  • weather conditions
	• fall arrest:
	  • fixed
	  • temporary
	• licences:
	  • backhoe operator
	  • borer
	  • chainsaw operation
	  • crane chaser
	  • crane operator
	  • dogman
	  • driver's
	  • forklift
	  • heavy vehicle
	  • machinery operation
	  • rigger
	  • winch operator

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RANGE STATEMENT	

	• lifting methods
	• load calculation
	• personal protective equipment
	• precautions for unsafe weather conditions to undertake works:
	  • heavy rains
	  • high winds
	  • severe cold
	  • severe heat
	  • thunderstorms
	• radio frequency (RF) EMR:
	  • sources and types of RF EMR
	  • associated risks
	  • methods of detecting
	  • reporting EMR hazards
	  • verifying and maintaining EMR hazard management plan
	• safety activities which may include traffic management
	• safety issues:
	  • fall arrest
	  • fall guarding
	  • roof work
	• site hazard identification and control measures.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Telecommunications Rigging Installation

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ICTTCR3191A Install radio plant and equipment on telecommunications structures

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install basic telecommunications radio plant and equipment on telecommunications structures. This unit applies to standard telecommunications structures. A licensed rigger is required for the installation of some rigging equipment. The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels. CPCCLDG3001A Licence to perform dogging CPCCLRG3001A Licence to perform rigging basic level CPCCLRG3002A Licence to perform rigging intermediate level CPCCLRG4001A Licence to perform rigging advanced level. If operation of an elevated work platform is required, a licence may be required. Users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Technical staff who install basic telecommunications radio plant and equipment on telecommunications structures apply the skills and knowledge in this unit. They may use rigging plant and equipment, fall arrest, fall guarding and fall constraint and team communications.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		
	ICTTCR2188A	Use rigging practices and systems on telecommunications network structures
	ICTTCR2189A	Use operational safety in a telecommunications rigging environment
	ICTTCR2190A	Use safe rigging practices to climb and perform rescues on telecommunications network structures

Employability Skills Information

Employability skills	This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for installation of radio plant	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Arrange access to the site and discuss ***customer requirements***
	1.3. Inform appropriate personnel of existing and potential site hazards
	1.4. Select ***tools*** and ***safety equipment*** required for safe rigging practice
	1.5. Develop ***installation plans*** in agreement with customer or site supervisor
	1.6. ***Procure materials*** and verify delivery against inventory according to industry practice
2. Install plant and equipment	2.1. Set up rigging equipment for safe and effective use according to specifications
	2.2. Install telecommunications radio ***equipment*** and feeders according to specifications and industry practice following occupational health and safety (OHS) and environmental requirements
	2.3. Maintain installation progress documentation according to company and customer requirements
3. Assist with testing and fault-finding	3.1. Assist with ***testing*** of telecommunications radio equipment mounted on telecommunications structures
	3.2. Identify and locate faults by interpreting test results and rectify according to industry practice
	3.3. Document test results according to specifications and customer requirements
4. Clean up site and complete	4.1. De-rig and lower rigging equipment according to specifications

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ELEMENT	PERFORMANCE CRITERIA
documentation	4.2. Restore site to customer expectations following completion of installation according to industry practice 4.3. Complete documentation and notify customer for sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise with other personnel, including the use of radio devices
• literacy skills to interpret technical documentation, plans and specifications
• numeracy skills to take measurements and interpret results and evaluate different types of technical data
• planning and organisational skills to plan, prioritise and monitor own work and OHS responsibilities
• problem solving and contingency management skills to adapt rigging activities and requirements to particular sites and conditions
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• task management skills to work systematically with required attention to detail and adherence to all safety requirements
• technical skills to :
  • select and use personal protective equipment
  • be aware of meteorology and weather prediction
  • use appropriate installation equipment

Required knowledge
• antenna principles • features and operating requirements of rigging equipment

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REQUIRED SKILLS AND KNOWLEDGE

• relevant regulations and typical issues and challenges that occur onsite
• rigging practices and systems in relation to telecommunications radio structures, and related licensing and regulatory issues
• specific knowledge of:
  • electromagnetic radiation (EMR) safety practices
  • optical fibre cabling and equipment safety practices
  • working at heights safety practices
• specific OHS requirements relating to the activity and site conditions:
  • basic survival skills
  • company OHS procedures
  • hypothermia
  • remote area first aid

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• install basic telecommunications radio plant and equipment on telecommunications structures
	• assist with testing and fault-finding basic telecommunications radio plant and equipment mounted on telecommunications structures
	• use effective communications skills related to:
	  • dogging
	  • work associates
	  • supervisors
	  • team members
	  • enterprise documentation.

Context of, and specific resources	Assessment must ensure:

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EVIDENCE GUIDE	
for assessment	• site on which rigging operations may be conducted • rigging and safety equipment • relevant regulations, standards, specifications and manuals.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate setting up and carrying out installation work on a telecommunications structure • oral or written questioning of the candidate to assess OHS requirements and work practices associated with installing radio plant and equipment on telecommunications structure.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTCR3192A Protect against electromagnetic radiation and system hazards when working on telecommunications radio sites. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include

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EVIDENCE GUIDE	
	equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences that may be required:
	  • crane
	  • dogging
	  • rigging
	  • scaffolding
	  • winch
	• AS 1353.1:1997
	• AS 1353.2:1997
	• AS 1657:1992
	• AS 2319:2001
	• AS 2626:replaced by AS/NZS 1891.4:2000
	• AS 2089:2008
	• AS 3775.1:2004
	• AS 3775.2:2004
	• AS 3777:2008
	• AS 4497.2:1997
	• AS/NZS 1891.1:2007
	• AS/NZS 1891.4:
	• AS/NZS 4801:2001
	• AS/NZS ISO 14001:2004
	• Equipment Certifications e.g. NFPA 1983 (2006 edition), NFPA/UL G-rated (General Use)
	• CE, American National Standards Institute (ANSI) equipment standards

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RANGE STATEMENT	
	• enterprise standards • equipment standards, intrinsically safe lightning protection, site engineering standard • OHS • Radcoms Act • Telecoms Act • Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) EMR standard • Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • fire regulations • heritage legislation • international standards • local government • WIs, CIs, Business Operating Procedures (BOPs), Radiocommunications Assignment and Licensing Instructions (RALIs), assignment guidelines.
Customer requirements may include:	• availability of asset owner site personnel • compatibility with rest of network • timelines • type of equipment • type of structure.
Tools may include:	• crane • forklift • hand tools • load tension gauge • mechanical • power tools.
Safety equipment may include:	• aerial safety belts and lines • anchor straps • anchors • crane cage • earmuffs • elevated platform

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RANGE STATEMENT	

	• equipment guards
	• fall arrest devices and systems
	• fall constraint systems
	• fall guarding systems
	• flashing lights
	• gloves
	• guards
	• helmets
	• lanyards
	• pulleys
	• rescue harness
	• rigging plates
	• rope clamps
	• safety cages
	• safety glasses
	• safety harnesses:
	  • basic
	  • full body fall arrest
	  • sit harness
	• scaffold deck
	• static lines
	• warning signs and tapes.

Installation plans may include:	• EMR hazard management plan against an on site situation
	• fall arrest systems:
	  • double lanyards
	  • pole straps
	  • static lines
	• installation structures
	• plans and specifications detailing:
	  • cabling
	  • compatibility issues
	  • location of antennae and hardware
	  • material types and quantities
	  • tools required
	• preparing for work at a telecommunications site with optical fibre and laser equipment
	• relevant legislation, codes, regulations and standards
	• rigging systems, methods, and equipment

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RANGE STATEMENT	

	• safe working practices:
	  • fall guarding
	  • fall restraint systems
	  • installation of fall arrest
	  • lifting methods
	  • load calculation
	  • personal protective equipment
	  • safety issues in roof work
	  • safety plans
	  • site hazard identification and control measures
	• specifications for bolts:
	  • high strength
	  • high tensile
	  • mild
	  • stainless
	  • torque requirements
	• specifications for tensioning:
	  • antenna mounts
	  • load cells
	  • temporary anchors
	  • terminations:
	  • bulldog grips
	  • dead ends
	  • preformed.

Procure materials may include:	• handling • purchasing • storage • withdrawal from stock or stores.
Equipment may include:	• antenna systems • cabinets • cable trays • coaxial feeders and connectors • connectors • ducting • earthing systems in communications • feeders • frames

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RANGE STATEMENT	
	• microwave systems • optical fibre cable and equipment on network structures • steel work • terminating blocks • waveguide.
Testing may relate to:	• alignment of antennas and line of sight systems • antennae • cables • connectors • earthing • feeders.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications Rigging Installation

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ICTTCR3192A Protect against electromagnetic radiation and system hazards when working on telecommunications radio sites

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to protect personnel against electromagnetic radiation (EMR) and system hazards when working on telecommunications radio sites. A licensed rigger is required for the installation of some rigging equipment. The National Standard for Licensing Persons Performing High Risk Work applies to persons performing dogging and rigging work. Completion of the following units is required for certification at either basic, intermediate or advanced levels. CPCCLDG3001A Licence to perform dogging CPCCLRG3001A Licence to perform rigging basic level CPCCLRG3002A Licence to perform rigging intermediate level CPCCLRG4001A Licence to perform rigging advanced level. If operation of an elevated work platform (EWP) is required, a licence may be required. Achievement of this unit standard does not imply that the holder is competent to carry out EMR surveys. Users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Technical staff who work on telecommunications radio sites apply the skills and knowledge in this unit. They may make use rigging plant and equipment, fall arrest, fall guarding and fall constraint and team communications. This unit applies to standard telecommunications structures.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range

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	statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for work at a telecommunications site with potential EMR hazards	1.1. Prepare for given work using safe working practices and procedures according to the occupational health and safety (OHS) Act and ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Assess ***potential sources of radio frequency*** (***RF***) ***EMR*** allowing permissible public and occupational EMR exposure limits according to Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) 1.3. Verify ***methods for determining EMR levels*** and strategies for eliminating, minimising, or isolating on-site EMR hazards according to industry practice 1.4. Confirm work objectives and specifications of equipment to be installed according to design drawings, installation plans, and equipment manufacturer's specifications 1.5. Select equipment and ***personal protective equipment*** required to support the ***EMR hazard management plan*** according to company policy
2. Plan and carry out the EMR hazard management plan against an on-site situation	2.1. Produce EMR hazard management plan according to company policy 2.2. Consult with client to confirm EMR hazard management plan and update if required 2.3. Communicate the agreed EMR hazard management plan to all personnel on site
3. Monitor the EMR hazard management plan	3.1. Maintain ongoing communication to all personnel regarding amendments to the EMR hazard management plan according to company policy 3.2. Ensure that a personal radiation monitor (Radman) is worn according to manufacturer's instructions and industry practice

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - communicate the revised EMR hazard management plan to all personnel on site
  - liaise with other personnel
  - use radio devices
- literacy skills to read and interpret:
  - EMR hazard management plan
  - specifications and technical documentation
- numeracy skills to:
  - evaluate different types of technical data
  - interpret results
  - take measurements
- planning and organisational skills to plan, prioritise and monitor own work and OHS responsibilities
- problem solving and contingency management skills to adapt rigging activities and requirements to particular sites and conditions
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - apply remote area first aid
  - ensure that Radman is worn according to manufacturer's instructions and industry practice
  - prevent and treat hypothermia
  - select and use personal protective equipment for rigging projects to suit different applications and for work at heights
  - select and use required personal protective equipment for rigging projects to suit different applications and for work at heights conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - interpret and analyse documentation as sources of information relating to the site and potential EMR hazards
  - select and use appropriate equipment and practices to suit different applications

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REQUIRED SKILLS AND KNOWLEDGE
• review the EMR hazard management plan and update to align with the on-site situation • use equipment required to support the EMR hazard management plan
Required knowledge

• antenna principles
• EMR risk assessment and mitigation strategies
• features and operating requirements of rigging equipment
• licensing and regulatory issues applying to rigging practices and systems on telecommunications radio structures
• remote area first aid
• rigging practices and systems to telecommunications radio structures
• specific knowledge of:
  • EMR:
  • associated risks
  • methods of detecting and reporting EMR hazards
  • potential dangers of overexposure
  • safety practices and devices
  • sources and types of radio frequency EMR
  • optical fibre cabling and equipment safety practices
  • personal protective equipment
  • requirements of the OHS Act, relevant regulations, and applicable site and company OHS procedures
  • working at heights safety practices

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • produce and maintain the EMR hazard management

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EVIDENCE GUIDE	
competency in this unit	plan against an on-site situation • carry out work according to the EMR hazard management plan.
Context of, and specific resources for assessment	Assessment must ensure: • site on which rigging operations may be conducted • rigging and safety equipment relevant regulations, standards specifications and manuals.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate working safely with EMR on a telecommunications radio structure • oral or written questioning of the candidate to assess OHS requirements and work practices associated with EMR.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTCR3191A Install radio plant and equipment on telecommunications structures. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• Australian Communications and Media Authority (ACMA) technical standards
	• appropriate licences that may be required:
	  • crane
	  • dogging
	  • rigging
	  • scaffolding
	  • winch
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) EMR standard
	• AS 1353.1:1997
	• AS 1353.2:1997
	• AS 1657:1992
	• AS 2089:2008
	• AS 2319:2001
	• AS 2626: replaced by AS/NZS 1891.4:2000
	• AS 3775.1:2004
	• AS 3775.2:2004 AS 3777:2008 Shank hooks and large eye hooks - maximum 60 t
	• AS 4497.2:1997

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RANGE STATEMENT	

	• AS/NZS 1891.1:2007
	• AS/NZS 1891.4:2000
	• AS/NZS 4801:2001
	• AS/NZS ISO 14001:2004 guidance for use
	• Australian building codes and regulations
	• Australian standards
	• CE, American National Standards Institute (ANSI) equipment standards
	• enterprise standards
	• environmental protection
	• equipment certifications:
	  • NFPA 1983 (2006 edition)
	  • NFPA/UL G-rated (General Use)
	• equipment standards:
	  • intrinsically safe lightning protection
	  • site engineering standard
	• fire regulations
	• heritage legislation
	• international standards
	• local government
	• OHS
	• Radcoms Act
	• related publications
	• Telecoms Act
	• WI's, CI's, Business Operating Procedures (BOP), Radiocommunications Assignment and Licensing Instruction (RALI), assignment guidelines.

Potential sources of radio frequency EMR may include:	• cellular and mobile transmitter • microwave • radar • radio.

Methods for determining EMR levels may include:	• calculations
	• documentation
	• EMR hazard management plan:
	  • EMR measuring devices with evidence of two required
	  • personal monitoring devices
	  • personal protection equipment
	• methods of detecting and reporting EMR

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RANGE STATEMENT	

	hazards
	• reported EMR hazards
	• signage
	• sources and types of radio frequency EMR
	• sources of information relating to the site and potential EMR hazards:
	  • co-location records
	  • company records
	  • site owner's documentation
	• use of personal monitoring devices
	• verifying and maintaining the EMR hazard management plan against an on-site situation.

Personal protective equipment may include:	• Radman
	• safety equipment may include:
	  • aerial safety belts and lines
	  • anchor straps
	  • anchors
	  • crane cage
	  • ear muffs
	  • elevated platform
	  • equipment guards
	  • fall arrest devices and systems
	  • fall constraint systems
	  • fall guarding systems
	  • flashing lights
	  • gloves
	  • guards
	  • helmets
	  • lanyards
	  • pulleys
	  • rescue harness
	  • rigging plates
	  • rope clamps
	  • safety cages
	  • safety glasses
	  • safety harness:
	  • fall arrest
	  • sit harness

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RANGE STATEMENT	
	• scaffold deck • static lines • warning signs and tapes.

EMR hazard management plan may relate to:	• assessment of the status and condition of telecommunications structures:
	  • access for climbing
	  • EMR hazardous areas
	  • structural integrity
	• control measures
	• EMR devices
	• site hazard identification
	• verifying and maintaining the EMR hazard management plan against an on-site situation.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications Rigging Installation

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ICTTEN2008A Use electrical skills in telecommunications work

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required for an entry-level worker to use electrical skills working in telecommunications.

Application of the Unit

Technical staff who undertake basic testing, circuit building and evaluation of cable and wireless devices apply the skills and knowledge in this unit. They may work in domestic, commercial and industrial situations.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills*

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Elements	Performance Criteria
	and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Connect up, test and verify DC and AC circuitry	1.1 Identify any hazards and work health and safety (WHS) issues for a safe work site, and notify appropriate personnel 1.2 Connect a series and a parallel ***DC and AC circuit configuration*** following ***safe work practices*** 1.3 Choose the appropriate ***test equipment*** and measure the values of electrical quantities of the circuits 1.4 Use ***calculations*** to verify the measured values of the ***electrical quantities*** in a series and in a parallel circuit configuration 1.5 Compare the measured values to the calculated values, and determine the reasons for any variations 1.6 Measure LV, ELV and TNV voltages to determine that the value is within equipment or power supply specifications 1.7 Use appropriate test equipment to measure AC voltage (multimeter) or AC current (clamp meter) in a safe manner that does not require an LV circuit to be disconnected 1.8 Test residual current devices (RCD) or earth leakage devices to ensure they are working prior to working with AC mains powered equipment, power supplies and tools 1.9 Evaluate results and determine ***probable faults if relevant***
2. Evaluate analog and digital signals	2.1 Compare ***characteristics of an analog signal and a digital signal*** 2.2 Produce a layout using the ***building blocks*** to represent a typical analog and a digital circuit showing the different characteristics between that of an analog signal and a digital signal 2.3 Produce 4-bit binary codes with their decimal equivalent to represent output voltages of a digital to analog converter 2.4 Choose appropriate test equipment and measure the output voltage of a digital device for ‘high’ and ‘low’ logic states
3. Perform cable	3.1 Compare basic ***transmission characteristics*** of different ***types of cables*** used in telecommunications and select the most

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selection	appropriate cable type to suit ***application characteristics*** 3.2 ***Connect two devices with a patch cable and test the connection***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to request technical information for activities
- literacy skills to:
  - interpret technical documentation
  - incorporate technical language into written tasks
- numeracy skills to:
  - interpret technical data, such as specifications of telecommunications networks
  - perform mathematical problem solving in AC and DC tasks and fault finding
- problem-solving skills to apply AC and DC fault-finding techniques to different situations
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment, conforming to industry and WHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to select and use appropriate test equipment and practices to perform basic AC and DC testing and fault finding tasks.
-

Required knowledge

- AC and DC electrical quantities, encompassing SI units, WHS issues and the application of Ohm’s law
- AC and DC fault-finding techniques and use of testing equipment
- AC and DC theory
- analog and digital principles
- application of binary to decimal conversion and vice versa
- distinction between analog and digital signals and devices
- encoding techniques and their application in wired, wireless and optical communications systems

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- features and applications of unshielded twisted pair (UTP), coaxial and fibre cables
- typical electronic devices, cable types and their applications
- modulation techniques used in wired, wireless and optical communications systems
- techniques to convert analog to digital and digital to analog.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use Ohm's law and fundamental electrical principles to solve basic AC and DC electrical problems • connect and test an AC and DC circuit • evaluate cable and wireless devices.
Context of, and specific resources for assessment	Assessment must ensure: • appropriate AC and DC testing equipment • manufacturer's documentation and equipment • safety equipment.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking AC and DC measurements and fault finding • oral or written questioning to assess knowledge of fundamental concepts of telecommunications networks.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN2140B Use hand and power tools. Aboriginal people and other people from a non-English

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	speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

DC and AC circuit configuration may include:	• AC to DC supply
	• DC circuit:
	  • resistances
	  • single DC voltage source:
	  • battery
	  • DC voltage supply
	  • solar panel
	  • power loads
	• AC circuit:
	  • inductors, capacitors and resistances
	  • single AC voltage source:

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	• AC generator • AC voltage supply • alternator • low voltage AC source.

Safe work practices may relate to:	• component tolerances not exceeded
	• correct use of power supply and test equipment
	• identifying electrical safety hazards
	• isolation from main supply
	• overdrawing of current
	• power down during set-up procedure
	• well laid out circuitry:
	  • avoid contact with external sources
	  • avoid shorting of components.

Test equipment may include:	• AC current clamp meters • multimeters, including digital multimeters • ohmmeters • voltmeters.
Calculations may include:	• application of Ohm's law • engineering notation • power calculations • power consumption and efficiencies • voltage dividers • voltage, resistance and current calculations.
Electrical quantities may include:	• current • power • voltage.
Probable faults may include:	• blown fuse • cracked circuit board • failed components • faulty power supply • foreign battery • intermittent faults • loose connections • open circuit • short circuit • short to ground • split pairs • water damage.
Characteristics of an analog signal and a digital signal may	• analog signal characteristics: • continuously variable, infinite number of states

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include:	• intelligence based on recreating exact waveshape • signal to noise ratio increase with amplification • digital signal characteristics: • encryption • error detection and correction • finite number of discrete states • high noise immunity • intelligence based on ability to discern only two states • regeneration • type of square wave (complex waveform).
Building blocks may include:	• analog: • amplifiers • attenuators • displays • filters • oscillators • transducers • digital: • ADC and DAC • computers • counter • data routers, switches and bridges • digital amplifier • digital display • input and output transducers • multiplexer.
Transmission characteristics may include:	• attenuation • balanced • characteristic impedance (Zo) • crosstalk • frequency range • transmission windows for glass optical fibre • unbalanced • waveguide cut-off frequency.
Types of cable may include:	• aluminium and copper DC busbars • coaxial cable • multi-pair communications cable • optical fibre • performance data cable CAT 5 and higher • rack and sub-rack alarm and power distribution cables

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	• shielded twisted pair (STP) communications cable • UTP communications cable.
Application characteristics may include:	• audio • data • digital subscriber line (DSL) • ethernet • microwave • optical/laser • power • radio frequency (RF) • satellite • video.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN2140B Use hand and power tools

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to safely use hand and power tools in the workshop and on the worksite.

It involves preparing for work, selecting, using and maintaining hand and power tools and cleaning up.

Application of the Unit

Technical staff who use hand and power tools apply the skills and knowledge in this unit. They may make use of safety equipment and workshop facilities.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for work activity	1.1 Identify the type of work to be performed from ***work instructions***
	1.2 Select appropriate ***hand and power tools*** for the work to be performed
	1.3 ***Set up and check tools*** for use according to available ***information***
	1.4 Examine ***work environment*** and plan work with tools to maximise safety and productivity
	1.5 Clear and clean work area to make it free of obstructions and allow clear access to tools
2. Prepare work piece for tool use	2.1 Mount, support or align ***work piece*** correctly to the tool or machine to be used
	2.2 Anchor work piece securely where necessary to prevent movement
3. Operate hand and power tools	3.1 Use hand and power tools according to industry and enterprise ***safe working practices***
	3.2 Use ***safety equipment*** during tool operation according to industry and enterprise safe working practices
	3.3 Monitor tool operation continuously and discontinue use if abnormal operation occurs
	3.4 Clean the work area on completion of work
4. Maintain hand and	4.1 Clean and store tools according to industry and enterprise

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power tools after use	safe working practices 4.2 Report abnormal tool operation or other problems according to established procedures 4.3 Perform programmed maintenance of tools according to work role 4.4 Arrange inspection of power tools according to ***regulatory requirements***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with colleagues on technical and operational matters
  - record and report procedures
- literacy skills to interpret and understand the information required for the preparation and application of hand and power tools including:
  - equipment
  - manufacturer's instructions
  - materials safety data sheets
  - quality assurance procedures
  - work instructions
- planning and organisational skills to manage time, organise priorities and plan work
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards associated with use of particular hand and power tools
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - use relevant chemicals and cleaning agents and dispose of waste products
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - select and use appropriate hand and power tools
  - use technical information for tools, processes, materials and equipment.
  -

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Required knowledge

- electrical and compressed air safety
- equipment types, characteristics, technical capabilities and limitations
- features and operating requirements of hand and power tools
- general housekeeping policies and procedures
- industry and work site terminology
- information required to operate equipment according to a test specification
- job safety analysis (JSA) or safe work method statement
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- materials commonly used in the industry
- material safety data sheets (MSDS) and materials handling methods
- operational, maintenance and basic diagnostic procedures
- power sources
- specific OHS requirements relating to the activity and site conditions
- typical issues and challenges that occur onsite.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • interpret work orders relevant to the selection and use of tools • interpret specifications and instructions relating to the materials and equipment on which the tools are to be used • prepare work environment and set up tools for safe and effective use • perform work processes following all relevant safety requirements applying to the use of hand and power tools • monitor tool operation for correct operation during use • inspect completed work to verify correct tool operation and use • document and communicate work related information including reporting of faults and other problems

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	• comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • sites where hand and power tools may be used • use of hand and power tools currently used in industry • relevant regulatory and equipment documentation that impact on the use of hand and power tools.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate setting and checking tools for use • direct observation of the candidate operating hand and power tools according to industry and enterprise safe working practices • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWHS2170B Follow WHS and environmental policy and procedures. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required

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	in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Work instructions may include:	• charts and hand drawings
	• diagrams or sketches
	• MSDS
	• memos
	• plans
	• quality requirements:
	  • dimensions and tolerances
	  • material standards
	  • standards of work
	• recording and reporting of work outcomes
	• safe work procedures or equivalent related to using hand and power tools
	• signage
	• specifications
	• verbal or written and graphical instructions
	• work bulletins
	• work schedules.

Hand and power tools may include:	• hand tools:
	  • chisels
	  • crowbars
	  • files
	  • hacksaws
	  • hammers
	  • measuring equipment
	  • pliers

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	• pop riveting machines • screwdrivers • shovels • spanners • wire strippers • power tools: • angle grinders • circular saws • drills • grinders • hammer drills • jig saws • lifting and hoisting equipment.
Set up and check tools may include:	• inspect tools for: • damage • missing components • other defects prior to use • install operating components (bits or blades) in tools • set or adjust tools.
Information may relate to:	• Australian and enterprise quality standards and procedures • enterprise or external personnel • enterprise work orders and instructions • industry codes and symbols • job procedures • product change policies and procedures • tool manufacturers' specifications, operating procedures and setting instructions.
Work environment may include:	• client site • hazardous or exposed conditions • operational indoor workplaces • operational outdoor workplaces • restricted or confined spaces.
Work piece may include blocks of:	• aluminium • bronze • plastic • stainless steel • steel • wood.
Safe working practices may refer to:	• barriers or screens to control access and minimise dust and noise

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	• clearing route for safe placement of leads
	• control of hazardous materials
	• emergency procedures related to equipment operation:
	  • emergency shutdown and stopping
	  • evacuation
	  • extinguishing equipment fires
	  • organisational first aid requirements
	• handling of materials
	• identification of potential hidden hazards:
	  • 'blind' drilling in walls
	  • harmful gasses
	  • non-visible laser emission
	• place tools in safe positions when not in use
	• running electrical power leads to power supply so they are clear of traffic or covered where possible
	• use of fire fighting equipment
	• use of first aid equipment
	• use of tools and equipment
	• visually checking power leads for serviceability and safety
	• workplace environment and safety.

Safety equipment may include:	• earth leakage circuit breaker (ELCB)
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• rubber mats.

Regulatory requirements may include:	• environment protection legislation • Federal, state and territory legislation • OHS legislation relevant to workplace activities • workers' compensation legislation • workplace agreements and awards.

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Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN2207A Install and configure a home or small office network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required for entry level networking support to establish a small office or home office (SOHO) internet connected PC network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to a home office or small business requiring the use of network and internetwork connectivity. It also applies to small networks with simple internet protocol (IP) addressing schemes that share a limited range of resources. Physical connections may be wired or wireless and simple firewall security employed. Relevant job roles include installer of SOHO IP networks, network technician, SOHO network support and digital home integrator.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for the installation of a home or small office network	1.1. Prepare for given work confirming site specific occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network and ***network resources*** from job briefs or appropriate personnel 1.4. Select and obtain ***personal computer system*** and ***network device*** requirements according to ***enterprise procedures***

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ELEMENT	PERFORMANCE CRITERIA
	1.5. Obtain operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the work site
2. Install and troubleshoot a home or small office network	2.1. Set up personal computer systems according to manufacturer's specifications and enterprise procedures 2.2. Set up, configure and share network resources between network devices 2.3. Determine ***network addressing scheme*** for network connectivity and confirm using ***calculations*** 2.4. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures 2.5. Identify security threats and initiate control measures according to enterprise procedures
3. Complete and document network installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures 3.4. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with customers and peers to achieve outcomes • literacy skills to read and interpret enterprise procedures, manuals and specifications • numeracy skills to interpret technical data and perform calculations to confirm network connectivity • planning and organisational skills to plan and prioritise own work • problem solving skills to:

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REQUIRED SKILLS AND KNOWLEDGE

• deal with unexpected situations on the basis of safety and specified work outcomes
• troubleshoot common network problems according to help desk procedures
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • follow enterprise OHS procedures
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • configure the security features of a network to minimise risk of any security breach
  • correctly use tools and equipment
  • design a small computer network using appropriate protocols, tools and models to provide a specified range of services
  • develop a security policy for a small computer network
  • install, configure and maintain basic wired and wireless computer networks, systems and peripherals
  • plan, select, install and configure network operating systems

Required knowledge
• correct usage of tools and equipment • enterprise OHS procedures • basic computer systems and network operating systems • computer networking principles (wired and wireless) • network addressing systems (basic) • network services and associated network models and protocols • network security management • troubleshooting procedures

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement OHS workplace procedures and practices • plan the installation of an internet connected network • set up and configure wired and wireless networks with simple addressing schemes • troubleshoot network and internet connectivity • set up resource sharing • deploy simple firewall network security.
Context of, and specific resources for assessment	Assessment must ensure: • a site where installation of a SOHO network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and configuring a SOHO network • direct observation of the candidate deploying simple firewall network security • oral or written questioning to assess knowledge of personal computer systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2208A Install and configure a small to medium business network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS requirements may include:	• awards provisions • hazardous substances and dangerous goods code • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste

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RANGE STATEMENT	
	• smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer/client • manager • network manager • site engineer • supervisor.
Network resources may include:	• dynamic host configuration protocol (DHCP) server • domain name system (DNS) server • files • software • web browser.
Personal computer system may include:	• interface cards • media connections • operating system • PC hardware • peripheral devices.
Network device may include:	• hub • network attached storage device • print server • router (wired or wireless) • switch.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Network addressing scheme may include:	• dynamic addressing • static addressing • sub-net addressing.
Calculations may include:	• binary addition • binary conversion • binary division

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RANGE STATEMENT	
	• binary multiplication • binary number system • binary subtraction.
Essential installation information may include:	• installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN2208A Install and configure a small to medium business network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to establish and support a small to medium business network capable of providing wide area network (WAN) connectivity and common web internet services. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to small and medium size businesses requiring the use of wired network connectivity. It also applies to networks that employ subnet addressing and provide internet service provider (ISP) services over a secure network. Relevant job roles include subject matter expert (SME) internet protocol (IP) network installer, network technician, SME network support and SME network administrator.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for the installation of a small to medium enterprise network	1.1. Prepare for given work confirming site specific occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the business network and ***network resources*** from job briefs or appropriate personnel 1.4. Select and obtain computer system and ***network device*** requirements according to ***enterprise procedures***

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ELEMENT	PERFORMANCE CRITERIA
	1.5. Obtain operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the work site
2. Install and configure a small to medium enterprise network	2.1. Set up ***wired infrastructure*** according to manufacturer's specifications and enterprise procedures 2.2. Set up and configure resource sharing on a network server 2.3. Install WAN connection and ISP services and configure according to enterprise procedures 2.4. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures 2.5. Implement data backup and disaster recovery measures according to enterprise procedures
3. Complete and document network installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures 3.4. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise with customers and peers to achieve outcomes
• literacy skills to:
  • develop network documentation and maintain network records
  • read and interpret enterprise procedures, manuals and specifications
• numeracy skills to interpret technical data
• planning and organisational skills to plan and prioritise own work

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REQUIRED SKILLS AND KNOWLEDGE

• problem solving skills to:
  • deal with unexpected situations on the basis of safety and specified work outcomes
  • troubleshoot common network problems according to help desk procedures
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • follow enterprise OHS procedures
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • determine business needs of a small ISP
  • identify customer requirements and provide help desk support
  • implement WAN services to the internet
  • install, configure and troubleshoot networking devices
  • instigate data backup and disaster recovery procedures
  • modify and translate network and port addresses to establish connectivity
  • plan wired network infrastructure
  • use router testing methodologies to verify a given configuration

Required knowledge
• correct usage of tools and equipment • data backup services and procedures • enterprise OHS procedures • ISP services • network device configuration • network models and topologies • subnet addressing • troubleshooting procedures • WAN services and ISP responsibilities

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement OHS workplace procedures and practices • plan the installation of a network that uses subnet addressing and provides ISP services • set up and configure wired infrastructure • troubleshoot local network and WAN connectivity and services • configure resource sharing on a network server • provide network data backup and disaster recovery.
Context of, and specific resources for assessment	Assessment must ensure: • a site where installation of a small to medium business network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and configuring a small to medium business network • direct observation of the candidate providing network data backup and disaster recovery • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN2207A Install and configure a home or small office network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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EVIDENCE GUIDE	
	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods code • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume

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RANGE STATEMENT	
	• gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• client • customer • manager • network manager • site engineer • supervisor.
Network resources may include:	• dynamic host configuration protocol (DHCP) server • domain name system (DNS) server • files • software • web browser.
Network device may include:	• router • server • switch • wired infrastructure for a small to medium size business.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Wired infrastructure may include:	• connectors and cabling • copper cables • distribution frames • fibre cables.
Essential installation information may include:	• installation software • IP addressing schemes • logical and physical diagrams • network administrator codes

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RANGE STATEMENT	
	• passwords • security access codes.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN2209A Build and maintain a secure network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to build a simple and secure wired local area network (LAN) or wide area network (WAN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to simplified network environments demonstrating the use of network and internetwork connectivity using a range of client server applications and services. Relevant job roles include installer of internet protocol (IP) networks, WAN and LAN network technician and WAN and LAN network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to build a LAN or WAN	1.1. Prepare for given work confirming site-specific occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine network design specification from job briefs or appropriate personnel 1.4. Determine ***network addressing scheme*** for network connectivity and confirm using ***calculations*** 1.5. Select and obtain ***network hardware*** according to ***established procedures*** 1.6. Obtain operating instructions, manuals, hardware and software testing methodologies

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ELEMENT	PERFORMANCE CRITERIA
	1.7. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Build and verify a network	2.1. Establish connections between network hardware according to manufacturer's specifications and established procedures 2.2. Verify network routing and switching to conform to network design specification 2.3. Set up, configure and share ***network resources*** between network devices
3. Monitor network performance and troubleshoot network	3.1. Monitor network traffic and assess performance metrics against manufacturer's specifications and established procedures 3.2. Identify security threats and initiate control measures according to enterprise procedures 3.3. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures
4. Complete and document network build	4.1. Restore work site to safe condition according to established safety procedures 4.2. Record and store network schematics and network addressing scheme 4.3. Notify appropriate personnel about the completion of the task 4.4. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with customers and peers to achieve outcomes • literacy skills to: • read and interpret enterprise procedures, manuals and specifications • numeracy skills to interpret technical data and devise addressing schemes • planning and organisational skills to plan and prioritise own work

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REQUIRED SKILLS AND KNOWLEDGE

• problem solving skills to:
  • deal with unexpected situations on the basis of safety and specified work outcomes
  • troubleshoot common network problems according to help desk procedures
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • follow enterprise OHS procedures
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • configure applications and verify their connection to provide network services
  • configure interfaces, test and verify correct functionality
  • configure the security features of a network to minimise risk of security breach
  • plan, build, configure, test and analyse the performance of a network
  • use appropriate tools to develop and test network addressing
  • use appropriate tools to monitor and analyse the routing of packets in a network

Required knowledge
• enterprise OHS procedures • internet and computer network communication • network addressing schemes • open systems interconnect (OSI) and transmission control protocol (TCP)/IP model • planning the cabling of Ethernet networks • seven layer OSI model • tool and equipment correct usage • troubleshooting procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement OHS workplace procedures and practices • develop a network addressing scheme • determine required network components to build the network • plan, build, configure, test and analyse the performance of a network • troubleshoot network problems.
Context of, and specific resources for assessment	Assessment must ensure: • a site where building and maintenance of a secure network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate building configuring and testing a secure wired LAN or WAN network • direct observation of the candidate troubleshooting network problems • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4212A Apply advanced routing protocols to network design • ICTTEN4213A Configure and troubleshoot advanced network switching • ICTTEN4214A Install and maintain a wide area network. Aboriginal people and other people from a non-English speaking background may have second language issues.

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EVIDENCE GUIDE	
	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods code • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume

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RANGE STATEMENT	
	• gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Network addressing scheme may include:	• dynamic • static • subnet.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Network hardware may include:	• cables • routers • switches.

Established procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Network resources may include:	• dynamic host configuration protocol (DHCP) server • domain name system (DNS) server • files • software • web browser.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN2218A Operate new media software packages

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge to operate media software packages and supporting hardware to produce a media design. It involves selection and appraisal of media software tools, assessment and manipulation of software functions. It also involves use and creation of graphics and editing media files. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit provides an introduction to the use of media software packages for people wanting to be employed in the multimedia production area. It may eventually lead to employment in graphic design, industrial design, production of promotional and marketing media material.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify relevant new media software and supporting hardware to meet a design brief	1.1. Perform the media work in a safe manner to comply with occupational health and safety (***OHS***) ***criteria*** and accepted industry practice 1.2. Identify the basic ***requirements of a media design brief***, including ***user environment*** from ***customer specifications*** 1.3. Research and review new media ***software*** and ***hardware*** available to realise the design requirements 1.4. Select a new media software program to meet design brief requirements 1.5. Identify relevant new media hardware to support design brief requirements

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ELEMENT	PERFORMANCE CRITERIA
	1.6. Select, ***re-encode*** and ***transcode*** relevant ***file formats*** to process and modify digital ***media files*** to suit ***user application***
2. Develop a new media graphic design	2.1. Review design brief to ensure customer requirements are well interpreted 2.2. Procure or create suitable ***graphics***, video or sound to meet requirements of design brief 2.3. Manipulate graphics, video or sound using freely available ***software tools*** for evaluating the capabilities and limitations of different software packages 2.4. Produce a media design according to customer specifications and save the new media files using the designated file formats
3. Review new media design	3.1. Evaluate media design for ***creative***, ***dramatic*** and ***technical quality***, file size, and ***data*** suitability to meet the brief 3.2. Test and run graphics, video and sound of the media design as part of a multimedia presentation and present designs in the appropriate format

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to work with others in a team
- literacy skills to read and interpret technical information and software specifications
- numeracy skills to size objects in computer assisted design (CAD)
- PC skills to load software and apply written keyboard instructions
- problem solving skills to clarify and solve unpredictable software and user environment problems that may arise
- technical skill to :
  - accurately incorporate workflow and stakeholder input
  - investigate, analyse and evaluate new media software requirements
  - manipulate digital photographs, images, videos and sound

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REQUIRED SKILLS AND KNOWLEDGE
• use and configure new media hardware • use new media software programs • use software tools to develop, edit and test design • use visual design techniques
Required knowledge

• functions and features of two new media applications
• graphic design and stylistic language conventions
• software tools to develop, edit and test design
• the principles of:
  • digital imaging and file formats
  • file management and
  • transfer systems
  • video and sound file formats
  • visual design principles
• vendor product directions in new media hardware and software
• visualisation and interpreting creative information, scripts (text) and images

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate new media software • manipulate files effectively • produce a media design using two new media software packages • evaluate design • test and run design.
Context of and specific resources for assessment	Assessment must ensure: • work stations with appropriate software tools loaded

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EVIDENCE GUIDE	
	• media capable PCs • peripheral media equipment with HD capability • LAN with media server • internet access.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate operating new media software • oral or written questioning to assess knowledge of media applications and required knowledge • review of new media graphic designs and presentations prepared by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS criteria may include:	• correct posture • ergonomic desk and chair • length of time in front of computer • light position • lighting • repetitive strain injury prevention • type of monitor • typing position • ventilation.

Requirements of a media design brief may include:	• animation
	• application
	• format:
	  • audio
	  • graphic
	  • images
	  • video
	• length
	• protocol
	• resolution or definition:
	  • high definition (HD)
	  • standard definition (SD)
	• type of production.

User environment may include:	• home theatre • internet protocol TV (IPTV) • iTune • UTube • media player • mobile devices • Web.
Customer specifications may refer to material for:	• advertising campaign • animation • magazine

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RANGE STATEMENT	
	• marketing • multimedia • point of sale • promotion • promotional material • sales brochure • theatre production • video clip • Web promotion material.

Software may include:	• animation software:
	  • 3D Studio Max
	  • Cinema 4D
	  • Houdini
	  • Lightwave
	  • Maya
	  • Motionbuilder
	  • Soft Image - XSI
	• graphics:
	  • 3D Studio Max
	  • Illustrator
	  • Maya
	  • Photoshop
	  • Softimage
	• sound editor application:
	  • Audacity
	  • BroadWave Streaming Audio Server
	  • DJ Audio Editor
	  • Peak Pro
	  • Power Sound editor
	  • WavePad
	  • Wavosaur
	• type:
	  • closed-source
	  • online
	  • open source
	  • proprietary
	• video encoding and conversion tools:
	  • Apple QuickTime Pro

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RANGE STATEMENT	

	• AutoGK
	• Avidemux
	• AVS Video converter
	• Cinema Craft Encoder
	• Encoding.com
	• Flix Cloud
	• FormatFactory
	• MediaCoder
	• MEncoder
	• Movavi
	• MP4Box
	• MPEG Streamclip
	• MythTV
	• Quick Media Converter
	• Total Video converter
	• VirtualDub
	• Zencoder
	• video editing:
	  • Adobe - Premier Pro, After effects, Encore
	  • Apple - Final cut, iMovie
	  • AviSynth
	  • AVS video
	  • Blender 3D - animation suite
	  • LiVES
	  • Media ComposerXpress Pro
	  • Montage Extreme
	  • MPEG Video Wizard
	  • Pinnacle VideoSpin
	  • Video ReDo Plus
	  • VideoPad.

Hardware may include:	• Blu Ray player • digital camera • HD DVD • media player • MP3 player • MP4 Player • personal digital assistant (PDA) • scanners.

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RANGE STATEMENT	
Re-encode may refer to:	• editing • image scaling or transsizing • lower bit rate or transrating.
Transcode may refer to:	• content adaptation • data conversion • data migration • different operating system • different platform • reducing disk space.

File formats may include:	• audio:
	  • lossy compression:
	  • AAC
	  • AC3
	  • MP3
	  • Musepack
	  • RealAudio
	  • Vorbis
	  • WMA
	  • lossless compression:
	  • ALAC
	  • ALAC
	  • APE
	  • FLAC
	  • OGG
	  • SHN
	  • WV
	  • uncompressed:
	  • AIFF
	  • Au
	  • WAV
	• video:
	  • Dirac
	  • Flash
	  • MPEG-1
	  • MPEG-2
	  • MPEG-4
	  • Real Video
	  • Snow

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RANGE STATEMENT	
	• Theora • WMV.
Media files may include:	• graphics • HTML pages • movies • music • PDF files • pictures • text files • video.

User application may refer to:	• applying special effects:
	  • equalisation
	  • fade
	  • flange
	  • noise reduction
	  • reverb
	• converting
	• cutting files
	• mixing
	• storing using different format
	• video and sound editing.

Graphics may include:	• animations • artwork • icons • logos • rendering images • screenshots • styles • symbol and images • typography.

Software tools include:	• video and sound:
	  • editor
	  • video and sound converter
	  • video and sound encoder.

Creative quality may include:	• creative design • interaction with other media formats • new and innovative ideas • novel approach • use of colour, sound and animation.

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RANGE STATEMENT	
Dramatic quality may include:	• attention grabbing • effective • message clarity.
Technical quality may include:	• compatibility with most players • CPU usage • effective use of format to create design • file size • storage requirements • store and retrieve speed • use of protocols.
Data may include:	• graphics • images • screenshots • sound • text • video and icons.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN2219A Install and test internet protocol devices in convergence networks

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install and test internet protocol (IP) based telecommunications networking using convergent technologies.

This entry-level unit introduces IP convergence of the emerging technologies used in telecommunications to deliver services of Next Generation Networks (NGN) by configuring and testing an IP device.

NGN services include internet protocol TV (IPTV), IP security, digital home networks, IP-based cable access TV (CATV), IP core and access networks, home automation, interactive TV, radio frequency identification (RFID), biometric recognition systems, mesh networks, smart grids and cloud computing.

Application of the Unit

Technicians and cable installers who install and maintain IP-based equipment for customer and service providers apply the skills and knowledge in this unit.

They may be up-skilling from traditional legacy telecommunications technologies or cross-skilling from related industries to provide services in NGN using IP technologies.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Gather information to prepare for the installation of an IP device	1.1 Obtain and clarify ***work health and safety (WHS) requirements*** and ***environmental requirements*** for a given work area with appropriate person 1.2 Identify safety hazards and notify ***appropriate personnel*** 1.3 Obtain identified operating instructions, manuals, and hardware and software testing methodologies 1.4 Obtain documentation on a range of ***IP devices*** that can be networked according to the ***open system interconnection (OSI) reference model*** in networking 1.5 Obtain the range of required IP devices to be connected to the ***network*** and identify the ***IP-based telecommunications application*** that will be provided
2. Prepare for the installation of an IP device	2.1 Select an IP device for installation that can be integrated into the existing network 2.2 Obtain appropriate ***hardware, software, network protocols, peripheral devices*** and ***media types and connectors*** for configuration process 2.3 Draw the physical topology of the device connection to the network and seek approval from the appropriate person 2.4 Obtain ***configuration details*** to start setting up the device

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3. Configure and test the IP device	3.1 Determine ***network addressing scheme*** for mapping network connectivity and verify by ***calculations***
	3.2 Assign a valid static IP address to the device
	3.3 Use ***network commands*** to determine and verify the media access control (MAC) address, the IP address and network performance of the device
	3.4 Determine ***security threats*** and initiate ***security solutions*** to prevent security breaches according to enterprise procedures
4. Complete and document network installation	4.1 Restore work site to safe condition according to established safety procedures
	4.2 Record and store ***essential installation information*** according to enterprise procedures
	4.3 Notify appropriate person about the completion of the task according to enterprise procedures
5. Test a wireless link	5.1 Select the types of ***wireless connections*** used in telecommunications
	5.2 Set up a wireless link to connect two wireless devices following safe work practices
	5.3 Transmit data over the link and verify the accuracy of the received data

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to work effectively within a group
- literacy skills to interpret configuration instructions
- numeracy skills to gather and record data from measurements
- technical skills to:
  - configure and test an IP device
  - recognise security threats and offer solutions.
  -

Required knowledge

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- computer networking principles
- configuration instructions
- IP addressing
- IP devices
- organisational policy and procedures relating to the installation and testing of internet protocol devices
- procedures for basic testing and troubleshooting of an IP device
- procedures for assigning networking protocols
- security configurations
- wireless technologies and basic applications
- work health and safety (WHS) requirements and personal safety issues relating to the installation and testing of internet protocol devices.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare for the installation of an IP device connected to a network • set up and configure IP device with simple addressing schemes • test and secure the device against security threats • produce essential installation information • follow WHS workplace procedures and practices • test wireless link.
Context of, and specific resources for assessment	Assessment must ensure: • a small network with IP devices • tools, equipment, materials and documentation required for installing and testing IP devices • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess

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	practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and testing IP devices • review of drawings of and records for installation • oral or written questioning to assess knowledge of personal computer systems • direct observation of the candidate setting up wireless link and transmitting data.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN2207A Install and configure a home or small office network • ICTTEN2208A Install and configure a small to medium business network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

WHS requirements may include:	• award provisions • hazardous substances and dangerous goods code • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include managing:	• dust • excessive energy and water use • excessive noise • fumes • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate person may include:	• customer • network manager • site manager • supervisor.

IP devices may include:	• asymmetric digital subscriber line (ADSL) router
	• biometric device:
	  • face recognition
	  • fingerprint scanner
	  • iris recognition scanner
	  • voice recognition
	• computer network:
	  • data switch
	  • gateway
	  • hub
	  • router
	  • server
	  • wireless access point (AP)

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	• IP CCTV unit or camera • IP security alarm panel • IP wireless router • RFID device • voice over internet protocol (VoIP) phone.
OSI reference model has seven layers, including:	• L1 – physical • L2 – data link • L3 – network • L4 – transport • L5 – session • L6 – presentation • L7 – application.
Network may include:	• carrier access network • carrier core network • client-server network • Ethernet • home network • internet • intranet • IPTV • local area networks (LAN) • mesh network • peer-to-peer network • RFID • smart grid network • virtual private network (VPN) • VoIP • wide area network (WAN) • wireless local area network (WLAN or WiFi).
IP-based telecommunications application may include:	• IP security network • IP-PBX • IPTV • VoIP • Web 2 applications.
Hardware may include:	• displays • DSL modems • external drives • IP device • memory • mobile equipment • motherboard

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	• network interface card (NIC) card • uninterrupted power supply (UPS) • workstations.
Software may include:	• configuration software • diagnostic software • modem driver • MS Office suite • operating system (OS) • printer driver.
Network protocols may include:	• address resolution protocol (ARP) • dynamic host configuration protocol (DHCP) • file transfer protocol (FTP) • H.323 • hypertext transfer protocol HTTP • IP • simple network management protocol (SNMP) • transmission control protocol (TCP)/IP • telnet • wireless application protocol (WAP).
Peripheral devices may include:	• Bluetooth device • IP speakers • modem • printer • RFID reader • scanner • USB and Firewire devices • webcam.

Media types and connectors may include:	• type:
	  • cable:
	  • Category 5, 5e, 6 or 7
	  • coaxial
	  • crossover
	  • optical fibre
	  • roll over
	  • straight through
	  • wireless
	• connectors:
	  • BNC
	  • FC
	  • RJ45

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	• SC • ST.
Configuration details may include:	• access levels • authorisation level • encapsulation • encryption • IP addressing and subnet mask • security level.
Network addressing scheme may include:	• dynamic addressing • IPv4 addressing • IPv6 addressing • static addressing • subnet addressing.
Calculations may include:	• binary addition • binary conversion • binary multiplication • binary number system • binary subtraction.
Network commands may include:	• ping • prompt • traceroute • tracert.
Security threats may include:	• denial of service (DoS) attack • hacking • phishing • spoofing • trojans • viruses • worms.
Security solutions may include:	• firewalls • hacking preventions • IPSec • password logons • public key infrastructure (PKI) • secure sockets layer (SSL) • wired equivalency protection (WEP) • wireless fidelity (WiFi) protected access (WPA).
Essential installation information may include:	• installation software • IP addressing schemes • logical and physical diagrams • network administrator codes

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	• passwords • security access codes.
Wireless connections may include:	• AM and FM • Bluetooth • cellular • infra-red • microwave • optical and laser • satellite • two-way radio • WiFi • worldwide interoperability for microwave access (WiMAX).

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN3054B Provide infrastructure for telecommunications network equipment

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0.* References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install supporting infrastructure for telecommunications equipment and associated hardware equipment. This includes carrier grade switching, transmission and access equipment and associated media, power and monitoring equipment and alarm systems.

Application of the Unit

Field officers, installation technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit.

This unit may apply to switching, transmission and radio networks and the various transmission paths including cable, optical fibre, radio, microwave and satellite.

Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority.

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If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for installation infrastructure work	1.1 Obtain ***relevant legislation, codes, regulations and standards*** for compliance when conducting work 1.2 Notify ***customer*** to arrange site access and obtain installation plan and specifications 1.3 Conduct a ***site survey*** to verify that ***infrastructure*** installation requirements can be met 1.4 Identify site ***hazards*** and notify appropriate personnel to make site safe 1.5 Notify customer of alterations required to installation design and make recommendations for possible solutions 1.6 Obtain approval for alterations and update installation plan 1.7 Develop an installation activity schedule to minimise disruption to the workplace and according to relevant regulation and standards 1.8 Obtain ***material supplies, safety equipment, resources, tools and test equipment*** to be available when required for

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	installation for safe work practice
2. Build network equipment infrastructure	2.1 Prepare for the given work according to occupational health and safety ***(OHS) and environmental requirements***
	2.2 Build metal superstructure to house equipment according to manufacturer's specifications and to safety and electrical standards
	2.3 Build ducts and tray ways for signal and data cabling and optical cables according to plan and specification after consultation with operational staff
	2.4 Build busbars or power cabling infrastructure as specified on the plan
	2.5 Install cable distribution frames according to plan and manufacturer's specifications
	2.6 Install earthing to all metal infrastructures according to specifications
3. Install power infrastructure	3.1 Install batteries and rectifiers and connect according to manufacturer and OHS requirements
	3.2 Test and monitor battery discharge levels and obtain replacement batteries under warranty where required
4. Supervise DC power distribution	4.1 Coordinate and arrange for ***power distribution work*** to be performed by ***qualified personnel*** to meet electrical safety requirements and certifications
	4.2 Monitor electrical work to ensure compliance with installation plan
	4.3 Identify and rectify faults where possible or escalate according to enterprise policy
5. Restore site and complete documentation	5.1 Attach infrastructure ***labels and designations*** according to enterprise requirements
	5.2 Complete inspection sheets and declare asset ready for next stage of installation using appropriate sign off documentation
	5.3 Clean up and prepare site in readiness for next installation phase
	5.4 Notify customer and obtain sign off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

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Required skills

- analytical skills to compare and evaluate most effective technical solutions
- communication skills to:
  - liaise with customers to ensure requirements are known and can be met within timeframes
  - negotiate approvals and contract arrangements with suppliers and contractors
- literacy skills to:
  - document technical requirements and procedures
  - interpret technical specifications and related documentation
- numeracy skills to calculate budget requirements and limitations
- planning and organisation skills to:
  - make site access and equipment delivery arrangements
  - set out project requirements and priorities
- problem solving skills to account for unexpected variations to requirements
- technical skills to:
  - perform cabling and terminating work
  - use hand tools to:
    - affix supports, cable trays and racks to surfaces
    - assemble infrastructure
    - work with construction materials.
    -

Required knowledge

- cabling types, connectors and cabling structures
- common customer telecommunications applications and related equipment
- connections to carrier infrastructure or equipment
- current legislation relating to installation of telecommunications equipment and connection to carrier services
- environmental impacts including options for green ICT installations
- network topologies, interface and interconnect solutions
- OHS requirements for:
  - confined spaces
  - electrical safety
  - heights
  - lifting
  - materials handling
  - physical hazards

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- overview knowledge of network and transmission equipment
- understanding of power requirements and electrical safety
- warranty information for equipment supplies and contractor work guarantees.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify potential earthing locations cable routes, cables trays, data cabinets, telecommunication enclosures, distributors • build metal superstructure • install protective earth and functional earth installations • install power infrastructure • supervise DC power distribution.
Context of and specific resources for assessment	Assessment must ensure: • site where installation of supporting infrastructure may be conducted • use of plant, tools and equipment currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate building metal superstructure to house equipment • direct observation of the candidate installing protective earth and functional earth installations • review of installation activity schedule prepared by the candidate • oral or written questioning to assess knowledge of installation issues, types of systems and applications.

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Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3009B Install, terminate and certify structured cabling installation • ICTCBL3010B Install and terminate optical fibre cable on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation,	• appropriate licences:

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codes, regulations and standards may include:	• crane • forklift • winch • AS Communications Cabling Manual (CCM) Volume 1 • AS/ACIF S008:2006 • AS/ACIF S009:2006 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian Construction Industry Forum (ACIF) standards and codes • cabling security codes and regulations • Environmental Protection Acts • OHS Acts.
Customer may be:	• architect • asset manager • builder • nominated representative • project manager • service provider.
Site survey may include:	• cable tunnels • equipment bays • floor layout • floor loadings • lighting • preparation area • roof structures • ventilation • wall structures.
Infrastructure may include:	• air conditioning requirements • alarm panels • cable entries • distribution frames • duct and cable trays

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	• equipment racks • power supplies • radio structure.
Hazards may include:	• building debris • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Materials supplies may include:	• back shelf cards • cable racks • cable trays, nuts and bolts • distribution frames or blocks • earth terminal and rod • frames and cabinets • insulation blocks • iron support structures • jumper wire • lacing, twine and cable ties • patch panels • termination blocks.
Safety equipment may include:	• electrical isolators • EWP • harnesses • manual lifters • personal protective equipment: • acid proof clothing • earmuffs • face masks • gloves • head protection • kneepads

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	• safety boots • safety glasses • safety barriers.
Resources may include:	• finance • labour • materials • tools and test equipment • vehicles.

Tools and test equipment may include:	• tools:
	  • anti-static wrist strap
	  • PC board or subrack removal tool
	  • pliers
	  • power drill
	  • screwdrivers
	  • sockets
	  • soldering iron
	  • spanners
	• test equipment:
	  • anti static testers
	  • cable testers
	  • displacement tools
	  • humidity and temperature testers
	  • insulation tester
	  • load testers
	  • multimeter
	  • optical fibre power meter
	  • oscilloscope
	  • tong meter
	  • volt meters.

OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services, including power and gas
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• safe working practices, such as the safe use and handling

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	of: • asbestos • chemicals • materials • tools and equipment • work platforms • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Power distribution work may include:	• 240 V rectifier panels • backup motor generator set • certifying electrical installation • installation of power distribution panel and cables • termination and connection of power cables to equipment • testing of electrical cabling.
Qualified personnel may include:	• electrical contractor • internal electrician • power company staff.
Labels and designations may include:	• cabinets • cables • distribution panels • racks • vendor labels.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN3056A Install telecommunications network equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively install and test telecommunications network equipment. It includes processes for checking plans, obtaining and proper handling of equipment and supplies. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors employed by carriers, contractors or other service providers apply the skills and knowledge in this unit. This unit may apply to switching, transmission and radio networks and various transmission paths, including cable, optical fibre, radio, microwave and satellite. The unit applies to installation of new, additional and replacement equipment.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan for installation of telecommunications network equipment	1.1. Prepare for given work according to ***relevant occupational health and safety*** (***OHS***) ***and environmental requirements*** 1.2. Notify customer to arrange site access if necessary 1.3. Assess existing and potential site ***hazards*** 1.4. Verify location of proposed ***network equipment*** installation according to the appropriate plans obtained from ***authorised personnel*** 1.5. Develop installation plans to ensure minimal disruption to the workplace and according to ***relevant legislation***, ***codes***, ***regulations and***

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ELEMENT	PERFORMANCE CRITERIA
	standards 1.6. Obtain ***tools*** and ***test equipment*** required for safe work practice 1.7. Notify affected parties of possible network outage if required
2. Install network hardware and cabling	2.1. Install network equipment according to the plan and manufacturer's instructions using safe industry practices 2.2. Insert equipment cards and modules 2.3. Install all ***interconnecting cables*** to specification 2.4. Confirm service interruption is within limits agreed with the customer 2.5. Document all installation drawings for the customer
3. Install equipment accessories	3.1. Install alarms according to instruction manuals and to specification 3.2. Install operations administration and maintenance system according to specification 3.3. Install communication facilities for operational staff according to specification, taking into account any special needs of the site and the operational staff 3.4. Install operator communication facilities according to needs and to specification
4. Configure and test the system	4.1. Install software and configuration instructions according to system specifications if required 4.2. ***Test*** to verify the system performance according to customer requirements 4.3. Recommend any possible changes and confirm with customer 4.4. Record all test results
5. Clean up worksite and complete documentation	5.1. Remove and dispose of installation waste and debris from worksite according to environmental requirements 5.2. Restore changes made to the work area during installation to the customer's satisfaction 5.3. Complete all installation documents and present to the customer 5.4. Declare asset ready for commissioning and integration

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ELEMENT	PERFORMANCE CRITERIA
	5.5. Notify the customer and obtain signoff

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to:
  • interpret test equipment settings and readings
  • interpret design specifications including:
  • circuit diagrams
  • plans
  • specifications
• communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
• literacy skills to interpret technical specifications and related documentation
• numeracy skills to make calculations and necessary calibration changes
• planning and organisation skills to make site access and equipment delivery arrangements
• problem solving to account for unexpected faults or equipment incompatibilities
• technical skills to:
  • apply antistatic techniques for material and equipment handling
  • correctly handle, connect and calibrate test equipment
  • install cables including:
  • appropriate cable separation
  • minimum bending radii
  • provision of spare length
  • terminate cables including:
  • stripping
  • conductor identification and fanning
  • cleaning of optical fibres connectors
  • provision of spare length
  • use hand tools for mounting and securing equipment

Required knowledge

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REQUIRED SKILLS AND KNOWLEDGE
• cabling types, connectors and cabling structures • connections to carrier infrastructure or equipment • electrical and or optical properties to be measured • overview knowledge of network and transmission equipment • power requirements and electrical safety • typical performance parameters and faults that may be encountered in customer equipment and related connection and transmission media • various test equipment types suitable for tests to be made • waste handling and environmental compliances in its disposal

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and install network hardware and cabling according to equipment/system manuals and specifications • configure and test installation • verify cable continuity • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites where installation of telecommunications network equipment may be conducted • use of network testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on telecommunications network equipment installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples

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EVIDENCE GUIDE	
	are appropriate for this unit: • direct observation of the candidate installing telecommunications network equipment • review of reports completed by the candidate for different scenarios and situations • oral or written questioning to assess knowledge of planning, types of systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS4184A Install and test power saving hardware • ICTTEN4051A Install configuration programs on PC based customer equipment • ICTTEN4198A Install, configure and test an internet protocol (IP) network • ICTTEN4199A Install, configure and test a router. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant OHS and environmental requirements may relate to:	• identifying other services including power and gas
	• need for decommissioning and isolate worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment

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RANGE STATEMENT	

	• work platforms
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural and other gas build up • needle stick injury • optical cable • radio frequency (RF) equipment emitting radiation • remote power feeding services • vermin.

Network equipment may include:	• customer premises equipment (CPE) equipment:
	  • cable/Pay TV
	  • closed circuit TV (CCTV)
	  • free to air TV
	  • intercom
	  • office equipment
	  • security equipment
	• computer network:
	  • gateways
	  • network managers
	  • router
	  • servers
	  • switches
	  • voice over internet protocol (VoIP)
	  • wireless LAN
	• multiplexing and radio:
	  • fixed
	  • mobile

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RANGE STATEMENT	
	• optical equipment • RF • switching • transmission • voice switching units.
Authorised personnel may include:	• consultant • contractor • network administrator • project manager.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) regulations relating to functional earthing • ACMA standards TS 14 • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian Construction Industry Forum (ACIF) standards and codes • Australian standards applying to radiation hazards • AS/NZS/ISO 9001:2000 • cabling security codes and regulations • environmental protection acts • heritage legislation • International Telecommunications Union (ITU) recommendations • OHS Acts • State/Territory and Federal environment Acts • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Tools may include:	• anti-static testers • cable strippers • cable testers

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RANGE STATEMENT	
	• cable tie tensioners • crimpers • hammers • humidity and temperature testers • insulation displacement tools • jigsaws • level • load testers • mechanical lifts/hoists • pliers • power tools • screwdrivers • soldering irons • spanners • tape measures • tension wrenches • termination tools • trolleys • wire strippers.
Test equipment may include:	• adaptors • analog transmission measuring sets • communication system analysers • digital analysers • error meter • frequency measurer • global system for mobile communication (GSM) spectrum frequency synthesiser • lap top computer • laser source • level meter • light meter • microwave link analyser • modulator tester • multimeters • optical attenuators • optical fibre power meters • oscillator • oscilloscopes • optical time domain reflectometer (OTDR) • pattern generators

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RANGE STATEMENT	
	• power meters • RF band noise measurer • RF microwave test sets • RF sweep tester • spectrum analysers • sweep test coaxial and wave guide antenna systems • standing wave ratio (SWR) meters • transmitter/receiver filter combiner equipment • video tester.

Interconnecting cables may include:	• communications cables:
	  • Category 5 or 6
	  • coaxial cable
	  • data cables
	  • jumper cables
	  • optical patch cords
	• control cables
	• power cables
	• signal cables.

Test may include:	• bit error rate (BER) • continuity • end to end • frequency response • functionality test • gain and attenuation • loop back • signal to noise ratio • speed.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN3063A Locate, identify and rectify recurrent network faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to locate, identify and rectify recurrent faults in a telecommunications network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Cablers, installers and technicians who install and maintain a broad range of telecommunications networks including fault investigations, apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for fault-finding activity	1.1. Prepare for given work according to occupational health and safety (***OHS***) ***and environmental requirements*** 1.2. Arrange access to the site according to required procedure 1.3. Locate existing and potential site ***hazards*** 1.4. Contact the customer to verify nature of the ***recurrent fault*** and the ***network type***
2. Conduct activities for recurrent network fault-finding	2.1. Analyse fault history using ***fault records*** to establish nature of fault 2.2. Select ***test equipment*** and conduct the ***appropriate test*** to identify potential faults ensuring the diagnostic process does not compromise the ***integrity*** of the network element or system 2.3. Evaluate test results to determine ***relevant symptoms*** of the recurrent fault using ***appropriate methods*** and ***appropriate process*** 2.4. Locate the probable cause, type and location of the fault

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ELEMENT	PERFORMANCE CRITERIA
	2.5. Rectify the fault or escalate to appropriate level
3. Report fault-findings and solutions	3.1. Prepare customer report on the diagnostic procedure, fault identification and fault clearance 3.2. Update fault records database 3.3. Restore worksite to the customer's satisfaction 3.4. Notify the customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to question and respond to subject matter experts on technical and operational matters related to performance of telecommunications networks and fault-finding
- literacy skills to interpret technical documentation and incorporate technical language into written tasks and basic reports
- numeracy skills to interpret technical data for specifications of telecommunications networks
- planning and organisational skills to:
  - coordinate the fault-finding process in liaison with others
  - plan, prioritise and monitor own work
- problem solving skills to apply network fault-finding techniques in a telecommunications network
- research skills to interrogate databases and other sources to investigate systematic and logical fault-finding techniques of telecommunication networks
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to select and use appropriate test equipment to undertake fault-finding techniques in telecommunications networks

Required knowledge

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REQUIRED SKILLS AND KNOWLEDGE
• application of Ohm's law, impedance and reactance formulas to solve AC electrical problems • behaviour of faulty network elements, including symptoms and impact on network • interpretation of test results and network element/system specifications • operation and purpose of testing equipment • operation of transformers • overview of telecommunications networks • performance testing and fault finding techniques of telecommunications networks • systematic and logical fault finding • types of power sources used in telecommunications networks

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • test telecommunications networks to identify faults • identify and rectify recurrent faults • conduct and report on a fault-finding task in a telecommunications network for a range of faults • use systematic and logical fault-finding techniques in telecommunications networks and field testing procedures to particular workplace situations • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites on which network testing and fault-finding may be conducted • use of line transmission, optical and radio measurement equipment currently used in industry • system documentation, and other site-related documentation necessary to conduct tests and fault-finding investigations.

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EVIDENCE GUIDE	
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking network tests and fault-finding techniques • review of the candidate's evaluation of network testing and fault diagnosis • oral or written questioning to assess knowledge of performance of telecommunications networks.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3056A Install telecommunications network equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

OHS and environmental requirements may relate to:	• need to decommission and isolate worksite and lines prior to commencement
	• need to identify other services, including power and gas
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses for laser work
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements

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RANGE STATEMENT	

	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste disposal containers:
	  • drop sheets
	  • sharps containers
	  • waste management.

Hazards may include:	• earth potential rise (EPR):
	• optical fibre cable:
	  • bare fibres
	  • hazardous laser light
	• radio frequency (RF) equipment emitting radiation
	• remote power feeding services which operate at above telecommunications network voltage (TNV).

Recurrent fault may relate to:	• call drop out • distortion • heat, vibration • intermittent fault or interference • noise • occurrences at set periodic times • periodic loss of performance.
Network type may include:	• cable • customer access network (CAN) • customer premises equipment (CPE) • data • hybrid fibre coaxial (HFC) • optical • radio.
Fault records may include:	• customer complaint database • fault records database • previous repairs • repair technician reports.
Test equipment may include:	• bit error rate tester (BERT) • cathode ray oscilloscope (CRO) • local area network (LAN) Cat tester

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RANGE STATEMENT	
	• multimeters • transmission level measuring set.
Appropriate test may include:	• bit error rate (BER) • crosstalk • impedance • loopback • power level • return loss • wire maps.
Integrity may include:	• downgraded performance • interference • loss of connection.

Relevant symptoms may include:	• emission of:
	  • heat
	  • noise
	  • odours
	• errors
	• low output levels or poor coverage
	• loss of functionality of equipment:
	  • distortion
	  • intermittent operation
	  • loss of timings
	• noise
	• physical damage to equipment.

Appropriate methods may include:	• direct observation • interrogation of network performance data • measurement • questioning.
Appropriate process may include:	• analysis of symptoms • fault isolation • observation and measurements • use of manufacturer's diagnostic data.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN3074A Recover customer premises equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to dismantle, package and dispose of recovered customer premises equipment. Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority. If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

Application of the Unit

Application of the unit	Technical staff who dismantle and recover customer premises systems and equipment apply the skills and knowledge in this unit. Relevant jobs roles include a supervisor in charge of installation and maintenance teams responsible for the new installations and upgrades of telecommunications customer equipment. This unit applies to indoor and outdoor installation within a customer premises. It may be applied to domestic, commercial or industrial installations.

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	Communications equipment includes telephony, data, video, digital broadcasting, computer networks including local area networks (LAN) and multimedia in domestic, commercial or industrial installations.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to recover customer equipment	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. Notify ***customer*** for site access and location details of ***customer equipment*** for ***recovery***
	1.3. Identify site ***hazards*** and notify customer to make site safe
	1.4. Arrange for ***tools and lifting equipment*** if required
2. Recover customer equipment	2.1. Verify equipment is out of operational service and disconnect from all power feeds
	2.2. Dismantle equipment and peripheral units according to occupational health and safety (***OHS***) ***and environmental requirements*** with minimal disruption to building occupants
	2.3. Package and label recovered equipment and dispose of according to arranged ***disposal agreement***
3. Complete documentation and clean up worksite	3.1. Amend site records to show existing equipment layout
	3.2. Clean up and restore site to customer satisfaction
	3.3. Collect and dispose of waste material and debris according to environmental requirements
	3.4. Notify customer of job completion to obtain sign off and present with a copy of documentation

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
- literacy skills to:
  - interpret technical documentation, such as equipment manuals and specifications
  - update site records
- planning and organisational skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• arrange for tools and equipment • make site access and equipment recovery arrangements • set out project requirements • problem solving skills to solve logistics problems • safety awareness skills to disconnect equipment from power sources • technical skills to: • dismantle and recover equipment • use hand and power tools
Required knowledge
• legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer requirements for safe operation of equipment • overview knowledge of customer premises equipment and customer premises cabling • regulatory and specific OHS requirements relating to the site • types of power sources used with telecommunications equipment • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview o f assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop a recovery plan • safely disconnect, dismantle and recover customer premises equipment • package and label recovered equipment • apply OHS requirements and work practices.
Context of, **and specific resources for assessment**	Assessment must ensure: • site where recovery of customer premises equipment can be conducted

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EVIDENCE GUIDE	
	• use of plant, tools and equipment currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit. • direct observation of the candidate making site safe • direct observation of the candidate performing recovery of customer premises equipment • review of plan for dismantling and recovery prepared by the candidate • oral or written questioning to assess knowledge of customer premises equipment and recovery issues.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3052A Cut over new systems and equipment on customer premises • ICTTEN3075A Refurbish customer premises equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • crane
	  • forklift
	  • winch
	• Australian Construction Industry Forum (ACIF) standards and codes AS/ACIF S008:2006 and AS/ACIF S009:2006
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• environmental protection acts
	• OHS
	• road and traffic control legislation and codes.

Customer may be:	• asset manager • nominated customer representative • project manager

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RANGE STATEMENT	
	• service provider.
Customer equipment may include:	• alarm systems • cable modem • cable TV (CATV) set-top boxes • digital reception equipment • digital subscriber line routers • home entertainment • internet protocol private branch exchange(IP PBX) • IP PBX server • IP security systems • IPTV • PBX • session initiation protocol (SIP)-enabled unified communication (UC) system • telephone handsets • video conferencing equipment • voice over internet protocol (VoIP) gateway • worldwide interoperability for microwave access (WiMAX) customer premises equipment (CPE).
Recovery can be associated with:	• cancellation of service • change of premises by customer • equipment upgrade • new technology replacement • non-payment of account.
Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.

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RANGE STATEMENT	

Tools and lifting equipment may include:	• tools:
	  • electrical:
	  • cordless drill
	  • power drills
	  • soldering iron
	  • hand:
	  • cutters
	  • hacksaws
	  • hammers
	  • pliers
	  • screwdrivers
	  • spanners
	• lifting equipment:
	  • fork lift
	  • pallet lift
	  • hydraulic lifter
	  • power lifter.

OHS and environmental requirements may relate to:	• decommissioning and isolating work site and lines prior to commencement
	• identifying other services, including power and gas
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards

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RANGE STATEMENT	
	• warning signs and tapes • witches hats • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • stormwater protection • waste management.
Disposal agreement may refer to:	• customer owned equipment is returned to designated site • leased equipment is returned to leasing company for disposal.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN3075A Refurbish customer premises equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to renovate, repair and test recovered customer equipment for reinstallation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who renovate and test recovered customer premises systems and equipment apply the skills and knowledge in this unit. Relevant jobs roles include supervisors in charge of installation and maintenance teams responsible for the new installations and upgrades of telecommunications customer equipment. Refurbishment can occur on all types of customer premises equipment (CPE), including telephony, data, video, digital broadcasting and computer networks, including local area networks (LAN) and multimedia in domestic, commercial or industrial installations.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Process recovered equipment	1.1. Conduct a visual inspection of the ***external condition*** of the ***customer equipment*** for acceptability 1.2. Conduct ***functional tests*** on equipment to determine equipment suitable for repair 1.3. Salvage, label and store functional equipment for use as spare parts 1.4. Label and scrap non-functional equipment and parts

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ELEMENT	PERFORMANCE CRITERIA
	according to company procedures
2. Renovate and repair equipment	2.1. Clean and ***renovate equipment housing*** to acceptable standard for reuse 2.2. Conduct full functional and operational tests on equipment circuit boards for suitability of reuse 2.3. Repair and rectify faulty equipment circuit boards for reuse 2.4. Reassemble equipment circuit boards into renovated housings and relabel accordingly 2.5. Reload new compatible software according to manufacturer's specifications 2.6. Conduct a final acceptance test on the refurbished equipment according to manufacturer's specifications and record test results
3. Package refurbished product and complete documentation	3.1. Prepare and place new labels on equipment and parts before using protective wrapping 3.2. Seal and label ***packaging*** with ***documentation*** according to specification 3.3. Store and assemble completed packages for distribution according to company requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
- literacy skills to:
  - read and interpret technical documentation, such as equipment manuals and specifications
  - record test results
  - update site records
- planning and organisational skills to organise equipment
- problem solving skills to solve equipment problems
- task management skills to work systematically with required attention to detail and

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REQUIRED SKILLS AND KNOWLEDGE

adherence to all safety requirements
• technical skills to:
  • repair and test recovered equipment
  • repair circuit boards
  • test equipment
  • use hand and power tools

Required knowledge
• features and operating requirements of test equipment • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for safe operation of equipment • operate equipment according to a test specification • overview knowledge of customer premises equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • process recovered equipment • renovate and repair equipment • package refurbished product.
Context of, and specific resources for assessment	Assessment must ensure: • systems and equipment to refurbish • test equipment and tools for refurbishment currently used in industry • manufacturer's specifications.

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EVIDENCE GUIDE	
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit. • direct observation of the candidate renovating, repairing and testing equipment • review of documentation and test results prepared by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3074A Recover customer premises equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
External condition may include:	• chemical or insect intrusion • cracks in plastic • deep scratches or scuff marks that will not buff out • holes in plastic • liquid • major discolouration • modifications • non-removable paint • physical damage.
Customer equipment may include:	• alarm systems • cable modem • cable TV (CATV) set-top boxes • digital reception equipment • digital subscriber line routers • home entertainment • internet protocol private branch exchange (IP PBX) • IP PBX server • IP security systems • internet protocol TV (IPTV) • PBX • session initiation protocol (SIP)-enabled unified communication (UC) system • telephone handsets • video conferencing equipment • voice over internet protocol (VoIP) gateway • worldwide interoperability for microwave access (WiMAX) CPE.
Functional tests may relate to:	• beep and speech • dial tone • existence of crackle or noise • intercom buttons

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RANGE STATEMENT	
	• lamp indication • lamp lights • microphone and microphone lights • side-tone confirmation • speaker operation • two way speech and music • volume control.
Renovate equipment housing may include:	• polishing metal casing • removing labels and stickers • repairing physical defects • replacing of fixtures on enclosure • respraying of enclosure.
Packaging may include:	• cardboard boxes • pallets • plastic bags.
Documentation may include:	• certification of worthiness • guarantee details • loaded software details • test results.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN3077B Commission an electronic unit

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to commission an electronic unit within a telecommunications environment with applications. Applications include voice over IP (VoIP), radio frequency identification (RFID), security networks, telephony, data, video and multimedia.

The commissioning may be for a new installation or upgrade of capacity or technology for existing network or subsystem for convergence to Next Generation Networks (NGN).

Application of the Unit

Field officers and technicians from telecommunications carriers, other service providers and contractors apply the skills and knowledge in this unit.

It involves commissioning an electronic unit at customer’s premises or within a carrier network.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to commission an electronic unit	1.1 Prepare for work following occupational health and safety ***(OHS) requirements***
	1.2 Organise resources based on existing and potential site ***hazards***
	1.3 Notify customer or ***network operations personnel*** for site access and network specifications
	1.4 Determine the type and complexity of the ***electronic unit*** from specifications
	1.5 Verify that the installed electronic unit and associated cabling conform to specifications
	1.6 Establish commissioning dates and confirm with all parties
	1.7 Determine commissioning parameters according to specification and establish ***planned outage*** if required
	1.8 Obtain ***test equipment*** and check suitability and calibration status
	1.9 Produce a preliminary commissioning plan according to manufacturer's instructions and enterprise guidelines for discussion with the customer
	1.10 Inform affected customers of impending action and likely timing and impact by the work

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2. Organise planned outages	2.1 Negotiate outage times with appropriate groups and ***affected customers*** to minimise disruptions 2.2 Refer to ***contingency plans*** and arrange for emergency communications if required 2.3 Notify alarm management centre of planned action 2.4 Obtain authority to proceed from the relevant control centre and notify customers affected by the outage
3. Perform commissioning procedures	3.1 Program equipment or install software according to manufacturer's specifications 3.2 Set electronic unit parameters according to manufacturer's specifications and customer requirements 3.3 Set up test equipment and conduct tests according to manufacturer's specifications and industry practice 3.4 Connect and test network access facilities for correct performance 3.5 Conduct the cut over according to project design and industry practice in consultation with ***appropriate person*** 3.6 Check that remote alarm and monitoring features are functional, if applicable
4. Finalise commissioning documentation	4.1 Update relevant databases according to enterprise and network guidelines 4.2 Notify appropriate person of commissioning results and work completion 4.3 Complete ***administrative tasks*** according to industry practice and enterprise guidelines

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test equipment settings and readings
- communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- numeracy skills to make calculations

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- planning and organisational skills to arrange site access and organise equipment
- problem solving to account for unexpected faults or equipment configuration anomalies
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - correctly test and carry out commissioning procedures
  - install supporting structures
  - terminate cables
  - use hand tools for removing and securing equipment covers.
  -

Required knowledge

- electrical and or optical properties to be measured
- extensive range of networking equipment
- legislation and licensing surrounding installation of telecommunications equipment
- network operation procedures
- power requirements and electrical safety
- test equipment types
- transmission type and signals that may be encountered.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • commission electronic unit according to specifications • interact with enterprise personnel, customers and other contractors keeping a customer focus and consideration of customer needs • negotiate the arrangements for the commissioning

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	• deal with faults and problems and provide solutions.
Context of and specific resources for assessment	Assessment must ensure: • sites on which installation and commissioning procedures can be conducted • relevant regulatory and equipment documentation that impact on commissioning • use of testing equipment currently used in industry.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate applying enterprise escalation and outage procedures within service assurance guidelines • review of reports completed by the candidate outlining test plan and test results complete with analysis of faults with solutions • oral or written questioning to assess knowledge of commissioning procedures and types of systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3104A Maintain an electronic system • ICTTEN3054B Provide infrastructure for telecommunications network equipment • ICTTEN3089A Repair and replace telecommunications network hardware • ICTCBL2068A Install telecommunications service to a building • ICTCBL3049A Install systems and equipment on customer premises. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally

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	appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

OHS requirements may include:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services:
	  • gas
	  • power
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses for laser work

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	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation.

Hazards may include:	• earth potential rise (EPR):
	• optical fibre cable:
	  • bare fibres
	  • hazardous laser light
	• radio frequency (RF) equipment emitting radiation
	• remote power feeding services which operate at above telecommunications network voltage (TNV).

Network operations personnel may include:	• alarm operations • network operations centre staff • network operations manager • project manager.
Electronic unit may relate to:	• biometrics • internet protocol TV (IPTV) • multiplexing • RFID • surveillance • VoIP.

Planned outage may refer to:	• allocation of additional services and support
	• notification to affected customers
	• plan for:
	  • redundant path
	  • standby equipment.

Test equipment may include:	• bit error rate (BER) testers • communication system analysers

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	• digital analysers • laser sources • magnetic error reduction (MER) meters • microwave link analysers • modulation analysers • multimeters • optical attenuators • optical fibre power meters • oscillators • oscilloscopes • optical time domain reflectometer (OTDR) • pattern generators • power meters • RF microwave test sets • RF sweep testers • signal level meters (SLM) • spectrum analysers • transmission measuring sets • voltage standing wave ratio (VSWR) meters.
Affected customers may include:	• building owner • communications consultant • contractor to a major supplier • end users • equipment owner • householder • operations staff.

Contingency plans may include:	• additional notification to affected customers
	• additional technical support
	• provision of:
	  • additional services
	  • redundant path
	  • standby equipment.

Appropriate person may include:	• customer • design engineer • network operations manager • project manager • supervisor.
Administrative tasks may refer to:	• checking correct labelling of all equipment and amending where required • completing job orders and submitting to appropriate enterprise organisational unit

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	• completing test sheets according to specification and logging test instrument usage • following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • providing customers with a telecommunications cabling advice (TCA) form, such as TCA1 or equivalent form • recording test results and updating appropriate data bases • updating design specifications and returning to design area as required by enterprise requirements.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN3089A Repair and replace telecommunications network hardware

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to repair and replace network hardware in a telecommunications network as part of fault restoration. This unit involves work performed under the direction of the Network Operations Centre (NOC), where control of the network is coordinated. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit. This unit may apply to replacement of equipment in switching, transmission and fixed and mobile radio networks, including the various transmission path components, such as cable, optical fibre, radio, microwave and satellite. The unit applies to installation of new, additional and replacement equipment.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for hardware repair and replacement	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for the given work 1.2. Discuss and record details of ***hardware*** to be repaired or replaced and proposed work schedule with the ***NOC appropriate person*** 1.3. Work safely according to relevant safety legislation and company work practices identifying ***hazards*** and using ***personal protective equipment***

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Obtain appropriate replacement hardware and associated documentation 1.5. Inspect network and determine the need for ***repair task*** 1.6. Obtain ***tools*** and check they are in good working order 1.7. Undertake an impact risk assessment of the ***hardware replacement*** with the NOC and prepare for ***contingencies*** using contingency plan
2. Rectify fault by replacing hardware	2.1. Replace equipment as instructed by the NOC following ***anti-static precautions*** in the case of sensitive electronic equipment and occupational health and safety (***OHS***) ***and environmental requirements*** 2.2. Inform NOC if problems occur with hardware replacement so that escalation may commence and contingency plan initiated 2.3. ***Test*** the replacement hardware to ensure satisfactory functionality
3. Clean up worksite and complete administrative work	3.1. Remove waste and debris from work site and dispose of according to environmental requirements and restore work area to customer's satisfaction 3.2. Recover faulty equipment and return to appropriate point for disposal or refurbishment 3.3. Complete documentation, update fault records and make recommendations according to the enterprise ***quality assurance*** system 3.4. Notify the customer of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to question and respond to subject matter experts on technical and operational matters related to performance of telecommunications

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REQUIRED SKILLS AND KNOWLEDGE

networks and fault-finding
• literacy skills to:
  • incorporate technical language into written tasks and basic reports
  • interpret enterprise policy
  • interpret technical documentation
• numeracy skills to:
  • apply mathematical formulas to solve problems in AC and DC circuits
  • interpret technical data for specifications of telecommunications networks
• PC skills to update records database
• planning and organisational skills to:
  • coordinate the fault-finding process in liaison with others
  • plan, prioritise and monitor own work
• problem solving skills to:
  • apply AC and DC fault finding techniques to different situations
  • apply network fault-finding techniques in a telecommunications network
• research skills to interrogate databases and other sources to investigate systematic and logical fault-finding techniques of telecommunication networks
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • replace network hardware
  • select and use appropriate test equipment to undertake fault finding techniques in telecommunications networks
  • use anti static procedures

Required knowledge
• application of DC and AC electrical and principles • behaviour of faulty network elements including symptoms and impact on network • interpretation of test results and network element/system specifications • operation and purpose of testing equipment • overview of telecommunications hardware and networks • performance testing and fault-finding techniques of telecommunications networks • systematic and logical fault-finding • types of power sources used in telecommunications networks

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • rectify fault as instructed by NOC, following OHS requirements and anti-static precautions • replace telecommunications hardware within service assurance guidelines according to enterprise procedures • update fault records database according to enterprise procedures.
Context of and specific resources for assessment	Assessment must ensure: • suitable site to replace telecommunications network hardware • range of hardware currently used in industry • range of general and test equipment required for testing telecommunications network hardware.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate developing rectification strategy • direct observation of the candidate replacing telecommunications network hardware within service assurance guidelines • oral or written questioning of the candidate to assess knowledge of replacement of telecommunications network hardware practices.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3056A Install telecommunications network

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EVIDENCE GUIDE	
	equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007

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RANGE STATEMENT	
	• AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6, 6A, 7 or 7A and unshielded twisted pairs (UTP) • Environmental Protection Acts • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Hardware may include:	• complete systems, subunits or circuit cards from:
	  • access
	  • broadband
	  • cellular radio
	  • hybrid fibre coaxial (HFC)
	  • internet protocol (IP) network:
	  • gateways
	  • router
	  • servers
	  • switches
	  • voice over internet protocol (VoIP)
	  • wireless LAN
	  • network management
	  • optical transmission
	  • synchronous digital hierarchy (SDH) multiplexing
	  • switching
	  • transmission.

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RANGE STATEMENT	

NOC may relate to:	• engineering unit within an enterprise responsible for:
	  • analysing problems
	  • communicating with other NOCs and technical staff
	  • coordinating repairs or changes to the network
	  • escalation of issues
	  • establishing control over a network
	  • monitoring the network alarms
	  • performing diagnostic tests
	  • tracking problems through to completion.

Appropriate person may include:	• customer • engineer • project manager • supervisor.
Hazards may include:	• building debris • earth potential rise • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Personal protective equipment may include:	• earmuffs • electrical isolators • gas detectors • gloves • head protection • kneepads • masks • personal protective clothing • safety boots

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RANGE STATEMENT	
	• safety glasses.
Repair task may include:	• conducting test • evaluating AC and DC test results • determining faulty component • replacement of faulty component.
Tools may include:	• crimping tools • hacksaw • ladders • levels and measuring tools • PC board or subrack card removal tool • pliers • power drills • screwdrivers • sockets • soldering iron • spanners • terminating tools.
Hardware replacement may include:	• cold swap • hot swap.

Contingencies may include:	• additional notification to affected customers
	• provision of:
	  • additional services
	  • additional technical support
	  • redundant path
	  • standby equipment.

Anti-static precautions may include:	• anti-static floor mat • anti-static workbench mat • anti-static wrist strap • controlled environment • correct printed circuit board handling procedures • use of anti-static bags.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • flashing lights • gas and other hazard detection equipment • identifying other services, including power and gas • safety barriers

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RANGE STATEMENT	

	• safety equipment
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• special access requirements
	• suitable light and ventilation
	• trench guards
	• warning signs and tapes
	• witches hats
	• environmental considerations:
	  • clean-up protection
	  • noise, dust and clean-up management
	  • stormwater protection
	  • waste management.

Test may include:	• bandwidth • blocking • call rate • congestion • distortion • drop out rate • functionality • generation of alarms • interference • latency • network tests • packet loss rate • power level measurement • quality of service • recovery rate • redundancy • signal to noise ratio • transmission quality • upload and download rate.
Quality assurance may include:	• acting on logs, reports and other data to guide ongoing quality improvements • updating logs and reporting on installation or

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RANGE STATEMENT	
	maintenance activities.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN3104A Maintain an electronic system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to perform periodic maintenance and testing of electronic systems and equipment on site and from remote locations, ensuring that electronic systems remain safe and fit for purpose. This unit does not include the major servicing of equipment or repair due to breakdowns. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who maintain an electronic system on site and from remote locations apply the skills and knowledge in this unit. On site routine maintenance involves inspection of critical parts, replacement of disposable items and confirmation that performance is within specification and operating levels are normal. Remote monitoring may be implemented from a Network Management Centre or Help Desk via dedicated communications services or by web-based services. Performance monitoring, investigation of alarms and updating of software, firmware and security systems are

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	all able to be managed remotely. This unit applies to all telecommunications applications including telephony, data, and video and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to maintain system	1.1. ***Consult with customer*** or property owner to arrange for site access if required 1.2. Plan a ***schedule*** of routine preventive ***maintenance*** for the electronic system based on recommended maintenance periods from manufacturer's handbooks and specifications 1.3. Report to ***appropriate person*** the impact of proposed maintenance activities on customer's service delivery 1.4. Confirm ***equipment*** is accessible and correctly set up for on site preventive maintenance activities and for ***remote interrogation*** if required 1.5. Confirm that alarms are functioning according to manufacturer's specifications and enterprise guidelines 1.6. Take corrective action if anomalies or faults are detected, according to enterprise guidelines and manufacturer's specifications
2. Undertake preventive maintenance routines on site and remotely	2.1. Conduct preventive maintenance according to planned schedule 2.2. Report to appropriate person any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 2.3. Verify equipment is functioning against expected operational parameters to confirm operational status 2.4. Take ***corrective action*** if faults are detected, according to enterprise guidelines and manufacturer's specifications 2.5. Escalate to the next level of support when required where preventive maintenance activity falls outside own level of expertise 2.6. Dispose of on site waste materials according to safe working practices and approved procedures
3. Make recommendations and update records	3.1. Record results of routine tests and make recommendations 3.2. Store records according to enterprise guidelines

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to record and process measurements
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - read and interpret results from testing routines
  - use electronic test equipment
  - use remote maintenance software to:
    - monitor and control a remote system
    - perform maintenance tasks
    - upload and download files

Required knowledge

- features and operating requirements of electronic equipment
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific occupational health and safety (OHS) requirements relating to the activity and site conditions
- testing methods and performance requirements
- troubleshooting and repair procedures
- typical issues and challenges that occur on site and when conducting remote maintenance

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify maintenance required • communicate maintenance details to customers and work associates • undertake preventive maintenance routines on site and remotely • conduct and interpret tests • complete documentation.
Context of, and specific resources for assessment	Assessment must ensure: • suitable site for maintenance of a range of equipment • use of test equipment currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of an oral and written report prepared by the candidate including test results and recommendations • direct observation of the candidate maintaining an electronic system on site and remotely • oral or written questioning of required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3077A Commission an electronic unit • ICTTEN3089A Repair and replace telecommunications network hardware. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Consult with customer may include:	• access arrangements • duration • location • nature of works • time.
Schedule may be:	• hourly • daily • weekly • monthly • annually • according to maintenance schedule • initiated by:

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RANGE STATEMENT	
	• alarms • elapsed time • error messages.
Maintenance may include:	• adjusting carrier frequency • blowing dust out of power supply • changing air filter • checking low voltage (LV) circuit breaker • infrared scan • measuring transmission line pressurisation • mechanical inspection • monitoring transmitter forward radio frequency (RF) power level • monitoring transmitter reflected RF power level • testing coolant system • testing over-current trip settings • visual inspection.
Appropriate person may include:	• customer • help desk operations manager • network management centre manager • project manager • supervisor.

Equipment may include:	• battery backup
	• biometrics
	• broadband cable network
	• broadcast transmitter
	• closed circuit TV (CCTV)
	• multiplexer:
	  • synchronous digital hierarchy(SDH)/synchronous optical network (SONET)
	  • statistical
	• radio frequency identification (RFID)
	• solar panel power supply
	• supervisory control and data acquisition (SCADA)
	• transmission system
	• voice over internet protocol (VoIP).

Remote interrogation may include:	• dedicated virtual private network (VPN) • local area network (LAN) • SCADA system:

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RANGE STATEMENT	
	• cellular telemetry • integrated dispatch enhanced network (IDEN) SCADA • web-based SCADA • wireless SCADA • transaction language 1 (TL1) interface • wide area network (WAN) • web server and simple network management protocol (SNMP) agent.
Corrective action may include:	• checking warranties and service agreements to establish if repair or alteration is covered • electronic adjustment • organising warranty replacement from manufacturer • physical adjustment • repair or replacement of parts or equipment.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN3250B Provide infrastructure for telecommunications customer equipment

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install supporting infrastructure for telecommunications equipment and associated hardware equipment. The unit also includes installation of access equipment and associated media, power and monitoring equipment and alarm systems.

Application of the Unit

The unit applies to field officers, installation technicians, technical supervisors, contractors and other service providers.

Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for infrastructure installation work	1.1 Identify ***relevant legislation, codes, regulations and standards*** that apply to work 1.2 Notify ***customer*** to arrange site access and obtain installation plan and specifications 1.3 Conduct a ***site survey*** to verify that ***infrastructure*** installation requirements can be met 1.4 Identify site ***hazards*** and notify appropriate personnel to make site safe 1.5 Notify customer of alterations required to installation design and make recommendations for possible solutions 1.6 Obtain approval for alterations and update installation plan 1.7 Develop an installation activity schedule to minimise disruption to the workplace according to relevant regulation and standards 1.8 Obtain ***material supplies, safety equipment, resources, tools and test equipment*** required for safe installation
2. Build customer equipment infrastructure	2.1 Prepare for and undertake work according to ***work health and safety (WHS) and environmental requirements*** 2.2 Build telecommunications closet or telecommunications equipment room for equipment, distributors and AC-DC power systems according to design plans, manufacturer specifications and safety and electrical standards 2.3 Build ***cable support systems*** for signal, data cabling and

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	optical cables according to plans and specifications 2.4 Organise the installation of mains AC electrical power cabling infrastructure as specified on the plan 2.5 Install cable distribution frames according to plan and manufacturer specifications 2.6 Install protective earthing to metal infrastructures or gas arrestors according to specifications or design
3. Install UPS power infrastructure	3.1 ***Install uninterruptible power source or supply (UPS) systems*** as required by specification or design, and connect according to manufacturer and WHS requirements 3.2 Test and monitor UPS battery discharge levels and obtain replacement batteries under warranty where required 3.3 Identify and rectify faults where possible or escalate according to organisational policy
4. Restore site and complete documentation	4.1 Attach infrastructure ***labels and designations*** according to organisational requirements 4.2 Complete inspection sheets and declare asset ready for customer sign-off documentation 4.3 Clean up site 4.4 Notify customer and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to compare and evaluate most effective technical solutions
- communication skills to:
  - liaise with customers to ensure requirements are identified
  - negotiate approvals and contract arrangements with suppliers and contractors
- literacy skills to:
  - document technical requirements and procedures
  - interpret technical specifications and related documentation
- numeracy skills to calculate budget requirements and limitations
- planning and organising skills to:
  - meet client requirements within agreed timeframes

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  - secure site access and make arrangements for equipment delivery
  - set out project requirements and priorities
- problem-solving skills to respond to unexpected variations to requirements
- technical skills to:
  - perform cabling and terminating work
  - use hand tools to:
    - affix supports, cable trays and racks to surfaces
    - assemble infrastructure
    - work with construction materials.
    -

Required knowledge

- best practices to minimise environmental impacts, including options for green ICT installations
- cabling types, connectors and cabling structures
- common customer telecommunications applications and related equipment
- range of other customer equipment, such as alarms and media devices
- current legislation and standards relating to installation of telecommunications equipment and connection to carrier services
- key features of backup UPS systems and AC mains power requirements and electrical safety
- network topologies, interface and interconnect solutions
- type of connections to carrier infrastructure or equipment
- WHS requirements for:
  - confined spaces
  - electrical safety
  - heights
  - lifting
  - materials handling
  - physical hazards
- warranty information for equipment supplies and contractor work guarantees.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

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Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify and work with potential earthing locations, cable routes, cable support systems, data cabinets, telecommunication enclosures, and distributors • build 19 inch racks • install protective earth installations • organise AC mains power infrastructure • install UPS DC backup power.
Context of and specific resources for assessment	Assessment must ensure access to: • site where supporting infrastructure may be installed, including simulated environment • use of industry-current plant, tools and equipment • relevant regulatory and equipment documentation that impacts on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate building metal superstructure to house equipment • direct observation of the candidate installing protective earth and functional earth installations • review of installation activity schedule prepared by the candidate • oral or written questioning to assess knowledge of installation issues, types of systems and applications.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3009B Install, terminate and certify structured cabling installation • ICTCBL3010B Install and terminate optical fibre cable on customer premises. Access must be provided to appropriate learning and assessment support when required.

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	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• appropriate licences for:
	  • crane
	  • forklift
	  • winch
	• AS/ACIF S008:2006
	• AS/ACIF S009:2006
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations
	• Communications Alliance standards and codes

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	• Communications Cabling Manual (CCM) Volume 1 • Environmental Protection Acts • WHS Acts
Customer may be:	• architect • asset manager • builder • business owner • nominated representative • project manager • service provider
Site survey may include:	• cable tunnels pathways • equipment bays • floor layout • floor loadings • lighting • preparation area • roof structures • ventilation • wall structures
Infrastructure may include:	• air conditioning requirements • alarm panels • cable entries • distribution frames • duct and cable trays • equipment racks • power supplies • radio structure
Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build-up • needle stick injury • optical fibre cable containing hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin
Material supplies may	• cable racks

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include:	• cable trays, nuts and bolts • distribution frames or blocks • earth terminal and rod • frames and cabinets • insulation blocks • iron support structures • jumper wire • lacing, twine and cable ties • patch panels • termination blocks

Safety equipment may include:	• electrical isolators
	• EWP
	• harnesses
	• manual lifters
	• personal protective equipment, including:
	  • acid-proof clothing
	  • earmuffs
	  • face masks
	  • gloves
	  • head protection
	  • kneepads
	  • safety boots
	  • safety glasses
	• safety barriers

Resources may include:	• finance • labour • materials • tools and test equipment • vehicles

Tools and test equipment may include:	• tools:
	  • antistatic wrist strap
	  • pliers
	  • power drill
	  • screwdrivers
	  • sockets
	  • soldering iron
	  • spanners
	• test equipment:
	  • antistatic testers
	  • cable testers

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	• displacement tools • humidity and temperature testers • insulation testers • load testers • multimeters • optical loss test set • oscilloscope • structured cabling certification • volt meters

WHS and environmental requirements may relate to:	• decommissioning and isolating work site and lines before beginning work
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management
	• identifying other services, including power and gas
	• safe work practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • traffic cones
	  • trench guards
	  • warning signs and tapes
	• special access requirements
	• suitable light and ventilation

Cable support systems may include:	• entrance facilities • intra- and inter-building facilities
Installing uninterruptible power source or supply systems may include:	• organising certification of electrical installation • terminating and connecting DC power cables to equipment • testing DC electrical cabling
Labels and designations may include:	• cabinets • cables

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	• distribution panels • racks • vendor labels

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4001B Identify requirements for customer telecommunications equipment

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to identify requirements for customer's telecommunications equipment.

Cable used must be compliant with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6A, 7 or 7A and unshielded twisted pairs (UTP). Cabling products must be ACMA-approved.

Assessment by a TITAB registered assessor is recommended.

All customer cabling work in the telecommunications, fire, security and data industries must be performed by a registered cabler. All cablers are required to register with an ACMA-accredited registrar.

Application of the Unit

Technical staff who identify requirements for customer's telecommunications equipment apply the skills and knowledge in this unit.

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This unit applies to indoor and outdoor installation within a customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN) and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

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Elements and Performance Criteria

1. Prepare to identify services required	1.1 Notify customer to arrange access to site and identify ***customer equipment***
	1.2 Assess site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures
	1.3 Notify customer to arrange access to the site and discuss customer requirements
	1.4 Confirm details of types and models of existing and proposed ***customer equipment***
	1.5 Establish ***intended uses of customer's equipment*** to assist in identifying cabling requirements
	1.6 Establish required ***cabling requirements*** with customer and make alternate recommendations
	1.7 Locate existing ***facilities*** and systems including network facilities
	1.8 Verify building construction to confirm accessibility
	1.9 Utilise existing floor plans where available and integrate into subsequent ***documentation***
	1.10 Notify customer where physical location may incur additional cost
	1.11 Prepare a report on required services
2. Establish availability of and access to existing cabling	2.1 Calculate capacity of existing cabling against proposed usage to ensure appropriate decisions are taken on extent of new cabling required
	2.2 Inspect cabling to ensure compliance with ACMA regulations, ***relevant legislation, codes, regulations and standards***
	2.3 Prepare a report on cabling infrastructure and equipment to meet customer requirements
3. Complete required reports and documentation	3.1 Complete all required documents promptly and accurately according to company policy
	3.2 Obtain customer confirmation of documented requirements where required
	3.3 Distribute relevant documentation promptly to required parties
	3.4 Obtain sign off from customer

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - interpret technical documentation, such as equipment manuals and specifications
  - read and interpret drawings related to customer's telecommunications equipment
  - write reports
- numeracy skills to calculate capacity of existing cabling
- planning and organisational skills to organise and maintain equipment
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to:
  - establish cabling requirements
  - inspect cabling.
  -

Required knowledge

- features and operating requirements of test equipment
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- specific OHS requirements relating to the activity and site conditions
- typical issues and challenges that occur on site.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for	Evidence of the ability to:

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assessment and evidence required to demonstrate competency in this unit	• identify services required and availability and access to existing cabling • identify locations of equipment and placement of cables on support structures and building faces for both internal and external locations for service delivery • complete required reports and documentation including order forms, services checklists and quotation forms.
Context of, and specific resources for assessment	Assessment must ensure: • sites on which telecommunications installations can be conducted • relevant databases, licensing requirements and other site-related documentation.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review of an oral and written report with completed documentation • direct observation of the candidate identifying requirements for customer's telecommunications equipment.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2017B Alter services to existing cable system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Customer equipment may include:	• bandwidth managers
	• computer network
	• digital subscriber line (DSL):
	  • asymmetric DSL (ADSL)
	  • digital broadcasting
	  • computer telephony integration CTI) technologies
	• modems
	• network equipment
	• private automatic branch exchange (PABX)
	• pay TV and satellite TV installations
	• radio frequency (RF) equipment
	• security panels and equipment
	• single line telephones
	• telephone systems
	• video.

Customer requirements may cover:	• an existing builder’s or electrical contractor’s schedule • cable • connectors • cost per cable length installed per outlet • equipment types:

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	• bandwidth managers
	• data
	• DSL
	  • ADSL
	  • ADSL2
	• digital broadcasting
	• CTI
	• modems
	• network equipment
	• PABX
	• RF equipment
	• single line telephones
	• telephone systems
	• video
	• frames
	• requirements for:
	  • equipment
	  • labour
	  • materials
	  • other resources
	  • timeframes
	• scope of works
	• support system.

Intended uses of customer's equipment may include:	• bandwidth management • future needs • interface types • integrated services digital network (ISDN) application • location • primary rate access • services required • speed • telephone distribution • video distribution.

Cabling requirements must include:	• cost estimates, speed, response time, capacity and compatibility of proposed cabling installation
	• ACMA approved cabling products
	• cable compliant with appropriate ACMA technical standard requirements:
	  • aerial
	  • Category 5, 6, 6A, 7 or 7A

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	• shielded twisted pairs (STP) • underground • UTP • customer premises telecommunications cabling includes any area under the control of the customer as distinct from areas controlled by a network carrier.
Facilities may be:	• associated with network: • business links • call barring • call diversion • city links • data links • dial tone • easy call • incoming lines only • least cost routing • metering • rotary dialling.
Documentation may include:	• order forms • quotation forms • services checklists.
Relevant legislation, codes, regulations and standards include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • fire regulations • industry standards may include regulated or industry codes of practice and include appropriate ACMA technical standards • mining legislation • noise abatement and heritage legislation

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	• OHS • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Trade Practices Act.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4003B Estimate and quote for customer telecommunications equipment installation

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to estimate and quote for customer telecommunications equipment installation.

It involves preparing detailed estimates and quotes and updating schematic drawings and specifications.

Application of the Unit

Technical staff who estimate and quote for customer equipment installation apply the skills and knowledge in this unit.

This unit applies to indoor and outdoor installation within a customer premises. It may be applied to domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN) and multimedia.

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Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Confirm and update schematic drawings and specifications	1.1 Obtain existing specifications and drawings and prepare additional or new schematic drawings and specifications for installation if required 1.2 Confirm all fittings, cable types and equipment locations with customer
2. Price labour, materials and other relevant items and establish availability	2.1 Obtain quotations and delivery dates from suppliers to ensure fair comparisons between suppliers 2.2 Estimate labour costs based on company or industry-labour rates and conditions 2.3 Check pricing documentation to ensure supply proposal matches ***customer specification*** for material, quality and performance
3. Estimate labour, materials and other	3.1 Prepare estimations allowing for ***contingencies*** during installation and ***relevant legislation, codes, regulations and***

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relevant item requirements	***standards*** 3.2 Calculate costs using standard unit measures where relevant 3.3 Ensure estimates will return a profit on installation where appropriate
4. Prepare and confirm quote with customer	4.1 Prepare an equipment installation quote that meets customer requirements 4.2 Negotiate ***changes and variations*** to meet customer and company needs
5. Establish customer's financial arrangements	5.1 Obtain customer's approval of ***purchase arrangements*** and method of payment 5.2 Complete finance company negotiations successfully where required and obtain customer's agreement

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to read and interpret drawings related to customer's telecommunications equipment
- communication skills to liaise and negotiate with customers and suppliers on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to estimate and quote for telecommunications installation
- problem solving skills to solve equipment and logistics problems
- task management skills to work systematically with required attention to detail and adherence to all safety requirements
- technical skills to estimate requirements for customer telecommunications equipment installation.
-

Required knowledge

- features of customer telecommunications equipment
- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment

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- processes and techniques required to prepare plans, estimate and quote for installations
- specific occupational health and safety (OHS) requirements relating to the activity and site conditions
- typical issues and challenges that occur when dealing with customers.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare detailed estimates, updated schematic drawings and specifications, including material and labour costs for telecommunications equipment installations • negotiate with contractors on material availability and pricing for customer equipment installations • complete detailed quotes for installations that allow for changes and variations • prepare and confirm quote and financial arrangements with customer.
Context of, and specific resources for assessment	Assessment must ensure: • sites on which estimates and quotes may be conducted • relevant databases, licensing requirements and other site-related documentation.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a hands-on project completed by the candidate • review written estimates and quotes with completed documentation • oral or written questioning on the estimate and quote process.
Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, for example: • ICTCBL2017B Alter services to existing cable system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Customer specification may include:	• cable • connectors • cost per cable length installed per outlet • equipment types: • bandwidth managers

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	• digital subscriber line (DSL):
	  • asymmetrical DSL (ADSL)
	  • digital broadcasting
	  • computer telephony integration (CTI) technologies
	• modems
	• network equipment
	• private automatic branch exchange (PABX)
	• radio frequency (RF) equipment
	• single line telephones
	• telephone systems
	• video and data
	• existing builders or electrical contractors schedule
	• frames
	• requirements for:
	  • equipment
	  • labour
	  • materials
	  • other resources
	• timeframes
	• scope of works
	• support system.

Contingencies may include:	• need for integration with existing building works schedules where available • requirements for installation method or of any proprietary system being installed • relevant constraints.
Relevant legislation, codes, regulations and standards include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • compliance with appropriate Australian Communications

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	and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6, 6A, 7 or 7A and unshielded twisted pairs (UTP) • Environmental Protection Acts • fire regulations • Institute of Electrical and Electronics Engineers (IEEE) • mining legislation • noise abatement and heritage legislation • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Trade Practices Act.
Changes and variations may include:	• availability • delivery • disputes • insurance • maintenance • network/system security implications • preparation of manuals • restricted site access • testing requirements • time penalties.
Purchase arrangements may include:	• buy, rent or lease option • conditions of payment • conditions surrounding installation/modification • legal requirements • service and warranty arrangements.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4040A Assign a transmission path

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to allocate channel capacity to a customer or customer group based on details provided in a service request. It involves identifying requirements and translating them into quantitative changes to network transmission and access systems. The activity may be for a new installation or upgrade of capacity or technology for existing network or subsystem for convergence to Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the planning skills and knowledge in this unit. They combine technical skills with organisational skills to assess customer requirements and allocate a transmission medium to provide access to the customer. They may be responsible for small projects or parts of larger projects and primarily perform planning functions to provide service to a customer.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Collect data to evaluate capability of transmission path	1.1. Determine ***service details*** from service request 1.2. Use transmission medium plans to locate customer position relative to the access network provisioning 1.3. Evaluate ***existing transmission mediums*** in close proximity to assess their capability to deliver service

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ELEMENT	PERFORMANCE CRITERIA
	to customer 1.4. Specify ***equipment*** to be used on the service from service request 1.5. Specify line interface type that is to be used according to enterprise guidelines
2. Allocate transmission medium for service	2.1. Select appropriate ***transmission medium*** to deliver service to customer's premises 2.2. Record information about transmission medium between customer's premises and exchange or network terminal point 2.3. Verify ***service delivery point interface*** at exchange or network terminal point is compatible with required system 2.4. Conduct appropriate ***allocation process*** to assign new services and send completed allocation information to appropriate field staff to verify physical allocation before providing service
3. Maintain transmission medium records	3.1. Advise relevant personnel of impending bearer shortages to facilitate future planning allocation 3.2. Update plans and databases to record all details

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret information affecting dimensioning decisions
- communication skills to liaise with:
  - customers to ensure requirements are known and can be met within timeframes
  - technical staff, subject matter experts and manufacturers
- literacy skills to:
  - interpret technical specifications and related documentation
  - notate and record information
- numeracy skills to make calculations to determine capacity requirements
- PC skills for interacting with software systems for allocation and re-routing of channel capacity

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REQUIRED SKILLS AND KNOWLEDGE

• planning and organisational skills to:
  • ensure correct allocation of actual and virtual resources
  • make site access and equipment delivery/allocation arrangements
• technical skills to implement changes to transmission systems:
  • channel allocation
  • reconfiguring
  • virtual private network (VPN)

Required knowledge
• common customer telecommunications applications and related equipment • Core Networks using emerging and converging technologies • current legislation relating to installation of telecommunications equipment and connection to carrier services • customer access options and their technical support systems • multiplexing principles and transmission hierarchies • network and transmission equipment • network topologies, interfaces and interconnect solutions

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • assess transmission needs for a transmission path according to service request • select suitable equipment to provide new services • interact with internal and external personnel, keeping a customer focus and consideration of customer needs • deal with problems and provide solutions • assess future needs.
Context of and specific resources for	Assessment must ensure:

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EVIDENCE GUIDE	
assessment	• sites where transmission paths can be allocated • computer networking facility • relevant regulatory and equipment documentation • use of equipment currently used in industry.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate assessing transmission needs and conducting allocation process • review of plans and databases completed by the candidate providing details of new transmission path • oral or written questioning to assess knowledge of assigning transmission paths.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL3069A Install network cable equipment • ICTCBL3103A Maintain cable network • ICTCBL4002A Prepare design drawings and specification for a cable installation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include

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EVIDENCE GUIDE	
	equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Service details may relate to:	• data allocation based on common digital hierarchy increments:
	  • asynchronous transfer mode (ATM)
	  • custom throughput requirements
	  • E1
	  • Synchronous transport module level x(STM-*X*)
	• multiple voices channels (ISDN)
	• need ascertained from application:
	  • other data sources
	  • private automatic branch exchange (PABX)
	  • video
	• single voice channel.

Existing transmission mediums may be determined from:	• databases
	• local knowledge and include allocation within existing multiplex schemes:
	  • associated physical media
	  • ATM
	  • plesiochronous digital hierarchy (PDH) (E1) transmission system
	  • synchronous digital hierarchy (SDH)
	• maps.

Equipment may include:	• access equipment:
	  • fibre termination equipment
	  • microwave

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RANGE STATEMENT	
	• modems • satellite • line termination units • multiplex equipment • network infrastructure including ports on multiplex equipment • transmission equipment.
Transmission medium may include:	• frequency allocation on radio transmission • global system for mobile (GSM)communications • hybrid fibre coaxial (HFC) • microwave • satellite • system channel on optical fibre • twisted pair • VPN on a multi protocol label switching (MPLS) link.
Service delivery point interface may include:	• ATM adapter • cross connect port • digital subscriber line access multiplexer (DSLAM) • exchange line interface unit • fibre termination point • main distribution frame (MDF).
Allocation process may relate to:	• automated allocation for a group service • manual or computer based procedures for allocating new transmission channel capacity • service.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4050A Install and configure a wireless mesh network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and configure a wireless mesh network comprised of radio nodes organised in a mesh topology. Wireless mesh networks provide users with secure wireless roaming beyond traditional wireless local area network (LAN) boundaries and are readily deployed in areas that lack wired backhaul. The mesh topology and ad-hoc routing give mesh networks stability, offer redundancy and have the ability to self form and self heal. Mesh networks enable local communities and those in remote areas to participate in a distributed shared network without the need for centralised management. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technicians and technical officers from private and public organisations who install and test wireless networking equipment or radio communications equipment apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Configure wireless mesh nodes and wireless access points	1.1. Determine internet protocol (IP) addressing schemes from design plan obtained from ***appropriate person*** 1.2. Confirm compatibility of factory installed firmware in wireless routers with mesh routing requirements, otherwise install ***upgrade firmware*** 1.3. Configure ***wireless router settings*** and wireless fidelity (***WiFi***) ***wireless access point settings*** for inclusion in mesh network 1.4. Connect mesh node and access node back-to-back via a ***straight LAN cable*** according to design plan
2. Connect separate mesh networks via	2.1. Configure routing software on mesh and backbone nodes to enable mesh traffic to reach backbone

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ELEMENT	PERFORMANCE CRITERIA
backbone	2.2. Connect mesh node and backbone node back-to-back via a straight LAN cable 2.3. Configure ***gateway server*** and gateway node and add required ***services*** to the network
3. Test connectivity within mesh network	3.1. Assemble all wireless mesh routers with ***configuration sheets*** attached and power up the routers 3.2. Connect PC to a wireless mesh router and confirm that an IP address is provided automatically by dynamic host configuration protocol (DHCP) 3.3. Confirm connectivity to mesh nodes and the gateway by pinging individual IP addresses, and rectify faulty nodes if required
4. Test network connectivity via wireless backbone	4.1. Install mesh nodes according to design plan 4.2. Install and ***align*** directional antennas on wireless backbone path according to installation instructions and occupational health and safety (OHS) procedures 4.3. Confirm connectivity between mesh clusters at either end of wireless backbone
5. Clean up work site and complete administrative work	5.1. Remove waste from work site, dispose of according to environmental requirements and restore work area to customer's satisfaction 5.2. Update ***documentation records*** and make recommendations according to the enterprise policy 5.3. Notify the customer of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with vendors and installation personnel on technical and operational matters • literacy skills to interpret technical documentation and write reports in required formats • numeracy skills to perform calculations, interpret results and evaluate different

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REQUIRED SKILLS AND KNOWLEDGE

types of technical data
• planning and organisational skills to plan, prioritise and monitor own work and that of others
• problem solving and contingency management skills to:
  • adapt testing procedures to requirements of particular situations
  • modify activities depending on operational contingencies, risk situations and environments
• technical skills to:
  • install software
  • select and specify appropriate performance tests and test equipment
  • set up IP addresses and subnet masks
  • use IT networking skills

Required knowledge
• 802.11 wireless protocols • allocation of IP addresses and subnet masks • antenna gain, polarisation • cable loss • calculation of effective isotropic radiated power (EIRP) • calculation of line of site radio range • decibels and related units • network topologies • radio frequency (RF) frequency bands • routing protocols • transmission control protocol (TCP)-IP protocols • wireless networking hardware, access points, wireless routers, gateway

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to:

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EVIDENCE GUIDE	
competency in this unit	• configure wireless mesh nodes • install wireless mesh nodes, access point nodes and gateway • test nodes for connectivity.
Context of and specific resources for assessment	Assessment must ensure: • sites on which configuring and installing wireless mesh network may be conducted • technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate configuring wireless mesh routers • direct observation of the candidate installing wireless mesh nodes, access point nodes and gateway • direct observation of the candidate testing nodes for connectivity • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5217A Plan a wireless mesh network • ICTRFN3055A Install a radio communications antenna and feedline. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be

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EVIDENCE GUIDE	
	combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate person may include:	• network engineer • project designer • project manager.
Upgrade firmware may include:	• OpenWrt Linux based firmware • Freifunk firmware • MIT Roofnet.

Wireless router settings may include:	• LAN settings:
	  • firewall usage
	  • LAN IP address and subnet mask
	  • LAN protocol
	• routing protocol:
	  • optimised link state routing (OLSR)
	• system settings:
	  • country
	  • host name
	• wireless settings:
	  • basic service set identifier (BSSID)
	  • channel number/frequency
	  • extended service set identifier (ESSID)

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RANGE STATEMENT	
	• wireless LAN (WLAN) IP address • WLAN IP address and subnet mask • WLAN mode • WLAN protocol.

WiFi wireless access point settings may include:	• settings:
	  • DHCP settings:
	  • maximum number of DHCP users
	  • starting IP address
	  • DHCP type
	  • router IP address
	  • router name
	• wireless settings:
	  • wireless channel number or frequency
	  • wireless network name (SSID).

Straight LAN cable may include:	• Category 5 • Category 5e • Category 6.
Gateway server may include:	• connection to another network • connection to the internet • via asymmetrical digital subscriber line (ADSL).
Services may include:	• domain name system (DNS) • mail server • web proxy.
Configuration sheets may include:	• host name • LAN settings • routing protocol • software or firmware version • WAN settings • wireless router details • wireless settings.

Align may include:	• azimuth angle
	• elevation angle
	• set antenna polarisation:
	  • horizontal
	  • vertical.

Documentation records may include:	• configuration details: • access point

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RANGE STATEMENT	
	• gateway • router • IP Addresses • signal levels.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4051A Install configuration programs on PC based customer equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install software on customer equipment, including telecommunications, data communications and security networks. The activity may be for a new installation, upgrade of capacity or technology for existing network or subsystem for convergence to Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from telecommunications carriers, contractors or other service providers or private providers apply the skills and knowledge in this unit. It involves configuration of specialist PC based customer equipment to allow access to telecommunications services. Customer equipment includes digital home integration, security, voice over IP (VoIP), internet protocol television (IPTV), radio frequency identification (RFID), wireless networking and home automation.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install software	1.1. Arrange access to the site according to required procedure 1.2. Determine the type of ***customer equipment*** from the installation plan to prepare the software requirements to provide ***functionality*** required 1.3. Prepare equipment ***software configuration specifications*** to include enhancements in customer requirements and confirm with customer

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Notify customers on proposed software installation 1.5. Confirm software compatibility with existing system if required 1.6. Document job software specification
2. Install the program and provide secure remote access	2.1. Configure ***customer specific data*** according to system specifications 2.2. Install and test system functionality to verify system operational performance following occupational health and safety (OHS), manufacturer's specifications and industry standards 2.3. Develop and configure ***security arrangements and codes*** for remote access systems in consultation with customer 2.4. Conduct tests to validate security arrangements
3. Undertake administrative tasks	3.1. Save and record configuration program and provide program backup for contingency use by customer 3.2. Complete administrative tasks and provide a copy of job specification to be securely stored on site following enterprise policy 3.3. Notify customer of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret required software and hardware settings
- communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- numeracy skills to make calculations and take readings for necessary configuration changes
- planning and organisation skills to make site access and equipment delivery arrangements
- problem solving to account for unexpected faults or equipment configuration anomalies

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REQUIRED SKILLS AND KNOWLEDGE

• technical skills to:
  • handle, connect and calibrate test equipment
  • manage transfer of data, installation and configuration of software
  • use networking skills

Required knowledge
• channels allocations • common operating systems and their impact on the configuration of, or version of software to be installed • frequency • IP addressing • logon procedures • numbering formats • product or service functions to ensure correct operation of completed installation • relevant regulatory and industry requirements

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• prepare software configuration
	• load software into customer equipment
	• install security programs agreed with customer
	• test program and program features including:
	  • system facilities
	  • product features
	  • required peripherals associated with the product
	  • system functionality.

Context of and specific resources for assessment	Assessment must ensure: • suitable site for installation of system programs

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EVIDENCE GUIDE	
	• use of equipment currently used in industry • relevant regulatory and enterprise documentation that impacts on testing and installation.
Method of assessment	The following assessment methods are appropriate for this unit: • direct observation of the candidate performing installation and configuration of software into equipment • review of written documentation prepared by the candidate outlining activity conducted, specific installation details and job completion records • written and oral questioning of the candidate on procedures and considerations for a range of installation situations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Customer equipment may include:	• cable modem
	• digital home integration
	• digital subscriber line (DSL) router modem
	• fire alarm
	• IPTV
	• media entertainment centre
	• private branch exchange (PBX)
	• retail point of sale (POS) equipment
	• RFID
	• security alarm panel
	• set-top box
	• telemetry devices used by utilities:
	  • electricity
	  • gas
	  • water
	• VoIP
	• Worldwide interoperability for microwave access (WiMAX) customer premises equipment (CPE)
	• wireless broadband modem.

Functionality may include:	• product features
	• required peripherals associated with product
	• system facilities
	• system functionality:
	  • call detail recording
	  • local area network (LAN) or wide area network (WAN)
	  • night service
	  • permissions

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RANGE STATEMENT	
	• security • station priorities • xDSL facilities.
Software configuration specifications may include:	• billing details • customer port configurations • customised installation • network management • patch • software functionality • toll details • upgrade.
Customer specific data may include:	• access and authorisation permissions • equipment configuration • location • service provider access codes.

Security arrangements and codes may include:	• account names
	• passwords
	• PINs
	• usernames
	• remote access provisions:
	  • logical ports
	  • physical access lines.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effect changes to existing customer premises equipment (CPE), systems and products. It involves producing plans, carrying out alterations and testing new work. The changes may be part of a project on emerging technologies on existing network or subsystem for convergence to Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Linesmen, line installers and technicians from telecommunications carriers, contractors, other service providers or private providers apply the skills and knowledge in this unit to upgrade or modify customer equipment and systems. This unit applies to all communications applications and emerging technologies of convergence and multimedia. This unit may be applied to domestic, commercial or industrial installations for indoor and outdoor installations within a customer premises.

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	CPE systems include digital home integration, security, voice over IP (VoIP), internet protocol television (IPTV), radio frequency identification (RFID), wireless networking and home automation.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**

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ELEMENT	PERFORMANCE CRITERIA
1. Prepare requirements for alteration	1.1. Arrange access to the site according to required procedure and comply with ***site security arrangements*** and ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Assess ***facilities*** and capacity to ensure requirements can be met 1.3. Evaluate existing system availability and access to accommodate proposed changes 1.4. Notify appropriate personnel of identified ***safety hazards*** at worksite 1.5. Evaluate the compatibility of existing and proposed ***systems*** and equipment before proceeding with planned changes 1.6. Negotiate planned system outages and outage time with the customer
2. Document specifications and plans for alteration	2.1. Produce an amendment plan of systems ***alterations*** to assess suitability with existing system 2.2. Produce ***specifications*** for alteration requirements according to customer requirements 2.3. Select materials and ***tools and equipment*** compatible with the upgrade activity
3. Install additional equipment and program system feature changes	3.1. Produce an activity plan for minimal disruption of alterations to ongoing client activity 3.2. Carry out all alterations in a ***safe manner*** according to relevant standards and regulations and manufacturer's specifications 3.3. Test new work in isolation and when integrated with existing systems to confirm compatibility of alterations with existing network
4. Update plans and records	4.1. Update all plans and documents to show installed systems accurately and clearly 4.2. Complete ***documentation*** for customer support
5. Restore site to required condition	5.1. Remove waste and debris from worksite and dispose of according to environmental requirements to maintain safe work site conditions 5.2. Recover obsolete equipment and return to customer or for disposal as agreed with customer 5.3. Notify customer of job completion and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret equipment settings and readings
- communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
- literacy skills to:
  - interpret technical specifications and related documentation
  - produce plans and update documentation
- planning and organisation skills to arrange site access and equipment delivery
- problem solving skills to account for unexpected faults or equipment configuration anomalies
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - perform fault clearance
  - use diagnostic equipment
  - use hand and power tools

Required knowledge

- legislation, codes of practice and other formal agreements that impact on the work activity
- manufacturer's requirements for safe operation of equipment
- network addressing
- specific OHS requirements relating to the activity and site conditions
- types of CPE
- typical issues and challenges that occur on site
- vendor products

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify customer's needs • develop plans and drawings to give effect to planned changes to systems and equipment • alter system and equipment including physical and programming change according to OHS and relevant standards and regulations • identify, conduct and interpret tests appropriate to the change.
Context of, and specific resources for assessment	Assessment must ensure: • systems and equipment to effect changes • equipment and systems manuals, specifications and enterprise policy.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing additional equipment and programming system changes • review of amendment plan prepared by the candidate outlining systems alterations and specifications • review of test results and documentation completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4073A Cut over customer premises equipment major upgrades. Aboriginal people and other people from a non-English

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EVIDENCE GUIDE	
	speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Site security arrangements may include:	• access times and methods • approval to enter site • approved entry requirements • electronic surveillance • security clearance.
Relevant legislation, ***codes***,	• Australian Communications Industry Forum

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RANGE STATEMENT	
regulations and standards may include:	(ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian Building Codes and Regulations • cabling security codes and regulations • confined spaces regulations • Environmental Protection Acts • OHS • regulated or industry codes of practice • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Facilities may include:	• available hardware • available rack space • building limitations • cooling requirements • enclosure capacity • floor space • power requirements.

Safety hazards may refer to:	• access points that may contain:
	  • hazardous light (non-visible laser)
	  • RF emission
	• contact with remote power feed
	• electrical supply and areas of earth potential rise (EPR) that require mandatory separation from communications cable
	• hazardous conduit as according to AS 1345:1995 conduit colours associated with a hazardous service.

Systems may include:	• digital home integration

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RANGE STATEMENT	
	• home automation • home computing • IPTV • RFID • security installation • VoIP • wireless network.
Alterations may relate to:	• additions • alterations that can be effected either on site or remotely • configurations • moving outlets and services • new extensions to services • removals • systems and application upgrades • upgrades to software.
Specifications may be found in:	• cable plans and designs • contract documents • equipment details • software requirements • specification schedules • upgrade specifications.

Tools and equipment may include:	• tools:
	  • electrical:
	  • cordless or power drill
	  • soldering iron
	  • hand:
	  • cutters
	  • pliers
	  • strippers
	  • terminating tools
	• equipment:
	  • analyser
	  • cable identification kit
	  • diagnostic tools
	  • local area network (LAN) Cat tester
	  • passive optical meter (PON).

Safe manner may include:	• safe use and handling of: • chemicals

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RANGE STATEMENT	

	• materials
	• tools and equipment
	• work platforms:
	  • ladders
	  • scaffold
	  • scissor lifts or cherry pickers
	• use of protective clothing:
	  • earmuffs
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses.

Documentation may include:	• boot up and back up procedures • equipment configurations • inventory of material used on project • software upgrades • updated cable records • updated plan.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4073A Cut over customer premises equipment major upgrades

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to cut over major equipment and network upgrades in customer premises. It involves cut over works, testing and rectifying problems. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who upgrade customer premises systems and equipment apply the skills and knowledge in this unit. Relevant job roles include supervisors in charge of installation and maintenance teams responsible for new installations and upgrades of telecommunications customer equipment. This unit applies to indoor and outdoor installation within customer premises. Customer premises equipment (CPE) includes telephony, data, video, digital broadcasting and computer networks including local area networks (LAN) and multimedia in domestic, commercial or industrial installations.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for the cut over	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Notify ***customer*** for site access, security arrangements and location details of ***customer equipment*** for ***major upgrade*** 1.3. Identify site ***hazards*** and notify appropriate personnel to make site safe 1.4. Prepare a ***cut over plan*** and seek approval from

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ELEMENT	PERFORMANCE CRITERIA
	customer 1.5. Complete functional testing of new systems and equipment prior to cut over to minimise system downtime 1.6. Notify ***network carrier*** of cut over details to prevent unnecessary alarm call outs and reports 1.7. Organise system backup from ***support personnel***
2. Cut over the system and equipment into service	2.1. Conduct ***cut over works*** for major system upgrade according to cut over plan with minimal disruption to customer service according to occupational health and safety (***OHS***) ***and environmental requirements*** 2.2. Conduct ***tests*** according to technical manuals and specifications to complete installation task 2.3. Analyse test results to verify system compatibility and interoperability with existing system 2.4. Rectify any problems if required
3. Finalise work and clean up worksite	3.1. Complete documentation containing installation details and test records 3.2. Amend site records to show existing equipment layout 3.3. Organise customer training in the new or modified system 3.4. Clean up and restore site to customer satisfaction 3.5. Collect and dispose of waste material and debris according to environmental requirements 3.6. Notify customer of job completion to obtain sign off and present with a copy of documentations

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to evaluate technical test results to diagnose problem • communication skills to interact with enterprise personnel and customers while maintaining a customer focus and consideration of customer needs • literacy skills to read and interpret technical documentation, such as equipment

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REQUIRED SKILLS AND KNOWLEDGE

manuals and specifications
• numeracy skills to take and analyse measurements
• planning and organisational skills to organise and maintain equipment
• problem solving skills to solve equipment and logistics problems
• task management skills to work systematically with required attention to detail and adherence to all safety requirements
• technical skills to:
  • perform cut over procedures
  • perform fault clearance
  • use diagnostic equipment
  • use hand and power tools

Required knowledge
• cut over procedures • detailed knowledge of CPE equipment • features and operating requirements of test equipment • information required to operate equipment according to a test specification • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for safe operation of equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop and implement a cut over plan • identify and organise resources including customer resources necessary to complete the cut over

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EVIDENCE GUIDE	
	• conduct relevant tests and interpret test results • identify and resolve problems.
Context of, and specific resources for assessment	Assessment must ensure: • site where cut over can be conducted • use of plant, tools and equipment currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit. • direct observation of the candidate performing cut over procedures of CPE • review of cut over plans, installation documents and records prepared by the candidate • oral or written questioning to assess knowledge of cut over and CPE installation procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4072A Effect changes to existing customer premises equipment systems and equipment • ICTTEN4076A Complete equipment and software upgrades. Aboriginal people and other people from a non-English speaking background may have second language issues Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require

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EVIDENCE GUIDE	
	language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Construction Industry Forum (ACIF) standards and codes AS/ACIF S008:2006 and AS/ACIF S009:2006 • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS.
Customer may be:	• asset manager • contractor • nominated customer representative • project manager • service provider.

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RANGE STATEMENT	
Customer equipment may include:	• alarms systems • internet protocol (IP) private branch exchange (PBX) • IP PBX server • IP security systems • internet protocol TV (IPTV) • network management addition • PBX • session initiation protocol (SIP)-enabled unified communication (UC) system • video conferencing equipment • voice over internet protocol (VoIP) gateway • worldwide interoperability for microwave access (WiMAX) CPE.
Major upgrade may include:	• network capacity upgrade • network major software upgrade • network services upgrade • network technology upgrade • system integration.
Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Cut over plan may include:	• access and security arrangements • after hours access • contingencies • contingency plans • customers communication priorities • customers communications needs • downtime

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RANGE STATEMENT	
	• installation of backup equipment • provision of temporary services • testing procedures • timing and disruption to services.
Network carrier refers to:	• asset owner • internet service provider • service provider.
Support personnel may include:	• help desk • IT support • network operations support • vendor backup.
Cut over works may include:	• commission of new system • installation of new additional equipment • installation of new software • integration of new equipment into existing system • jumpering of bypass connection • provision of temporary service • removal of redundant equipment • test on new system.

OHS and environmental requirements may include:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services, including power and gas
	• personal protective clothing:
	  • earmuffs
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment

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RANGE STATEMENT	

	• work platforms
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Tests may include:	• ability to make and receive a call • configuration • diagnostic • programme checks • routing • software • switching • traffic measurement • transmission.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4076A Complete equipment and software upgrades

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to upgrade telecommunications equipment and software in service provider networks and customer premises. This unit may apply to switching, transmission, radio and computer networks using cable, optical fibre, radio, microwave and satellite transmission. Computer networks include local area networks (LAN) and wide area networks (WAN) and internet protocol (IP) based equipment of the Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who upgrade systems and equipment in customer networks and core and access networks apply the skills and knowledge in this unit. They are involved in maintenance, upgrades and cut overs of emerging technologies in IP based telecommunications networks. Relevant jobs roles include a supervisor in charge of installation and maintenance teams responsible for the

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	new installations and upgrades of telecommunications networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for the upgrade activity	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work

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ELEMENT	PERFORMANCE CRITERIA
	1.2. Notify ***customer*** for site access, security arrangements and location details of ***equipment*** for ***upgrade*** 1.3. Identify site ***hazards*** and notify appropriate personnel to make site safe 1.4. Prepare an ***upgrade plan*** against work order and seek approval from customer 1.5. Organise system back up from ***support personnel*** 1.6. Obtain tools and ***test equipment*** and check for accuracy and safety 1.7. Allocate specific tasks according to the skill mix of staff involved 1.8. Run ***test*** plan on current equipment and identify and rectify problems in consultation with planners 1.9. Complete functional testing of new systems and equipment prior to upgrade to minimise system downtime 1.10. Analyse test results to predict compatibility and interoperability issues of equipment and systems prior to the ***upgrade work***
2. Undertake upgrade	2.1. Implement upgrade according to design specification following occupational health and safety (***OHS***) ***and environmental requirements*** 2.2. Follow procedures for upgrade of network in sequential order as defined in instruction manuals 2.3. Monitor ***progress of upgrade*** periodically to ensure that plans in relation to time and duration are being met 2.4. Notify planner of problems encountered with detail as to the impact of the problem on the upgrade plan 2.5. Abort upgrade and implement ***contingency plan*** should an upgrade plan not be realised without major disruption to network 2.6. Monitor system response during upgrade and take action according to instructions provided
3. Test upgrade for acceptance	3.1. Undertake tests according to the predetermined test plan 3.2. Analyse test results and verify against specified performance levels 3.3. Escalate problems encountered according to enterprise policy 3.4. Invoke reversion procedure to pre-upgrade state, if

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ELEMENT	PERFORMANCE CRITERIA
	directed by planners, according to enterprise policy 3.5. Record upgrade test results and provide to network management group 3.6. Run post-upgrade routines according to documented procedures
4. Monitor post-upgrade performance	4.1. Conduct ongoing tests to ensure success of upgrade 4.2. Monitor relevant alarms to measure impact of upgrade 4.3. Review customer complaints to assess impact of upgrade on customer satisfaction
5. Finalise administrative work and clean up worksite	5.1. Complete relevant work ***documentation*** and administrative tasks according to enterprise policy 5.2. Amend site records to show upgraded equipment layout 5.3. Organise customer training in the new or modified system 5.4. Clean up and restore site to customer satisfaction 5.5. Collect and dispose of waste material and debris according to environmental requirements 5.6. Declare asset ready for use 5.7. Notify customer of upgrade job completion to obtain sign off of work order and present with a copy of documentation

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to evaluate impact of upgrades on customer equipment and systems
• communication skills to:
  • provide advice and guidance to others and to liaise with other technical staff on operational matters
  • respond to customer complaints
• literacy skills to read and interpret:

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REQUIRED SKILLS AND KNOWLEDGE

- contingency plans
- enterprise procedures, manuals and specifications
- technical data, technical and non-technical information from a range of sources
- test results
- numeracy skills to interpret technical data
- PC skills to monitor installed software
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - prepare upgrade plan
  - troubleshoot common equipment and network problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - analyse the impact of applications on traffic flow in the network
  - determine customer requirements
  - determine the impact of upgrading hardware and software on network functionality
  - identify the technical requirements, constraints and manageability issues for a given customer network requirement
  - implement upgrade of equipment and software
  - use test equipment and monitoring tools
  - use tools and equipment to assemble and disassemble equipment

Required knowledge

- alarms
- backup systems
- upgrades and post-upgrade routines
- computer knowledge
- escalation and outage procedures
- network management systems
- overview knowledge of telecommunications networks and equipment
- telecommunications monitoring tools
- telecommunications test equipment and test set-ups
- telecommunications wiring practices

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse the implications of hardware and software upgrade on the remainder of the network • plan and identify the components of the upgrade process • prepare an upgrade plan and organise system backup • run test plan and analyse test results • implement upgrade and monitor progress of upgrade periodically using both vendor and enterprise specific monitoring tools • implement contingency plan • escalate problems encountered according to enterprise policy • analyse alarms and alarm conditions • review customer complaints to assess impact of upgrade.
Context of, and specific resources for assessment	Assessment must ensure: • site where upgrade may be conducted • use of equipment, software, test and monitoring equipment currently used in industry • relevant regulatory, equipment, enterprise and vendor documentation that impacts on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing upgrade • direct observation of the candidate performing tests and monitoring alarms • review of documents prepared by the candidate providing upgrade plan and assessing impact of upgrade taking into consideration customer feedback

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EVIDENCE GUIDE	
	• oral or written questioning to assess knowledge of upgrade, testing and monitoring procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTTEN4073A Cut over customer premises equipment major upgrades • ICTTEN4086A Undertake routine maintenance of the telecommunications network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating

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RANGE STATEMENT	
conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Construction Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Environmental Protection Acts • OHS Acts • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Customer may be:	• asset manager • contractor • network planner • nominated customer representative • project manager • service provider.

Equipment may include:	• Core and Access network:
	  • cellular mobile network
	  • dense wavelength division multiplexing (DWDM) network
	  • gateway router
	  • IP-Core Network
	  • mesh network
	  • multiprotocol label switching (MPLS) router
	  • network server
	  • optical network
	  • satellite network
	  • switching equipment

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RANGE STATEMENT	
	• transmission equipment • worldwide interoperability for microwave access (WiMAX) network • customer network: • alarms systems • IP private branch exchange (PBX) • IP PBX server • IP security systems • Internet protocol TV (IPTV) • LAN: • data switch • router • server • network management addition • PBX • session initiation protocol (SIP)-enabled UC system • video conferencing equipment • voice over internet protocol (VoIP) gateway • WiMAX CPE.
Upgrade may include:	• network capacity upgrade • network major software upgrade • network services upgrade • network technology upgrade • system integration.
Hazards may include:	• building debris • earth potential rise (EPR): • event at a site, such as an electrical distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build up • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting

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RANGE STATEMENT	
	radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Upgrade plan may include:	• access and security arrangements • after hours access • contingencies • contingency plans • customers communication priorities • customers communications needs • downtime • installation of backup equipment • provision of temporary services • test plans • testing procedures • timing and disruption to services.
Support personnel may include:	• help desk • IT support • network operations support • vendor backup.
Test equipment may include:	• communication testers • frequency analysers • microwave link analysers • network analyser • protocol analyser • spectrum analysers • traffic analyser • transmission measuring sets.
Test may include:	• ability to make and receive a call • configuration tests • diagnostic tests • programme checks • routing tests • software tests • switching tests • traffic measurement test • transmission tests.
Upgrade work may include:	• commission of new system • installation of new additional equipment

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RANGE STATEMENT	
	• installation of new software • integration of new equipment into existing system • provision of temporary service • removal of redundant equipment • test on new system.

OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services, including power and gas
	• personal protective clothing:
	  • earmuffs
	  • gloves
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Progress of upgrade may include:	• rate of deliverables against project timeline • risk management • timing.
Contingency plan may:	• be developed as part of the upgrade planning and design • be escalated and referred to more specialist team

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RANGE STATEMENT	
	• invoke partial upgrade to be continued at later stage • invoke reversion procedure to pre-update condition.
Documentation may include:	• configuration details • implementation and testing procedures • network impact statement • software test results • system updates • test results and recommendations • upgrade details • vendor, equipment and enterprise specific details.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4078A Commission an electronic system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to commission an electronic system within a telecommunications environment in a broad range of applications. This involves commissioning an electronic system with applications, including cellular telemetry, voice over IP (VoIP), radio frequency identification (RFID), supervisory control and data acquisition (SCADA) networks and SCADA security, telephony, data, video, IP television (IPTV) and multimedia. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers and technicians employed by telecommunications carriers, service providers or contractors apply the skills and knowledge in this unit. It involves commissioning an electronic system at customer's premises and within a carrier network. The commissioning may be for a new installation or an upgrade of capacity or technology for an existing network or subsystem for convergence to Next Generation Networks (NGN).

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to commission an electronic system	1.1. Prepare for work following occupational health and safety (***OHS***) ***requirements*** 1.2. Organise resources based on existing and potential site ***hazards*** 1.3. Notify customer or ***network operations personnel*** for site access and network specifications

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Determine the function and requirements of the ***electronic system*** from specifications 1.5. Identify potential ***security threats*** and vulnerability where remote monitoring and control via the public telecommunications network or internet are used, and report to appropriate person 1.6. Verify that the installed electronic system and associated cabling conform to specifications and assess compatibility of system units 1.7. Establish commissioning dates with all parties and establish ***planned outage*** 1.8. Check suitability and calibration status of ***test equipment*** 1.9. Produce a preliminary commissioning plan according to manufacturer's instructions and enterprise guidelines for discussion with the customer
2. Organise planned outages	2.1. Negotiate outage times with appropriate groups and ***affected customers*** to minimise disruptions 2.2. Arrange for emergency communications based on ***contingency plans*** 2.3. Notify alarm management centre of planned action 2.4. Obtain authority to proceed from the relevant control centre and notify customers affected by the outage
3. Perform commissioning procedures	3.1. Configure the electronic system parameters and install software according to manufacturer's specifications and customer requirements 3.2. ***Conduct tests*** according to manufacturer's specifications and industry practice 3.3. Conduct the cut over according to project design and industry practice in consultation with ***appropriate person*** 3.4. Conduct a security audit, including remote threat analysis in applications where the public telecommunications network or internet is linked to the overall electronic system
4. Finalise commissioning	4.1. Record configuration information and update relevant databases according to enterprise and network guidelines 4.2. Notify appropriate person of commissioning results and work completion

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ELEMENT	PERFORMANCE CRITERIA
	4.3. Complete ***administrative tasks*** according to industry practice and enterprise guidelines

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test equipment settings and readings
- communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- numeracy skills to make calculations
- planning and organisational skills to arrange site access and contingency plans
- problem solving to account for unexpected faults or equipment configuration anomalies
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - conduct security audit
  - conduct tests
  - configure electronic system parameters
  - establish planned outage
  - identify security threats
  - install software
  - perform cut over

Required knowledge

- acceptance testing
- commissioning procedures
- commissioning testing

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REQUIRED SKILLS AND KNOWLEDGE
• electrical and optical properties to be measured • extensive range of networking equipment • legislation and licensing associated with installation of telecommunications equipment • network operation procedures • power requirements and electrical safety • setup and operation of test equipment applicable to a wide range of measurements • transmission type and signals that may be encountered

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • negotiate arrangements for commissioning • configure electronic equipment and system parameters • commission electronic system according to specifications • deal with faults and problems and provide solutions • identify potential security threats and vulnerability.
Context of and specific resources for assessment	Assessment must ensure: • sites on which installation and commissioning procedures may be conducted • relevant regulatory and equipment documentation that impact on commissioning • use of testing equipment currently used in industry.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate applying enterprise escalation and outage procedures within

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EVIDENCE GUIDE	
	service assurance guidelines • review of reports completed by the candidate outlining test plan and test results complete with analysis of faults with solutions • oral or written questioning to assess knowledge of commissioning procedures and types of systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN3077A Commission an electronic unit • ICTTEN3104A Maintain an electronic system • ICTTEN4076A Complete equipment and software upgrades • ICTTEN4081A Locate, diagnose and rectify faults • ICTTEN4198A Install, configure and test an internet protocol network • ICAB4236B Build security into a virtual private network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

OHS requirements may include:	• decommissioning and isolating worksite and lines prior to commencement
	• identifying other services:
	  • gas
	  • power
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses for laser work
	• safe working practices to handle:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes

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RANGE STATEMENT	
	• witches hats • special access requirements • suitable light and ventilation.

Hazards may include:	• earth potential rise (EPR)
	• optical fibre cable:
	  • bare fibres
	  • hazardous laser light
	• radio frequency (RF) equipment emitting radiation
	• remote power feeding services operating above telecommunications network voltage (TNV).

Network operations personnel may include:	• alarm operations • network operations centre staff • network operations manager • project manager.
Electronic system may relate to:	• biometrics • cellular telemetry • IPTV • multiplexing • RFID • supervisory control and data acquisition (SCADA) • surveillance • VoIP.
Security threats may include:	• disgruntled employees • general internet threats • holes in firewalls • malware • network Intrusion • recreational hackers • virus • worm.

Planned outage may refer to:	• allocation of additional services and support
	• notification to affected customers
	• plan for:
	  • redundant path
	  • standby equipment.

Test equipment may include:	• bit error rate (BER) tester • communication system analyser

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RANGE STATEMENT	
	• digital analyser • laptop computer with diagnostic routines • laser source • magnetic error reduction (MER) meter • microwave link analyser • modulation analyser • multimeter • optical attenuator • optical fibre power meter • oscillator • oscilloscope • optical time domain relectometer (OTDR) • pattern generator • power meter • RF microwave test set • RF sweep tester • signal level meter (SLM) • spectrum analyses • transmission measuring set • voltage standing wave ratio (VSWR) meter.
Affected customers may include:	• building owner • communications consultant • contractor to a major supplier • end users • equipment owner • householder • operations staff.

Contingency plans may include:	• additional notification to affected customers
	• additional technical support
	• provision of:
	  • additional services
	  • redundant path
	  • standby equipment.

Conduct tests may involve:	• compatibility • end-to-end systems • monitoring features • network assess facilities • remote alarm.
Appropriate person may include:	• customer

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RANGE STATEMENT	
	• design engineer • network operations manager • project manager • supervisor.
Administrative tasks may refer to:	• completing job orders • completing test sheets according to specification and logging test instrument usage • correct labelling of all equipment and amending where required • following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • providing customers with a telecommunications cabling advice (TCA) form, such asTCA1 form or equivalent form • recording test results and updating appropriate data bases • submitting job orders • updating design specifications.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4081A Locate, diagnose and rectify faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to locate, diagnose and rectify faults in telecommunications networks. Telecommunications networks include cabling, customer premises equipment (CPE), access, telephony, broadband deployment, local area networks (LAN), wide area networks (WAN) and internet protocol (IP) networks for enterprise and customer systems and installations. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Telecommunications officers, communications cablers, installers of customer premises equipment, optical and radio frequency (RF) equipment, multimedia and IP networks apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan to locate and rectify a fault	1.1. Prepare for given work according to ***relevant legislation***, ***occupational health and safety*** (***OHS***), ***codes***, ***regulations and standards*** and identified ***hazards*** 1.2. Arrange access to the site according to required procedure 1.3. Obtain information on the ***nature of fault*** from the ***customer*** 1.4. Obtain suitable ***testing tools and equipment*** and specify ***personal protective equipment*** 1.5. Conduct fault finding using methodical and safe practices suitable for system and problem type
2. Locate and diagnose	2.1. Conduct ***appropriate test*** to identify ***type of fault***

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ELEMENT	PERFORMANCE CRITERIA
the fault	2.2. Isolate the fault progressively to remove likely variables from assessment 2.3. Locate the fault without undue interruptions to the customer activity in the shortest possible time 2.4. Notify the customer of the findings
3. Rectify the fault	3.1. Determine the options to rectify the fault and present them to the customer 3.2. Advise the customer of costs of any repair not covered by service agreement 3.3. Rectify the fault if in agreement with the client 3.4. Conduct the work in a manner which is safe to the repairer and the customer 3.5. Refer any unresolved faults to other parties for resolution or escalation if required
4. Complete documentation and clean up worksite	4.1. Advise the customer of successful fault clearance and secure sign off 4.2. Complete all records 4.3. Complete reports to justify the fault diagnosis and rectification methodology if required 4.4. Remove all waste and debris from worksite and dispose them according to environmental requirements 4.5. Restore any changes made to the worksite during fault repair to the client's satisfaction

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with clients on technical and operational matters and raise OHS issues • literacy skills to interpret technical documentation and standards and incorporate technical language into written tasks including report on recommendation to rectify fault • numeracy skills to interpret technical data, such as specifications of equipment operations

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REQUIRED SKILLS AND KNOWLEDGE

• problem solving skills to apply methodology in fault diagnosis
• research skills to access technical information and sources to assist fault identification
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and OHS standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to select and use appropriate methods for fault identification and rectification

Required knowledge
• fault-finding techniques and test equipment • safety requirements and standards • various client's workplace environment and practices • various types of networks and equipment • various types of networks and equipment faults and rectification

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify different faults • establish context and background information and determine and rank likely causes of fault • obtain suitable tools and equipment and apply simple checks, tests and fault-finding methodology • apply recommended means to rectify fault • comply with all related OHS requirements and work practices.

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EVIDENCE GUIDE	
Context of and specific resources for assessment	Assessment must ensure: • site where fault identification and resolution may be conducted • use of test and related equipment currently used in industry • relevant technical specifications and requirements for telecommunications networks • regulatory and site-related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate locating and rectifying faults following OHS requirements • oral or written questioning to assess knowledge of types of faults and implications • evaluation of written reports prepared by the candidate, outlining test result interpretation, fault rectification and recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTOPN4115A Install and test a dense wavelength division multiplexer system • ICTTEN4051A Install configuration programs on PC based customer equipment • ICTTEN4198A Install, configure and test an internet protocol network • ICTTEN4199A Install, configure and test a router. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***OHS***, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • contract law • National Association of Testing Authorities (NATA) requirements • regulated or industry codes of practice including appropriate Australian

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RANGE STATEMENT	

	Communications and Media Authority (ACMA) technical standards
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006
	• Trade Practices Act
	• OHS including specific OHS and environmental requirements:
	  • decommissioning and isolating work site and lines prior to commencement
	  • environmental considerations include:
	  • clean-up protection
	  • stormwater protection
	  • waste management
	  • noise, dust and clean-up management
	  • identifying other services including power and gas
	  • safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	  • safe working practices such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	  • special access requirements
	  • suitable light and ventilation.

Hazards may include:	• building debris • earth potential rise (EPR): • event at a site, such as an electrical distribution substation may expose telecommunications personnel, users or plant to hazardous voltages • glass fibre

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RANGE STATEMENT	
	• live power lines • manual handling • mud and water • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV) • vermin.
Nature of fault may include:	• cable fault • distortion • excessive latency • interference • intermittent • low signal level • network fault • no transmission • poor grade of service • poor signal quality.
Customer may include:	• fault centre • individual reporting the fault • network manager • network administrator • network operations centre staff • site manager.
Testing tools and equipment may include:	• cable locater • cable test set • LAN Cat tester • network management system • optical fault locater • optical time domain reflectometer (OTDR) • protocol analyser • pulse echo test set • sniffer • spectrum analyser.
Personal protective equipment may include:	• electrical isolators • gas detectors

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RANGE STATEMENT	

	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses.

Appropriate test may include:	• bit error rate test (BERT)
	• cable tests
	• distortion
	• frequency measurement
	• insertion loss
	• packet sniffing
	• ping
	• protocol analysis
	• return loss
	• route test
	• signal loss:
	  • optical
	  • RF.

Type of fault may include:	• cable fault:
	  • attenuation
	  • cracked fibre
	  • crossed wires
	  • crosstalk
	  • damaged coax
	  • faulty splice
	  • incorrect terminations
	  • moisture ingress
	  • open circuit
	  • short circuit
	• network fault:
	  • customer equipment

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RANGE STATEMENT	
	• drop out • latency • loss of addressing • packet loss • poor wireless connection • routing problems.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4085A Monitor, analyse and action telecommunications network alarms

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to take appropriate action in response to network alarms. It includes network impact, problem diagnosis, network restoration and normalisation of alarms. The alarms may be monitored locally on site, or remotely by technical field staff or by personnel at the Network Operations Centre (NOC). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians, maintenance staff and supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit. It applies to maintenance staff who are responsible for monitoring equipment rooms, having both physical access to local alarms and remote access to alarms where the equipment is externally located.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan response to network alarm	1.1. Determine ***alarm*** severity and specific ***network elements*** affected from presentation of alarm 1.2. Assess the likely ***impact*** to the client and network of the alarm 1.3. Notify the ***NOC*** and other ***relevant parties*** of alarm condition 1.4. Prioritise the actioning of alarms according to existing service level agreement obligations and enterprise policy 1.5. Assess the impact of any ***outage*** issues and major customers affected 1.6. Provide information to and seek advice from other

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ELEMENT	PERFORMANCE CRITERIA
	relevant parties in identifying the problem and cause of the alarm condition 1.7. Diagnose the likely cause of the alarm condition using established ***methodical strategies*** 1.8. Escalate diagnosis to higher level fault clearance unit according to enterprise policy where necessary
2. Arrange rectification of network problem	2.1. Implement enterprise policy relating to outages as required 2.2. Rectify network problems when appropriate capability and time constraints can be met 2.3. Enact ***escalation procedures*** according to enterprise policy 2.4. Make available all alarm data and diagnosis to other areas with responsibility and jurisdiction for network restoration 2.5. Provide clear and concise instructions to field staff to facilitate all repair efforts 2.6. Monitor the progress of the network repair effort 2.7. Apply enterprise policy in relation to alarms requiring no further action
3. Complete alarm clearance tasks	3.1. Reset alarms following network restoration 3.2. Notify all relevant parties of problem rectification 3.3. Undertake appropriate cause and effect studies to prevent re-occurrence of problem 3.4. Complete ***administrative tasks*** and recommend any changes required by the enterprise ***quality assurance*** system

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to review alarm information and make judgments to inform operational decisions • communication skills to provide advice and guidance to others and to liaise with technical personnel working across different levels and in different contexts

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REQUIRED SKILLS AND KNOWLEDGE
• initiative and enterprise skills to identify improvements to alarm resolution and troubleshooting • learning skills to keep up to date with new technology • literacy skills to read complex technical data and procedures • numeracy skills to interpret levels, readings and numerical data • problem solving skills to address complex problems from a remote location • research skills to source technical information from enterprise website or manufacturer's technical documentation • technical skills to undertake diagnosis and repairs on a range of networks
Required knowledge
• escalation procedures • installed telecommunications systems and equipment • path protection • telecommunications networks • test equipment and test procedures • typical problems and challenges that arise in NOCs and in the field • typical systems and procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • monitor and analyse a range of network alarms including use of fault history and ranking of likely causes • undertake and monitor network repairs • plan and coordinate the actioning of network alarms.
Context of and specific resources for assessment	Assessment must ensure: • sites on which local and remote monitoring and analysis of network alarms may be conducted

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EVIDENCE GUIDE	
	• manufacturer's technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing remote diagnosis of network alarms, ranging from common to complex • direct observation of the candidate preparing an action plan in response to a range of network alarms • oral or written questioning of required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4081A Locate, diagnose and rectify faults • ICTTEN4086A Undertake routine maintenance of the telecommunications network • ICTTEN4087A Undertake remote diagnosis and repair of network faults. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Alarm may include:	• computer screen alarm information sourced from network management system
	• physical indicator lamps on:
	  • equipment circuit cards
	  • equipment rooms
	  • racks
	  • subracks
	  • suites.

Network elements may include:	• equipment utilised in the following networks:
	  • cellular
	  • data
	  • fixed radio
	  • hybrid fibre coaxial (HFC)
	  • mobile radio
	  • satellite
	  • voice.

Impact may include:	• customer impact:
	  • degradation of service
	  • disruption of service to residential customers
	  • intermittent performance
	  • loss of revenue to an enterprise customer
	  • loss of service to an enterprise customer
	• network impact:
	  • congestion
	  • drop out
	  • excessive latency
	  • limited coverage

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RANGE STATEMENT	
	• no transmission • poor grade of service • poor signal quality • routing problems.

NOC may include:	• engineering unit within a carrier responsible for:
	  • coordinating repairs or changes to the network
	  • monitoring the network
	  • performing diagnostic tests.

Relevant parties may include:	• customer • design engineer • NOC • on site technical staff • other installations sharing same network traffic • project manager • specialist technical support staff.
Outage may include:	• loss of service to customers due to a network fault or upgrade • planned, in the case of network upgrades or unplanned in relation to faults.
Methodical strategies may relate to:	• analysing test results and previous fault history • conducting tests • coordinating the actions of upstream and downstream maintenance personnel • isolating fault progressively to eliminate probable causes • reloading software • remotely interrogating hardware • scheduling diagnosis for low traffic times • substituting hardware.
Escalation procedures may include:	• greater involvement from the NOC • progressive shifting of network restoration responsibility to more capable areas.
Administrative tasks may include:	• checking correct labelling of all equipment and amending where required • completing job orders and submitting to appropriate enterprise organisational unit • completing test sheets according to specification and logging test instrument usage

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RANGE STATEMENT	
	• following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • recording test results and updating appropriate databases • updating design specifications and returning to design area as required by enterprise requirements.
Quality assurance may include:	• acting on logs, reports and other data to guide ongoing quality improvements • updating logs and reporting on installation or maintenance activities.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4086A Undertake routine maintenance of the telecommunications network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake routine maintenance of the telecommunications network. This planned maintenance ensures that network equipment is regularly serviced and is operating correctly, so that minor faults and potential problems are corrected before they develop into major defects and disruption to the network. Licensing, legislative, regulatory and certification requirements apply to working at heights, confined spaces, crane operation, rigging, driving and other operations involved in this unit. Users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers or technicians from carriers, contractors and other service providers apply the skills and knowledge in this unit. This unit involves routine maintenance of network plant and equipment in various telecommunications switching and transmission environments, including wide area networks (WAN), virtual private networks (VPN) and Core networks, using wireless, optical, broadband and Next Generation Networking (NGN) technologies.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan routine maintenance	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for the given work 1.2. Determine the ***network elements*** requiring ***maintenance*** and the maintenance details from the manufacturer's equipment manual 1.3. Notify the ***network operations centre*** (***NOC***) of the proposed ***maintenance schedule*** and maintenance details to minimise disruption to the network

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Assess the ***potential impact*** of the proposed maintenance on customers and network and plan for possible ***outage*** or deferral of maintenance 1.5. Obtain necessary ***tools***, ***test equipment and resources*** to undertake the maintenance 1.6. Produce a schedule of the planned routine maintenance 1.7. Negotiate schedules and access with the customer where equipment to be maintained is located on customer premises 1.8. Ascertain and record ***network stability*** to determine network performance
2. Undertake planned maintenance	2.1. Conduct routine maintenance tasks following occupational health and safety (***OHS***) ***and environmental requirements*** and record ***results*** 2.2. ***Escalate*** unresolved faults according to established ***enterprise procedure*** 2.3. ***Test*** the network equipment for required performance following routine maintenance 2.4. Check operation of associated network equipment to ensure that the maintenance did not generate other faults or alarms
3. Report on routine maintenance and document results	3.1. Notify all ***relevant parties*** of the results of the routine maintenance 3.2. Update routine maintenance logs and record other additional work for inclusion in the next cycle of maintenance 3.3. Complete ***administrative tasks*** and recommend any changes as required by the enterprise ***quality assurance system*** 3.4. Notify NOC of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE
• analytical skills to evaluate impact of maintenance on customers and network • communication skills to provide advice and guidance to others and to liaise with other technical staff on operational matters • initiative and enterprise skills to identify improvements to routine maintenance • literacy skills to read and interpret technical data and technical and non-technical information from a range of sources • PC skills to upgrade installed software • planning and organisational skills to plan for outage • technical skills to use hand and power tools to assemble and disassemble equipment
Required knowledge
• alarms • computer knowledge • network management systems • overview knowledge of telecommunications networks and equipment • telecommunications test equipment and test setups • telecommunications wiring practices • use of scheduler

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan a detailed routine maintenance schedule • conduct and record routine maintenance activities procedures and techniques • test network equipment complying with site risk control, OHS, environmental, quality and communication requirements.
Context of and specific resources for	Assessment must ensure:

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EVIDENCE GUIDE	
assessment	• sites on which routine maintenance may be conducted • use of maintenance tools and test instruments currently used in industry • relevant regulatory and equipment documentation that impacts on maintenance activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate carrying out routine maintenance activities • review of maintenance reports completed by the candidate for different sites and equipment • oral or written questioning to assess knowledge of maintenance procedures.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTTEN4081A Locate, diagnose and rectify faults. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licences:
	  • cable
	  • electrical
	  • elevated work platform (EWP)
	  • rigger
	• AS/ACIF standards and codes
	• Australian building codes and regulations
	• Australian and New Zealand standards
	• cabling security codes and regulations
	• Environmental Protection Acts
	• fire regulations
	• noise abatement and heritage legislation
	• OHS
	• relevant international standards
	• Trade Practices Act.

Network elements may include:	• cellular base station • gateway • optical add drop multiplexer • private automatic branch exchange (PABX) • router • synchronous digital hierarchy (SDH) multiplexer • server • switch.
Maintenance may include:	• corrective maintenance • remote maintenance • routine maintenance.
Network operations centre	• coordinating repairs or changes to the network • escalation

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RANGE STATEMENT	

(***NOC***) may include:	• monitoring:
	  • network alarms
	  • optical fibre cuts
	  • power failures
	• performing diagnostic tests
	• troubleshooting.

Maintenance schedule may be:	• details from service level agreement (SLA)
	• frequency:
	  • monthly
	  • quarterly
	• procedures
	• responsibilities and commitment
	• timings.

Potential impact may include:	• customer impact:
	  • disruption of service to residential customers
	  • intermittent performance
	  • loss of service and revenue to an enterprise customer
	• network impact:
	  • call drop out
	  • congestion
	  • excessive latency
	  • limited coverage
	  • poor grade of service (GoS)
	  • poor signal quality
	  • routing problems
	  • transmission loss.

Outage may include:	• loss of service to customers due to a network fault or upgrade • planned in the case of network upgrades • unplanned in relation to faults.

Tools, ***test equipment and resources*** may include:	• resources:
	  • elevated work platform hire
	  • licensed cabler
	  • licensed electrician
	  • licensed rigger
	  • optical fibre specialist

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RANGE STATEMENT	

	• test equipment:
	  • communication system analyser
	  • lap top computer
	  • microwave link analyser
	  • multimeter
	  • optical fibre power meter
	  • optical time domain reflectometer (OTDR)
	  • oscilloscope
	  • RF microwave test set
	  • RF power meter
	  • RF sweep tester
	  • spectrum analyser
	  • SWR meter
	  • transmission measuring set
	• tools:
	  • anti-static wrist strap
	  • PC board or subrack removal tool
	  • pliers
	  • power drill
	  • screwdrivers
	  • sockets
	  • soldering iron
	  • spanners.

Network stability may include:	• reliability of the network over time • reliability of the network under varying load conditions • reliability of the network under varying traffic conditions.

OHS and environmental requirements may relate to:	• decommissioning and isolating work ite and lines prior to commencement
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety barriers
	• safety equipment

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RANGE STATEMENT	

	• warning signs and tapes
	• environmental considerations
	  • clean-up
	  • noise and dust
	  • stormwater protection
	  • waste management.

Results may include:	• calibration date
	• lubrication date
	• meter readings
	• replacement of air filter date
	• visual inspection findings:
	  • electrical cables
	  • electrical connectors
	  • failed indicator lights and alarms.

Escalate may include:	• requesting action from:
	  • expert staff
	  • network specialist
	  • NOC
	  • vendor.

Enterprise procedure may include:	• clearing faults • implementing maintenance • installation • reporting.
Test may include:	• bandwidth • bit error ratio (BER) • blocking • call rate • congestion • distortion • drop out rate • equipment self diagnostics • functionality • interference • latency • packet loss rate • ping • protocol analysis • quality of service (QoS) • recovery rate

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RANGE STATEMENT	

	• redundancy
	• return loss
	• signal level
	• switching tests
	• testing functionality of:
	  • individual equipment
	  • system
	• uploads and downloads rate.

Relevant parties may include:	• customer • design engineer • NOC • project manager • supervisor.
Administrative tasks may include:	• checking and amending labelling of equipment • completing test sheets according to specification • completion and submission of job orders • following quality control procedures • handing over installation briefs and equipment manuals to operational staff • recording test results • updating databases • updating design specifications and returning them to design area.
Quality assurance system may include:	• analysing logs • correction of legacy problems • documenting logs • ongoing improvements • reporting on installation • reporting on maintenance activities.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4087A Undertake remote diagnosis and repair of network faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake remote diagnosis and repair of network faults. It includes fault diagnostic and repair strategies for working with remote network equipment. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit. It is particularly relevant to field technicians remotely accessing the network and the network operation centre (NOC) which controls the coordination of remote network activities.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Diagnose remote faults	1.1. Install remote access software on notebook computers 1.2. Verify network fault by analysing ***relevant data*** 1.3. Investigate ***context and background information*** relevant to network fault 1.4. Source ***appropriate documentation*** and ***test equipment*** relevant to the network fault 1.5. Conduct ***appropriate tests and*** analyse results 1.6. Diagnose ***network faults*** using established ***methodical strategies*** in a timely fashion without disruption to other services
2. Plan remote repair	2.1. Assess the level of involvement of the ***NOC*** in

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ELEMENT	PERFORMANCE CRITERIA
	planning the repair 2.2. Plan for any necessary ***outages*** and notify customers 2.3. Develop ***repair strategies*** to clear fault 2.4. Develop a strategy for the rerouting of ***customer traffic*** if applicable 2.5. Advise on site personnel of required work and clearly communicate the repair strategy
3. Repair fault	3.1. Initiate remote repair strategies to reconfigure or repair remote equipment in a manner safe to self, fellow workers network equipment and public 3.2. Inform customers of repair progress where fault has caused degradation of service or outage 3.3. ***Escalate*** unresolved faults according to established ***enterprise procedure*** 3.4. Test the remote repair for required performance 3.5. Assess ongoing network performance and the likelihood of further problems
4. Report remote diagnosis and repair and document results	4.1. Notify all ***relevant parties*** of the results of the remote diagnosis and repair 4.2. Record details relating to any outage according to enterprise procedures 4.3. Complete all relevant documentation and recommend any changes required by the enterprise ***quality assurance*** system

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to review alarm information and make judgments to inform operational decisions
• communication skills to:
  • liaise with technical personnel working across different levels and in different contexts
  • provide advice and guidance to others

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REQUIRED SKILLS AND KNOWLEDGE

• initiative and enterprise skills to identify improvements to alarm resolution and troubleshooting
• learning skills to keep up to date with new technology
• literacy skills to read complex technical data, procedures, equipment and system manuals and specifications
• numeracy skills to interpret levels, readings and numerical data
• problem solving skills to address complex problems from a remote location
• research skills to source technical information from enterprise website or manufacturer's technical documentation
• technical skills to:
  • interpret and use equipment and system manuals and specifications
  • undertake diagnosis and repairs on a range of networks

Required knowledge
• installed telecommunications systems and equipment • path protection • telecommunications networks • test equipment and test procedures • typical problems and challenges that arise in NOCs and in the field • typical systems and procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • diagnose and identify faults including using fault history and ranking likely causes • plan and coordinate repair of network faults • apply enterprise escalation and outage procedures following related OHS requirements and work practices.

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EVIDENCE GUIDE	
Context of and specific resources for assessment	Assessment must ensure: • sites on which remote diagnosis and repair of network may be conducted • use of test equipment currently used in industry • manufacturer's technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • observation of the candidate performing remote diagnosis of network faults • observation of the candidate giving clear and precise instructions to staff engaged in on site repair • observation of the candidate repairing network faults • review of documentation completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL4099A Remotely locate and identify cable network faults • ICTTEN4081A Locate, diagnose and rectify faults • ICTTEN4085A Monitor, analyse and action telecommunications network alarms • ICTTEN4086A Undertake routine maintenance of the telecommunications network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant data may include:	• alarm conditions • customer reports • event history • event log • service level degradation • test results from remote interrogation.
Context and background information may include:	• customer reports • environmental factors • fault history • previous reports.
Appropriate documentation may include:	• manufacturer's technical documentation • test procedures • trouble clearing and alarm reference guide.
Test equipment may include:	• bit error rate tester • communication system analyser • digital analyser • laser source • magnetic error reduction meter • microwave link analyser

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RANGE STATEMENT	
	• modulation analyser • multimeter • optical attenuator • optical fibre power meter • optical loss test set • oscillator • oscilloscope • optical time domain reflectometer (OTDR) • pattern generator • personal computer loaded with diagnostic routines • power meter • radio frequency (RF) microwave test set • RF sweep tester • signal level meter • spectrum analyses • transmission measuring set • voltage standing wave ratio (VSWR) meter.
Appropriate tests may include:	• bandwidth • blocking • call rate • congestion • distortion • drop out rate • functionality • interference • latency • network tests • optical transmission • packet loss rate • quality of service (QoS) • radio transmission • recovery rate • redundancy • signal to noise ratio • transmitted power measurements • upload and download rates.
Network faults may include:	• out of specification faults • dynamic loops • intermittent performance problems

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RANGE STATEMENT	
	• latency • network dropout • severe cable or transmission path damage • system configuration problems • system equipment failure or partial failure • traffic congestion.

Network operation centre may include:	• engineering unit within an enterprise responsible for:
	  • coordinating repairs or changes to the network
	  • monitoring the network
	  • performing diagnostic tests.

Outages may include:	• loss of service to customers due to a network fault or upgrade • planned, in the case of network upgrades • unplanned in relation to faults.
Repair strategies may include:	• force traffic to alternate path • isolate faulty unit • switch to redundant equipment.

Customer traffic may include:	• analogue or digital forms of:
	  • data
	  • image
	  • voice.

Escalate may include:	• greater involvement from the NOC • progressive shifting of network restoration responsibility to more capable areas.
Enterprise procedure may include:	• installation • maintenance • reporting.
Relevant parties may include:	• contractors • customers • equipment vendors and manufacturers • fault centre • individual reporting the fault • network administrator • network manager • network operations centre staff • on site technical staff • site manager.

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RANGE STATEMENT	
Quality assurance may include:	• acting on logs, reports and other data to guide ongoing quality improvements • updating logs and reporting on installation or maintenance activities.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4102A Repair telecommunication system faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to diagnose and repair faults in telecommunications systems from a customer report or a maintenance schedule. Hardware and software system faults may be in optical, computer, radio, satellite, security and radio frequency identification (RFID) systems found in customer and service provider Access Networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors, other service providers and employees working in small to medium enterprises apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for equipment repairs	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Identify ***hazards***, make work site safe according to relevant safety legislation and company work practices and use ***personal protective equipment*** 1.3. Notify customer and other ***appropriate personnel*** of work and arrange for site access and security where required 1.4. Obtain fault details to determine type of ***system fault*** 1.5. Determine the ***type of repair*** required according to enterprise guidelines, site requirements and type of equipment, and arrange for additional technical

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ELEMENT	PERFORMANCE CRITERIA
	support as appropriate 1.6. Confirm if warranties and service agreements covering identified repairs exist 1.7. Obtain ***tools*** and necessary hardware and ensure that replacement parts and material is delivered to the worksite at the required time
2. Repair fault	2.1. Follow occupational health and safety (***OHS***) ***and environmental requirements*** when carrying out repair or replacement tasks 2.2. Notify appropriate personnel of service disruption and remove network equipment from service 2.3. Diagnose the fault and carry out repair work on equipment according to manufacturer's or enterprise procedures 2.4. ***Test*** equipment to manufacturer's specifications following repairs and return to live operation for testing overall performance
3. Complete repair work documentation and administrative tasks	3.1. Notify customer and other appropriate personnel of completion of repair work according to enterprise guidelines 3.2. Record any changes to equipment and store according to enterprise guidelines 3.3. Dispose of waste and debris from worksite according to environmental requirements and enterprise guidelines 3.4. Complete ***administrative tasks*** and make recommendations for improvements under ***quality assurance*** system

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with customers on technical and operational matters and raise OHS issues • literacy skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• incorporate technical language into written tasks to prepare report on recommendations to rectify faults • interpret technical documentation and standards • numeracy skills to interpret technical data, such as equipment specifications • problem solving skills to diagnose faults • research skills to access technical information and sources to assist in fault identification • safety awareness skills to: • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities • select and use required personal protective equipment conforming to industry and OHS standards • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment • technical skills to: • select and use appropriate methods for fault identification and rectification • use hand tools
Required knowledge
• anti static procedures • enterprise policies and procedures • fault diagnosis techniques • general fault-finding techniques and test equipment • OHS • product knowledge • safety requirements and standards • telecommunications network and equipment fault types and rectification • telecommunications network and equipment types • test equipment

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • diagnose and identify faults methodically using fault history and recognition of likely causes • repair telecommunication equipment according to manufacturer's or enterprise procedures applying related OHS requirements and work practices • test the equipment following repairs and put back into commission.
Context of and specific resources for assessment	Assessment must ensure: • sites on which diagnosis and repair of communication equipment may be conducted • use of test equipment currently used in industry • manufacturer's technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate diagnosing faults in communications equipment, ranging from common to complex • review of documentation completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4081A Locate, diagnose and rectify faults • ICTTEN4086A Undertake routine maintenance of the telecommunications network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication

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EVIDENCE GUIDE	
	skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes AS/ACIF S008:2006, and AS/ACIF S009:2006 • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations

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RANGE STATEMENT	
	• compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6, 6A, 7 or 7A and unshielded twisted pairs (UTP) • Environmental Protection Acts • fire regulations • noise abatement and heritage legislation • OHS • relevant international standards • Trade Practices Act.
Hazards may include:	• building debris • earth potential rise (EPR) • glass fibres • live power lines • manual handling • natural gas and other gas build up • needle stick injury • optical fibre cable may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services which operate at above telecommunications network voltage (TNV).

Personal protective equipment may include:	• electrical isolators
	• gas detectors
	• personal protective clothing:
	  • earmuffs
	  • face masks
	  • gloves
	  • head protection
	  • kneepads
	  • safety boots
	  • safety glasses.

Appropriate personnel may include:	• asset manager • network operations centre (NOC) • on site technical staff • project manager • specialist technical support staff.

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RANGE STATEMENT	
System fault may include:	• hardware • internet protocol (IP) network • optical system • radio system • software • switching • transmission.

Type of repair may include:	• calibration
	• hardware adjustment:
	  • alignment
	  • clock oscillator
	  • gain
	• hardware replacement:
	  • component
	  • module
	  • sub-assembly
	• reconfiguration:
	  • hardware
	  • software
	• system reconfiguration
	• system reload.

Tools may include:	• anti-static work mat • anti-static wrist strap • crimping tools • PC board or subrack removal tool • pliers • screwdrivers • sockets • soldering iron • spanners • terminating tools • testing tools.
OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement • gas and other hazard detection equipment • identifying other services, including power and gas • safety equipment: • flashing lights

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RANGE STATEMENT	
	• safety barriers • trench guards • warning signs and tapes • witches hats • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • noise, dust and clean-up management • stormwater protection • waste management.
Test may include:	• bit error ratio (BER) • electrical • equipment self diagnostics • optical power level • ping • protocol analysis • remote test • return loss • RF power level • signal level • signal to noise ratio • software diagnostic • testing function of: • complete system • individual equipment sections • transmission path • test on network equipment functions • optical time domain reflectometer (OTDR).
Administrative tasks may relate to:	• checking correct labelling of all equipment and amending where required • completing job orders and submitting to

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RANGE STATEMENT	
	appropriate enterprise organisational unit • completing test sheets according to specification and logging test instrument usage • following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • recording test results and updating appropriate data bases • updating design specifications and returning to design area as required by enterprise requirements.
Quality assurance may include:	• acting on logs, reports and other data to guide ongoing quality improvements • updating logs and reporting on installation or maintenance activities.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4126A Install and configure internet protocol TV in a home network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to integrate internet protocol TV (IPTV) functionality into an existing customer home network. It involves installing and configuring a secure internet protocol (IP) network for the customer. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to technical staff installing an IP network for the delivery of emerging technologies for IPTV and convergence networks. Relevant job roles include installer of Next Generation Networks (NGN). These IP networks provide fast internet, voice over internet protocol (VoIP), IPTV and internet TV services.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to implement IPTV in a home network	1.1. Obtain and clarify occupational health and safety (***OHS***) ***requirements*** and risk control measures and procedures for a given work area with ***appropriate personnel*** 1.2. Evaluate existing customer home network equipment for operational status
2. Design IPTV integration to a home network to meet customer requirements	2.1. Prepare a configuration layout integrating IPTV to the existing customer network using ***IPTV network elements*** to provide optimum video delivery service 2.2. Select IPTV network elements to provide optimum video delivery service 2.3. Obtain configuration instructions for the network elements 2.4. Design a connection plan to integrate the customer network

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ELEMENT	PERFORMANCE CRITERIA
	elements and optimise system performance 2.5. Identify any connection problems and amend design plan
3. Implement IPTV design plan to a home network	3.1. Interconnect network elements according to design plan using manufacturer's instructions 3.2. Configure and test the network elements to provide integrated IPTV to the existing system 3.3. Provide a free to air (FTA) connection over digital video broadcasting - terrestrial (DVB-T) to complement the IPTV service 3.4. Set up ***customer specific operations*** as required 3.5. Configure ***security measures*** in an IPTV network to protect against ***security threats*** 3.6. Troubleshoot home network according to manufacturer's specifications and escalate unresolvable items to the service provider
4. Complete and document network installation	4.1. Restore worksite to safe condition according to established safety procedures 4.2. Record and store ***essential installation information*** 4.3. Notify appropriate personnel about the completion of the task and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise with customer to determine needs
• literacy skills to:
  • develop integration plan
  • interpret technical specifications and related documentation
• project planning skills to set benchmarks and identify scope
• problem solving skills to resolve a predictable range of network problems
• numeracy skills to produce IP addressing schemes
• technical skills to:
  • configure IP network
  • dimension network parameters

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REQUIRED SKILLS AND KNOWLEDGE

• evaluate competing video over broadband networks
• implement and verify:
  • border gateway protocol (BGP)
  • enhanced interior gateway routing protocol (EIGRP)
  • flash
  • hypertext transfer protocol (HTTP)
  • internet group management protocol (IGMP)
  • open shortest path first (OSPF)
  • real time streaming protocol (RTSP)
  • routing information protocol (RIP)
  • web cache communication protocol (WCCP) operations
• implement secure video network
• trouble shoot home network performance issues

Required knowledge
• competing video delivery over broadband networks • current industry-accepted hardware and software products • IPTV configurations • IPTV protocols and encoding techniques • networking technologies incorporating substantial depth in network operating systems and IP networks • transmission technologies and protocols • video compression formats

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • create and follow implementation plans for IPTV • install relevant network hardware and software • configure and test the IPTV network according to

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EVIDENCE GUIDE	
	specified guidelines • integrate IPTV to existing network • produce appropriate documentation • implement secure network.
Context of and specific resources for assessment	Assessment must ensure: • a site where the installation and configuration of an IPTV network may be conducted • equipment currently used in industry • information on different protocols • relevant technical information, legislative requirements and other site and project related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and configuring IPTV in a home network ensuring network security • review of implementation plans outlining integration elements to optimise system performance • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTDRE4166A Integrate customer digital reception equipment • ICTDRE4167A Integrate data delivery modes • ICTTEN4215A Install and configure internet protocol TV in a service provider network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication

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EVIDENCE GUIDE	
	skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS requirements may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems • protective equipment.
Appropriate personnel may include:	• customer • site administrator • site engineer • site manager • supervisor.
IPTV network elements may include:	• dual decoders • dual DVB-T tuners • hard disk drive (HDD) • home gateway

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RANGE STATEMENT	

	• integrated access device (IAD)
	• internet devices:
	  • digital TV
	  • mobile devices
	  • PC
	• layer 2 protocols:
	  • Ethernet
	  • G.hn (G.9600) for home grid network
	• media centre
	• media router
	• multipoint control unit (MCU) for HD video conferencing
	• set top box

Customer specific operations may include:	• electronic program guide (EPG)
	• information widgets:
	  • news headlines
	  • traffic watch
	  • weather
	• linear IPTV channels
	• network personal video recorder (nPVR) set up
	• social networking applications
	• video on demand (VoD).

Security measures may include:	• digital signatures and certificates • encryption • integrity and authentication.
Security threats may include:	• botnets • distributed denial of service (DDoS) • fraud • hacking • malware.
Essential installation information may include:	• installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4198A Install, configure and test an internet protocol network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to carry out the installation of network hardware and software, initial configuration according to organisational requirements and testing of an internet protocol (IP) network. This may be part of the upgrade of an existing network or the implementation of a new network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers who carry out installation, maintenance and upgrade of ICT networks apply the skills and knowledge in this unit. They would be employed by telecommunications companies and IT networking provisioning companies. They will gain knowledge of hardware and software installations, routing and switching protocols and diagnostics required for integrating new and converging functionalities to the network.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install an IP network	1.1. Prepare for given work according to relevant legislation, occupational health and safety (OHS), codes, regulations and standards 1.2. Arrange access to the site according to required procedure 1.3. Review existing ***network*** design ***documentation*** to ensure it is current and complete 1.4. Select the ***components*** and ***network elements***

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ELEMENT	PERFORMANCE CRITERIA
	required to be installed to meet the technical ***requirements*** 1.5. Contact vendors and service suppliers to obtain specifications and availability of identified components 1.6. Develop plans, with prioritised tasks and contingency arrangements, for installation of components with minimum disruption to ***client*** 1.7. Liaise with ***appropriate person*** to obtain approval for the plans, including security clearance and timing
2. Install and configure an IP network	2.1. Install and configure server ***hardware*** and ***software*** according to organisational and industry ***standards***, following plans 2.2. Install and configure ***computer***, other hardware and software according to organisational and industry standards and plans 2.3. Install and configure other software required for the network to operate with security and integrity according to the plan
3. Test and reconfigure the IP network	3.1. Test the installed software and hardware, utilising available ***technical tools***, to ensure that all components are functioning as expected 3.2. Test the network to ensure it is functioning according to specifications 3.3. Resolve problems identified in the modified network
4. Complete documentation and clean up worksite	4.1. Complete hardware and asset recording document in line with ***organisational requirements*** 4.2. Document installation, boot-up and configuration procedures according to organisational requirements 4.3. Tabulate test results and complete all user reports 4.4. Complete client report and notify of status of the network 4.5. Clean up and restore worksite to client's satisfaction 4.6. Secure sign-off from appropriate person

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical, operational and business related matters • literacy skills to interpret technical documentation and write reports in required formats • numeracy skills to take test measurements, interpret results and evaluate performance and interoperability of network • planning and organisational skills to plan, prioritise and monitor own work and coordinate the process in liaison with others • problem solving and contingency management skills to adapt configuration procedures to requirements of network and reconfigure depending on differing operational contingencies, risk situations and environments • research skills to interrogate vendor databases and websites to implement different configuration requirements to meet security levels • technical skills to select and use router test software and hardware to suit different network applications
Required knowledge
• client business domain, business function and organisation • current industry-accepted hardware and software products • data and voice transmission technologies and protocols • networking technologies incorporating substantial depth in some areas • router-based network architectures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and prepare for the IP network installation task • select network elements to meet the client business

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EVIDENCE GUIDE	
	specifications • install, configure and test the network elements to ensure interoperability within the network • apply network topologies, protocols and security issues • apply solutions to defined network problems.
Context of and specific resources for assessment	Assessment must ensure: • site where network installation may be conducted • use of field measurement equipment currently used in industry • network design documentation • equipment specifications • network components • hardware and software • live network • organisational guidelines • networked (LAN) computers • WAN service point of presence.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing, configuring and testing a new or updated network • evaluation of report prepared by the candidate outlining testing procedures, test results, recommendation to network changes and completion records • oral or written questioning of required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4199A Install, configure and test a router • ICTTEN5201A Install, configure and test a server. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Network may include:	• data • internet • internet protocol private branch exchange (IP PBX) • IPTV • large and small local area networks (LAN) • national wide area networks (WAN) • radio frequency identification (RFID) • storage area network (SAN) • voice • voice over internet protocol (VoIP) • virtual private network (VPN).

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RANGE STATEMENT	
Documentation may include:	• audit trails • client training • equipment inventory • ISO, IEC, AS standards • naming standards • project management templates and report writing • satisfaction reports • version control.
Components may include:	• CD, DVD and Blu-ray drives • central processing unit (CPU) • complementary metal oxide semiconductor (CMOS) battery • central processing unit (CPU) upgrades • fax and modem cards • hard drives (internal and external) • hardware • interface cards • motherboards • RAM upgrades • software • wireless adaptors.
Network elements may include:	• adaptors • communications cables and connectors • hubs • routers • servers • switches.
Requirements may refer to:	• application • business • network • people in the organisation • system.
Client may include:	• external organisations • individuals • internal departments • Internal employees.
Appropriate person may include:	• authorised business representative • client

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RANGE STATEMENT	
	• supervisor.

Hardware may include but is not limited to:	• cables:
	  • Category 5e, 6, or 7
	  • crossover
	  • fibre
	  • shielded twisted pairs (STP)
	  • straight through
	  • unshielded twisted pairs (UTP)
	• digital subscriber line (DSL) modems
	• modems and other connectivity devices
	• network elements
	• personal computers
	• remote sites
	• workstations.

Software may include:	• commercial software applications • in-house or customised software • open software • organisation-specific software • packaged software.
Standards may include:	• ISO, IEC, IEEE, IETF, ITU, AS standards • organisational standards • project standards.
Computer may include:	• laptops • mobile equipment • netbooks • other devices • servers • smart phones • workstations.
Technical tools may include:	• diagnostic software • hyperterminal • LAN Cat tester.
Organisational requirements may include:	• preventative maintenance and diagnostic policy • problem solution processes • roles and technical responsibilities in the network management • vendor and product service level support agreements

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RANGE STATEMENT	
	• work environment.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4199A Install, configure and test a router

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake router installation and configuration as part of the upgrade in an existing network or the implementation of a new network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers who carry out installation, maintenance and upgrade of ICT networks apply the skills and knowledge in this unit. They would be employed by telecommunications companies and IT networking provisioning companies. They will gain knowledge of routing protocols and routing diagnostics required for integrating new and converging functionalities to the network.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install a router	1.1. Prepare for given work according to relevant legislation, occupational health and safety (OHS), codes, regulations and standards 1.2. Arrange access to the site according to required procedure 1.3. Ascertain ***network*** topology from technical requirements 1.4. Determine the internet protocol (IP) addressing scheme for the network topology 1.5. Evaluate network management and security ***requirements***, with reference to current and future requirements

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ELEMENT	PERFORMANCE CRITERIA
	1.6. Select a ***router*** with appropriate features according to technical requirements 1.7. Choose ***cables***, wireless application protocol (WAP), wide area network (WAN) connectors and other ***peripherals*** according to network and router specification, and ***WAN protocols***
2. Install and configure a router	2.1. Assemble router and peripherals according to manufacturer's requirements, enterprise guidelines and ***protocols*** 2.2. Connect communications cables and WAN connectors to the router and to the network 2.3. Configure router according to manufacturer's instructions and technical requirements, taking into account interoperability requirements with network components
3. Test the router and reconfigure the network	3.1. Test the router for connectivity across the network and for ***routing protocol*** functions 3.2. Adapt or modify the predetermined router configuration, depending on outcome of tests 3.3. Review router in line with organisational requirements 3.4. Test router and peripherals according to manufacturer's instructions and technical requirements 3.5. Test ***hardware*** and router to ensure full functionality and interoperability 3.6. Reconfigure additional hardware as required 3.7. Make adjustments to network depending on test results
4. Complete documentation and clean up worksite	4.1. Tabulate test results and complete all user reports 4.2. Complete report and notify client of status of the network 4.3. Clean up and restore worksite to client's satisfaction 4.4. Secure sign off from ***appropriate person***

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical, operational and business related matters
- literacy skills to interpret technical documentation and write reports in required formats
- numeracy skills to take test measurements, interpret results and evaluate performance and interoperability of network
- planning and organisational skills to plan, prioritise and monitor own work and coordinate the process in liaison with others
- problem solving and contingency management skills to adapt configuration procedures to requirements of network and reconfigure depending on differing operational contingencies, risk situations and environments
- research skills to interrogate vendor databases and websites to implement different configuration requirements to meet security levels
- technical skills to select and use router test software and hardware to suit different network applications

Required knowledge

- Australian Computer Society Code of Ethics
- effect of a router on delimiting broadcast traffic and on conserving bandwidth
- how dynamic routing algorithms or protocols create and maintain routing tables
- providing the network with redundant paths for reliability and the way routers manage these paths
- router:
  - basic router commands
  - configuration:
    - clock rate
    - password protection of router
    - routing protocol
  - dynamic routing
  - firewalls
  - functions
  - routing protocols and how they operate
  - tables
- router-based network architectures
- use of routing tables in intelligent packet routing and switching

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and prepare for the router installation task • select a router to meet the client business specifications • install and test the router that ensures interoperability within the network and applying router principles and technologies • report on the status of the completed installation and seek sign off and customer satisfaction • use routers • apply solutions to defined routing problems.
Context of and specific resources for assessment	Assessment must ensure: • site where router installation may be conducted • use of field measurement equipment currently used in industry • relevant router specifications • technical requirements for a network • router • cabling • networked (LAN) computers • WAN service point of presence • relevant equipment and organisational documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing, configuring and testing a router • oral or written questioning of underpinning skills and knowledge • evaluation of report prepared by the candidate outlining testing procedures, results,

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EVIDENCE GUIDE	
	recommendations to network changes and completion records.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4198A Install, configure and test an internet protocol network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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RANGE STATEMENT	
Network may include:	• data • internet • internet protocol private branch exchange (IP PBX) • internet protocol TV (IPTV) • large and small LANs • national WANs • radio frequency identification (RFID) • storage area network (SAN) • voice • voice over internet protocol (VoIP) • virtual private network (VPN).
Requirements may be in reference to:	• application • business • network • employees in the organisation • system.
Router may include:	• 3Com OfficeConnect Remote 810 ADSL • 3Com SuperStack 400 • Cisco 800 and ISR Series routers • Cisco uBR7200 universal broadband routers • Cisco wireless access points • D-Link routers • Intel Express series • Juniper routers • Linksys routers • Motorola Vanguard series • Netopia routers.
Cables may include:	• Category 5e, 6 or 7 • crossover • fibre • shielded twisted pair (STP) • straight through • unshielded twisted pair (UTP).

Peripherals may include:	• Bluetooth devices
	• fax
	• Firewire (IEEE 1394)
	• input equipment:
	  • keyboard
	  • mouse

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RANGE STATEMENT	
	• pens • touch pad • laptops and desktop computers • mobile phones • modems • multimedia kits • palmtops and personal digital assistants (PDAs) • personal computer • printers • scanners • speakers • tape cartridges • universal serial bus (USB).
WAN protocols may include:	• advanced data communications protocol (ADCP) • binary synchronous control (BSC) • high-level data link control (HDLC) • point to point protocol (PPP) • synchronous data link control (SDLC) • transmission of IP datagrams over X.25, Frame Relay or ATM.

Protocols may include:	• AppleTalk protocol - Phase 2 (1989)
	• dynamic host configuration protocol (DHCP)
	• novell protocol suite:
	  • internetwork packet exchange (IPX)
	  • NetBIOS emulator
	  • netware core protocol
	  • sequenced packet exchange (SPX)
	• TCP/IP:
	  • internet control message protocol (ICMP) see router protocols above
	  • Net BT
	• WAN protocols (encapsulations):
	  • advanced data communications protocol (ADCP)
	  • binary synchronous control (BSC)
	  • high-level data link control (HDLC)
	  • point-to-point protocol (PPP)
	  • synchronous data link control (SDLC).

Routing protocol may include:	• Cisco discovery protocol (CDP) • dynamic routing

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RANGE STATEMENT	
	• enhanced interior gateway routing protocol (EIGRP) • exterior gateway protocol and border gateway protocol (superseded by BGP) • netWare link state protocol (NLSP) • open shortest-path first interior gateway protocol (OSPF) • routing information protocol (RIP) • static routing.
Hardware may include:	• DSL modems • modems and other connectivity devices • networks • personal computers • remote sites • servers • workstations.
Appropriate person may include:	• authorised business representative • client • supervisor.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4202A Install and test a radio frequency identification system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake a radio frequency identification (RFID) installation, configuration and testing. This could be part of the upgrade in an existing or the implementation of a new logistical or security network using RFID technology. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers in field work who carry out installation, maintenance and upgrade of ICT networks apply the skills and knowledge in this unit. They would be employed by telecommunications and IT networking provisioning companies specialising in RFID technology. They will be able to use acquired knowledge of integrating new and converging functionalities to a network.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install specified RFID system	1.1. Prepare for given work according to relevant legislation, occupational health and safety (OHS), codes, regulations and standards 1.2. Arrange access to the site according to required procedure 1.3. Choose the most suitable ***RFID system*** based on ***specifications*** and in consultation with ***appropriate person*** 1.4. Evaluate options for equipment installation siting and antenna positioning to include the effects of electromagnetic interference and shielding 1.5. Investigate causes of interference with RFID

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ELEMENT	PERFORMANCE CRITERIA
	systems 1.6. Specify the ***network element requirements*** for the installation and any ***training requirements*** for ***clients*** 1.7. Create a deployment plan including down times and advise the ***user group*** 1.8. Obtain all components and devices required for the RFID system
2. Install specified RFID system and resolve any faults	2.1. Install interrogators or readers according to given plan 2.2. Install tags and document the correct procedures for locating and orienting tags 2.3. Install and undertake network ***configuration*** activities using relevant operating system and application upgrades to integrate RFID system into the overall network 2.4. Troubleshoot problems between interrogators or readers, tags and networks including tuning for ***optimum performance*** and rectify any faults
3. Test the RFID installation according to specification and standards	3.1. Test system installation according to design specifications and standards including optimum placement of tags and data transmission completeness and record outcomes 3.2. Carry out any changes 3.3. Validate changes or additions against specifications 3.4. Document the test results
4. Complete documentation in compliance with customer requirements and clean up worksite	4.1. Complete all ***documentation*** for users according to the design and customer requirements 4.2. Complete report and notify client of status of the network and standards applying to the installation 4.3. Clean up and restore worksite to client's satisfaction 4.4. Secure sign off from appropriate person

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE
Required skills
• communication skills to liaise with internal and external personnel on technical, operational and business related matters • literacy skills to interpret technical documentation and write reports, user and training documentation in required formats • numeracy skills to take test measurements, interpret results and evaluate performance and interoperability of RFID system • planning and organisational skills to plan, prioritise and monitor own work • problem solving and contingency management skills to adapt configuration procedures to requirements of RFID network and reconfigure depending on differing operational contingencies, risk situations and environments • research skills to interrogate vendor databases and website to implement different configuration requirements to meet client design specifications • technical skills to select and use RFID diagnostic test, application software and hardware to suit different RFID network applications
Required knowledge
• client business domain, business function and organisation • common network cable types and connectors • compatibility issues and resolution procedures • configuration of internet protocol (IP) networks • current industry-accepted hardware and software products • desktop applications and operating systems as required • enterprise communication and training systems in relation to training and advising staff involved in the deployment • network topologies • RFID technologies incorporating substantial depth in network operating systems, protocols, interrogators and sensors, wireless technologies and cabling standards

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan installation • use basic research skills for adapting RFID technologies to specified plan and design • implement and verify RFID operations • implement RFID architecture across a secure environment • encode RFID tags and attach to items • integrate RFID information into business applications • configure the network with IP addressing • cable and test the RFID network • create technical and user documentation.
Context of and specific resources for assessment	Assessment must ensure: • site where RFID installation may be conducted • use of field measurement equipment currently used in industry • relevant network element specifications • technical requirements for an RFID network • cabling • networked (LAN) computers • workstations • RFID diagnostic software • WAN service point of presence.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and testing an RFID system • oral or written questioning of underpinning skills and knowledge • evaluation of report prepared by the candidate outlining testing procedures, test results and recommendation of network changes.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4198A Install, configure and test an internet protocol network.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
RFID system may include:	• antenna • cabling • databases • interrogators or readers • power supplies • tags • wireless units.

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RANGE STATEMENT	

Specifications may include:	• cable drops
	• device mounting locations
	• electrical specifications for:
	  • adapters
	  • interrogators
	  • power units
	  • readers
	  • sensors
	  • tags
	  • wireless units
	• interrogation zone locations
	• RFID network topology
	• site diagrams.

Appropriate person may include:	• authorised business representative • client • IT support manager • network administrator • RFID network manager • small or medium enterprise (SME) customer • small office home office (SOHO) customer • supervisor.
Network element requirements may include:	• drives • routers • servers • switches.
Training requirements relate to:	• education requirements for support staff • client requirements • relevant enterprise policies.
Clients may include:	• external organisations • individual people • internal departments • internal employees • logistic company • warehouse.
User group may include:	• administration • dispatch • inventory • stores • transport

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RANGE STATEMENT	
	• warehouse.
Configuration may include:	• access control needs • hostnames • IP addresses • network connectivity issues • port numbers • server domains.

Optimum performance may include:	• antenna type
	• cable length or loss
	• equipment mounting and protection
	• interference considerations
	• latency
	• tag type
	  • active
	  • operating frequency
	  • passive.

Documentation may include:	• audit trails • ISO, IEC, AS standards • naming standards • operational instructions • project management templates • report writing • training documentations • version control.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4210A Implement and troubleshoot enterprise routers and switches

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to implement and troubleshoot routers and switches. It involves configuring and programming routers and switches to establish voice and data services and applications over local area networks (LAN) and wide area networks (WAN) connections for enterprise networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to medium to large enterprises requiring the use of internetwork services and applications. It also applies to networks employing virtual LAN (VLAN) connectivity and hierarchical addressing schemes and where access control will be used to achieve network security. Relevant job roles include installer of IP networks, enterprise network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for implementation of network routers and switches	1.1. Prepare for given work according to occupational helath and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network routers and network switches and ***network resources*** from job briefs or appropriate personnel 1.4. Select and obtain network services and network application requirements according to ***enterprise procedures***

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ELEMENT	PERFORMANCE CRITERIA
	1.5. Obtain identified operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Implement network switches and routers	2.1. Configure routers and switches according to manufacturer's specifications and enterprise procedures 2.2. Determine ***network addressing scheme*** for network connectivity and verify using ***calculations*** 2.3. Activate and verify network WAN links to provide network connectivity 2.4. Enable ***network services*** and ***network applications*** to the network to complete network connectivity process 2.5. Set up traffic access and filtering according to enterprise procedures
3. Troubleshoot network switches and routers	3.1. Monitor network performance and isolate faults using diagnostic and analysis tools 3.2. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures
4. Document configuration and troubleshooting records	4.1. Restore work site to safe condition according to established safety procedures 4.2. Record and store ***essential implementation information*** according to enterprise procedures 4.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with technical staff • literacy skills to read and interpret enterprise procedures, manuals and specifications

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REQUIRED SKILLS AND KNOWLEDGE

- numeracy skills to interpret technical data and perform calculations
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to :
  - configure and activate network access and security measures
  - configure switches and routers to enable LAN and WAN links
  - connect enterprise networks using WAN services and applications
  - connect the enterprise network to external services
  - maintain enterprise network documentation
  - troubleshoot network faults and implement recovery action
  - use a hierarchical internet protocol (IP) network address scheme
  - use tools and equipment to analyse enterprise network

Required knowledge

- access control lists
- correct use of tools and equipment
- enterprise:
  - features and applications
  - OHS procedures
  - record keeping procedures
  - switching and routing protocols and strategies:
    - hierarchical addressing
    - multilayer switching
    - routing protocols
    - VLAN routing
- implement enterprise WAN links
- network diagnostic and troubleshooting techniques
- network modelling

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine customer networking requirements • configure routers and switches using hierarchical addressing over VLANs to meet network link requirements • enable and control access to network services and applications across the network • diagnose and rectify network hardware and device configuration faults • document configuration information, fault-finding history and remediation action.
Context of, and specific resources for assessment	Assessment must ensure: • a network facility and workstations • operating instructions, installation documents and manuals • hardware and software testing tools currently used in industry.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and troubleshooting routers and switches • review documentation of implementation and troubleshooting prepared by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2207A Install and configure a home or small office network • ICTTEN2208A Install and configure a small to

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EVIDENCE GUIDE	
	medium business network • ICTTEN2209A Build and maintain a secure network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation

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RANGE STATEMENT	
	• local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fumes • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Network resources may include:	• domain name system (DNS) server • dynamic host configuration protocol (DHCP) server • files • software • web browser.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Network addressing scheme may include:	• dynamic • static • subnet.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication

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RANGE STATEMENT	
	• binary number system • binary subtraction.
Network services may include:	• authentication servers • collaborative services • DHCP • directory services • DNS • email • network file system • printing • web services.
Network applications may include:	• media player • spreadsheet • word-processor.
Essential implementation information may include:	• fault history • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • network recovery actions • passwords • router configuration details • security access codes • switch configuration details.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4211A Design, install and configure an internetwork

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design, install and configure an enterprise local area network (LAN) and wide area network (WAN) internetwork. It involves testing and troubleshooting an internetwork. The design involves determining network requirements and topology selection for wired and wireless infrastructure. Advanced routing and addressing schemes are also used in the design. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to the design, installation and configuration of cable and wireless networks suitable for large, medium and small office home office (SOHO) enterprises. Relevant job roles include designer and installer of IP networks, enterprise internetwork technician, network administrator and network support.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for the design and installation of an internetwork	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the ***internetwork*** from job briefs and appropriate personnel 1.4. Obtain operating instructions, manuals, hardware

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ELEMENT	PERFORMANCE CRITERIA
	and software testing methodologies 1.5. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Design an enterprise internetwork	2.1. Produce enterprise ***internetwork topology*** after considering technical requirements, physical and financial constraints and expansion projections 2.2. Determine ***network devices*** and ***network resources*** according to enterprise procedures 2.3. Produce the internetwork design including network security and router and switch configurations to meet design specifications and ***enterprise procedures***
3. Install and configure a designed internetwork	3.1. Install network hardware to network topology design plan according to enterprise procedures 3.2. Determine ***network addressing scheme*** for network connectivity and verify using ***calculations*** 3.3. Configure routers and switches to perform the logical connection of the internetwork 3.4. Conduct connectivity and performance tests to verify the network installation meets the design specification 3.5. Troubleshoot internetwork and internet connectivity according to manufacturer's specifications and enterprise procedures
4. Complete and document network design and installation	4.1. Restore worksite to safe condition according to established safety procedures 4.2. Record and store ***essential design and installation information*** according to enterprise procedures 4.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise and negotiate with customers and peers to achieve

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REQUIRED SKILLS AND KNOWLEDGE

design specifications

- literacy skills to:
  - develop network documentation and maintain network records
  - read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems according to help desk procedures
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - analyse the impact of applications on traffic flow in the network
  - apply network design methodologies to design networks that provide a range of services and applications found in larger networks
  - conduct a wireless site survey
  - determine customer requirements and a design specification
  - determine the impact of upgrading hardware and software on network functionality
  - identify the technical requirements, constraints and manageability issues for a given customer network requirement
  - install a network design
  - use tools and equipment

Required knowledge

- enterprise OHS procedures
- open systems interconnect (OSI) layered communication model
- network requirements:
  - applications
  - lifecycle
  - manageability
  - quality of service
- network design concepts:
  - business requirements

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REQUIRED SKILLS AND KNOWLEDGE
• network topologies • physical and financial constraints • security • wired or wireless options • tool and equipment use • troubleshooting: • impact of network failure • maintenance • troubleshooting methodology

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine customer requirements • design an internetwork that uses advanced routing and addressing techniques • install an internetwork according to design specification • configure network devices to meet design functionality • document internetwork design, installation and configuration.
Context of, and specific resources for assessment	Assessment must ensure: • a site where design and installation of an internetwork network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate designing, installing and configuring an internetwork • review of documents prepared by the candidate detailing design and installation • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2207A Install and configure a home or small office network • ICTTEN2208A Install and configure a small to medium business network • ICTTEN4210A Implement and troubleshoot enterprise routers and switches. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Internetwork may refer to:	• connection of two or more distinct computer networks or network segments via a common routing technology • LAN • WAN.
Internetwork topology may refer to:	• physical and logical interconnection between network devices: • bus

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RANGE STATEMENT	
	• mesh • ring • star • tree.

Network devices may include:	• cable and wireless:
	  • router
	  • server
	  • switch.

Network resources may include:	• files • printers • software.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Network addressing scheme may include:	• dynamic • static • subnet.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Essential design and installation information may include:	• configuration • design • installation • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes

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RANGE STATEMENT	
	• troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4212A Apply advanced routing protocols to network design

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to use software tools, equipment, software and protocols to configure and troubleshoot network routers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to configuration, analysis and troubleshooting of routers in small and medium sized enterprise (SME) networks. It is relevant to advanced routing networks that employ subnet addressing and provide services over a secure network. Relevant job roles include installer of internet protocol (IP) SME networks, SME network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan to apply routing protocols	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the ***network*** and ***network routing requirements*** from job briefs and appropriate personnel 1.4. Determine hardware and software diagnostic test methodologies and testing resources according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, hardware

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ELEMENT	PERFORMANCE CRITERIA
	and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Build and test advanced routing	2.1. Set up router interfaces according to manufacturer's specifications and established procedures 2.2. Implement advanced routing protocols to achieve network design requirements 2.3. Implement classless addressing across a network to perform logical connectivity and confirm using ***calculations*** 2.4. Troubleshoot network routing according to manufacturer's specifications and established procedures 2.5. Identify security threats and initiate control measures according to enterprise procedures
3. Complete and document advanced router installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise and negotiate with customers and peers to achieve design specifications
• literacy skills to:
  • develop network documentation and maintain network records
  • read and interpret enterprise procedures, manuals and specifications
• numeracy skills to interpret technical data
• planning and organisational skills to plan and prioritise own work
• problem solving skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• deal with unexpected situations on the basis of safety and specified work outcomes • troubleshoot common network problems according to help desk procedures • safety awareness skills to: • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities • follow enterprise OHS procedures • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment • technical skills to: • configure network routing interfaces and protocols • implement IP addressing schemes and security strategies • troubleshoot advanced routing for client networks • use software tools and equipment • verify routing
Required knowledge
• distance vector routing protocols RIP v1 and v2 • dynamic routing • enterprise OHS procedures • hybrid routing protocols enhanced interior gateway routing protocol (EIGRP) • link-state routing protocols open shortest path first (OSPF) • routing and packet forwarding • routing tables • scalable routing strategies variable length subnet masking (VSLM) and classless inter-domain routing (CIDR) • security protocols using access lists • static routing • use of software tools and equipment

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan network routing requirements to meet design specification • configure advanced protocols on network routers • manage network addressing • troubleshoot the network • install network security.
Context of, and specific resources for assessment	Assessment must ensure: • a network facility and workstations • tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate applying advance routing protocols • review documentation of network routing requirements and router installation prepared by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2209A Build and maintain a secure network • ICTTEN4213A Configure and troubleshoot advanced network switching • ICTTEN4214A Install and maintain a wide area network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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EVIDENCE GUIDE	
	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume

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RANGE STATEMENT	
	• gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Network may include:	• internetwork • LAN • WAN.
Network routing requirements may include:	• addressing schemes • latency • management • packet loss • protocols • security.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Essential installation information may include:	• configuration • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes

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RANGE STATEMENT	
	• passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4213A Configure and troubleshoot advanced network switching

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to perform network switch configuration and troubleshooting, including network management by remote access for wired and wireless networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to large networks involving wireless local area networks (WLANs), virtual local area networks (VLANs), interVLAN routing, remote access management and operating system management of network devices. Relevant job roles include installer of internet protocol (IP) enterprise networks, enterprise network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to work on a switched network	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network and network topology from job briefs or appropriate personnel 1.4. Select and obtain wireless and wired network components requirements according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, hardware

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ELEMENT	PERFORMANCE CRITERIA
	and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Configure network switches	2.1. Set up and configure network switches according to manufacturer's specifications and enterprise procedures 2.2. Build and configure a routed network using remote access management 2.3. Establish multiple VLANs across the network to manage the access and traffic across the network
3. Troubleshoot network	3.1. Monitor network traffic and assess performance against manufacturer's specifications and established procedures 3.2. Troubleshoot network according to manufacturer's specifications and enterprise procedures 3.3. Identify and rectify faults according to enterprise procedures
4. Complete and document network installation and configuration	4.1. Restore worksite to safe condition according to established safety procedures 4.2. Record and store ***essential configuration information*** according to enterprise procedures 4.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with customers and peers to achieve outcomes • literacy skills to read and interpret enterprise procedures, manuals and specifications • numeracy skills to interpret technical data • planning and organisational skills to plan and prioritise own work • problem solving skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• deal with unexpected situations on the basis of safety and specified work outcomes • troubleshoot network malfunctions • safety awareness skills to: • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities • follow enterprise OHS procedures • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment • technical skills to: • configure a network to support multiple VLANS • configure a switch using VLAN trunking and spanning tree protocols • design and build a interVLAN switched network • establish LAN switching over a wireless network • install switch and remote access security • use tools and equipment
Required knowledge
• enterprise OHS procedures • interVLAN routing • spanning tree protocol • switch and remote network security management • tool and equipment correct usage • troubleshooting procedures • VLAN trunking protocol • wireless LAN setup and access configuration

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and	Evidence of the ability to:

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EVIDENCE GUIDE	
evidence required to demonstrate competency in this unit	• build and configure a routed network • configure a VLAN on a given network topology • configure VLAN trunking and spanning tree protocols • establish VLANs over a wireless network • design and deploy remote access and network security.
Context of, and specific resources for assessment	Assessment must ensure: • a site where configuring advanced network switching may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing network switch configuration • direct observation of the candidate troubleshooting network problems • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2209A Build and maintain a secure network • ICTTEN4212A Apply advanced routing protocols to network design • ICTTEN4214A Install and maintain a wide area network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke and fugitive emissions

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RANGE STATEMENT	
	• solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Essential configuration information may include:	• installation software • installation and configuration documentation • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4214A Install and maintain a wide area network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to use appropriate tools, equipment, software and protocols to install and maintain a wide area network (WAN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to the installation and maintenance of medium to large enterprise networks requiring secure WAN access. Relevant job roles include installer of internet protocol (IP) networks, IP network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for the installation and maintenance of a network with WAN access	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network from job briefs or appropriate personnel 1.4. Select and obtain network hardware, software, ***WAN protocol*** and technology requirements according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, installation procedures, hardware and software testing methodologies and testing resources 1.6. Consult appropriate personnel to ensure the task is

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ELEMENT	PERFORMANCE CRITERIA
	coordinated effectively with others involved at the worksite
2. Install and maintain a WAN accessible network	2.1. Determine ***network addressing scheme*** for network connectivity and confirm using ***calculations*** 2.2. Identify security threats and initiate control measures according to enterprise procedures 2.3. Set up and configure the network to provide WAN access according to manufacturer's specifications and enterprise procedures 2.4. Use hardware and software analysis and diagnostic methodologies to test network connectivity
3. Complete and document WAN network installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

- communication skills to:
  - identify customer requirements
  - liaise with customers and peers to achieve outcomes
- literacy skills to read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot client network problems using industry standard troubleshooting methodologies and tools
- safety awareness skills to:

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REQUIRED SKILLS AND KNOWLEDGE

• apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
• follow enterprise OHS procedures
• work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • determine and select an appropriate WAN configuration
  • facilitate network connectivity by installing and configuring a WAN communication protocols:
  • frame relay
  • high-level data link control (HDLC)
  • link access procedure, balance (LAPB)
  • point-to-point (PPP)
  • implement teleworker services and network security measures
  • use tools and equipment

Required knowledge

• enterprise OHS procedures
• IP addressing services and network scaling
• methods of securing network services including access control lists
• Open Systems Interconnection layered communication model
• requirements to provide teleworker network services
• tools and equipment correct usage
• WAN link protocols:
  • frame relay
  • HDLC
  • LAPB
  • PPP
• WAN troubleshooting methodologies and analysis and diagnostic tools

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan the installation of a WAN accessible network • select and apply WAN link protocols • configure IP addressing across the WAN • troubleshoot WAN communication issues • install WAN access security measures.
Context of, and specific resources for assessment	Assessment must ensure: • a site where installation and maintenance of a WAN may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and maintaining a WAN • direct observation of the candidate troubleshooting WAN communication problems • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2209A Build and maintain a secure network • ICTTEN4212A Apply advanced routing protocols to network design • ICTTEN4213A Configure and troubleshoot advanced network switching. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste

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RANGE STATEMENT	
	• smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
WAN protocol may include:	• frame relay • HDLC • LAPB • PPP.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment:
	  • bit error rate tester (BERT)
	  • protocol analyser
	  • WAN analyser.

Network addressing scheme may include:	• dynamic addressing • static addressing • subnet addressing.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Essential installation information may include:	• installation and configuration documentation • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • network schematics

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RANGE STATEMENT	
	• passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4215A Install and configure internet protocol TV in a service provider network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and configure a multi-protocol label switching (MPLS) network for internet protocol TV (IPTV). This includes secure Core and Access Networks for the service provider. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to technical staff installing an internet protocol (IP) service provider network for the delivery of emerging technologies for IPTV using multicast (broadcast) and unicast video on demand (VoD) streaming. Relevant job roles include installer of Next Generation Networks (NGN). These IP networks provide fast internet, voice over internet protocol (VoIP), IPTV and internet TV services.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to implement an IPTV service provider	1.1. Obtain and clarify occupational health and safety (***OHS***) ***requirements*** and risk control measures and procedures for a given work area with ***appropriate personnel*** 1.2. Use the ***topology of an IPTV network*** and design plans to locate the ***network elements*** for video over broadband 1.3. Select network elements to provide optimum video delivery service 1.4. Obtain configuration instructions for the network elements
2. Implement an IPTV network to meet business requirements	2.1. Configure an IP-MPLS core network overlaying the IP network to deliver IPTV 2.2. Implement VoD application to meet bandwidth requirements and quality of service (QoS) requirements for commercial viability of IPTV network

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ELEMENT	PERFORMANCE CRITERIA
	2.3. Install and configure video service routers for content delivery system (CDS) applications to support TV streaming and internet streaming with session shifting for follow-me or mobile video facility 2.4. Produce the addressing scheme and ***protocols*** required for IP multicasting used in the IPTV network 2.5. Configure ***security measures*** in an IPTV network to protect against ***security threats*** 2.6. Configure the label switch routers (LSR) to provide secure methods of transporting IP packets using ***layer 2 protocols*** in an ***MPLS network*** 2.7. Configure the MPLS-TE (traffic engineering) to provide routing on diverse paths to avoid congestion and guarantee bandwidth services 2.8. Troubleshoot network according to manufacturer's specifications and enterprise procedures
3. Build and configure CDN architecture network	3.1. Build the content delivery network (CDN) architecture overlaying the routing and switching architecture of an IP network to deliver internet TV to ***Internet devices*** 3.2. Use routing and switching infrastructure to enable CDN share characteristics of each element to produce ***network functionality*** 3.3. Install and configure web cache communication protocol (WCCP) on the router to redirect traffic flows in real-time to reduce transmission costs and download times
4. Complete and document network installation	4.1. Restore worksite to safe condition according to established safety procedures 4.2. Record and store ***essential installation information*** according to enterprise procedures 4.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

• communication skills to liaise with customer to determine needs
• literacy skills to interpret technical specifications and related documentation
• project planning skills to set benchmarks and identify scope
• problem solving skills to resolve a predictable range of network problems
• numeracy skills to produce IP addressing schemes
• technical skills to:
  • deploy point-to-multipoint video broadcast over IP-MPLS network
  • dimension network parameters
  • evaluate competing video over broadband networks
  • implement and verify implement and verify:
  • border gateway protocol (BGP)
  • enhanced interior gateway routing protocol (EIGRP)
  • flash
  • hypertext transfer protocol (HTTP)
  • internet group management protocol (IGMP)
  • open shortest path first (OSPF)
  • real time streaming protocol (RTSP)
  • routing information protocol (RIP)
  • web cache communication protocol (WCCP) operations
  • implement MPLS architecture across a WAN environment
  • implement secure video streaming (unicast) over MPLS network

Required knowledge
• competing video delivery over broadband networks • current industry-accepted hardware and software products • networking technologies incorporating detailed knowledge of network operating systems and IP networks • transmission technologies and protocols

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install relevant network hardware and software • configure and test the IPTV network according to specified guidelines • configure the LSR in an MPLS network • build and configure CDN architecture network • implement secure network.
Context of and specific resources for assessment	Assessment must ensure: • a site where the installation and configuration of an IPTV network may be conducted • equipment currently used in industry • information on different protocols • relevant technical information, legislative requirements and other site and project-related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and configuring IPTV in a service provider network ensuring network security • direct observation of the candidate building and configuring CDN architecture network • direct observation of the candidate configuring the LSR in an MPLS network • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4126A Install and configure internet protocol TV in a home network • ICTTEN4198A Install, configure and test an internet protocol (IP) network • ICTTEN4199A Install, configure and test a router • ICTTEN4212A Apply advanced routing protocols to network design • ICTTEN4213A Configure and troubleshoot advanced

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EVIDENCE GUIDE	
	network switching. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS requirements may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures

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RANGE STATEMENT	
	• material safety management systems • protective equipment.
Appropriate personnel may include:	• customer • network administrator • network manager • site engineer • supervisor.
Topology of an IPTV network may include:	• digital subscriber line access multiplexer (DSLAM) • head end servers • home gateway • media centres • media content servers • MPLS routers • MPLS switches • set top box.
Network elements may include:	• head end servers • media content servers • MPLS routers and switches • video service routers.
Protocols may include:	• IGMP • point to multipoint (p-to-mp) for IPTV • protocol independent multicast (PIM) • reverse path forwarding (RPF) • routing table protocol (RTP) • RTSP • session definition or data protocol (SDP) • session initiation protocol (SIP) • spanning-tree protocol (STP).
Security measures may include:	• digital signatures and certificates • encryption • integrity and authentication.
Security threats may include:	• botnets • distributed denial of service (DDoS) • fraud • hacking • malware.
Layer 2 protocols may include:	• asynchronous transfer mode (ATM) • Ethernet

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RANGE STATEMENT	
	• frame relay (FR) • IGMP • packet over SONET (POS) • p-to-mp for IPTV • point-to-point protocol (PPP) unicast for VoD streaming • PIM • STP.
MPLS network may include location and type of:	• core label switch routers (Core LSR) • edge label switch routers (Edge LSR) • hosting servers for media content.
Internet devices may include:	• digital TV • media centre • mobile devices • PC.
Network functionality may include:	• application processing • caching • file access and sharing • multimedia delivery.
Essential installation information may include:	• installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4229B Design, install and configure a customer smart technology network

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor change to unit title and other minor editorial changes. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to design, install and configure an enterprise smart technology network in a home or commercial environment. It involves testing and troubleshooting the smart technology network installation.

Smart technology network changes the focus from the physical infrastructure to the new world of virtual infrastructure. It uses the internet protocol (IP) home network to provide applications that are scalable and sustainable from an energy conservation aspect.

Scalability, cost savings, security, flexibility of infrastructure and energy consumption are significant factors when businesses considers smart technology network.

Smart technology network solutions support the application of Next Generation Technologies (NGN).

Application of the Unit

This unit applies to the design, installation and configuration of a smart technology network suitable for domestic or industrial enterprises using IP networking technology.

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Relevant job roles include designer and installer of smart grid networks, IP networks, and sustainable networks. This includes maintaining and supporting smart grid networks.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for the design and installation of a smart technology network	1.1 Prepare for given work according to occupational health and safety ***(OHS)*** and ***environmental requirements*** with ***appropriate personnel*** from the enterprise 1.2 Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3 Determine nature and scope of the ***smart technology network*** from customer specifications and appropriate personnel 1.4 Obtain operating instructions, manuals, hardware and software testing methodologies 1.5 Consult appropriate personnel to ensure the task is

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	coordinated effectively with others involved at the work site
2. Design a customer smart technology network	2.1 Produce a ***smart technology network topology*** that is interoperable and scalable after considering customer requirements, technical specifications, physical and financial constraints and expansion projections 2.2 Determine ***network devices*** and ***network resources*** according to enterprise procedures 2.3 Produce the smart technology network design, including network security and network element configurations to meet design specifications and ***enterprise procedures***
3. Install and configure a designed smart technology network	3.1 Install smart technology network hardware to topology design plan according to enterprise procedures 3.2 Determine ***network addressing scheme*** for network connectivity and verify using ***calculations*** 3.3 Configure network elements to perform the logical connection of the smart technology network topology with the network security features required 3.4 Conduct connectivity and performance tests to verify that the network installation meets the design specification 3.5 Troubleshoot the smart technology network and internet connectivity according to manufacturer specifications and enterprise procedures
4. Complete and document network design and installation	4.1 Restore work site to safe condition according to established safety procedures 4.2 Record and store ***essential design and installation information*** according to enterprise procedures 4.3 Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise and negotiate with customers and peers to achieve design specifications

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- literacy skills to:
  - develop network documentation and maintain network records
  - read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organising skills to plan and prioritise own work
- problem-solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems according to help desk procedures
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - analyse the impact of applications on traffic flow in the network
  - apply network design methodologies to design networks that provide a range of services and applications found in larger networks
  - conduct a wireless site survey
  - determine customer requirements and a design specification
  - determine the impact of upgrading hardware and software on network functionality
  - identify the technical requirements, constraints and manageability issues for a given customer network requirement
  - install a network design
  - use tools and equipment.
  -

Required knowledge

- enterprise OHS procedures
- network design concepts:
  - business requirements
  - network topologies
  - physical and financial constraints
  - security
  - wired or wireless options
- network requirements:
  - applications
  - lifecycle
  - manageability
  - quality of service

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- open systems interconnect (OSI) layered communication model
- tool and equipment use
- troubleshooting:
  - impact of network failure
  - maintenance
  - troubleshooting methodology.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine customer requirements • design a smart technology network that uses advanced networking techniques • install a smart technology network according to design specification • configure network devices to meet design functionality • document smart technology network design, installation and configuration.
Context of, and specific resources for assessment	Assessment must ensure: • a site where design and installation of a smart technology network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate designing, installing and configuring a smart technology network

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	• review of documents prepared by the candidate detailing design and installation • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2207A Install and configure a home or small office network • ICTTEN2208A Install and configure a small to medium business network • ICTTEN4210A Implement and troubleshoot enterprise routers and switches. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

OHS may include:	• hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include managing:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.

Smart technology network may refer to:	• domestic:
	  • home automation:
	  • climate control
	  • light switches
	  • power
	  • thermostats
	  • window shade
	  • wireless control
	  • in-home patient monitoring
	  • internet protocol TV (IPTV)
	  • home computer network
	  • home security
	  • smart sprinkler

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	• industrial:
	  • building automation
	  • commercial lighting (wireless control)
	  • heating, ventilation and air conditioning (HVAC) energy management
	  • industrial security
	  • plant monitoring:
	  • infra-red
	  • pressure settings
	  • temperature control
	  • smart sprinkler
	  • warehousing.

Smart technology network topology may refer to:	• physical and logical interconnection between network devices:
	  • bus
	  • mesh
	  • ring
	  • star
	  • tree.

Network devices may include:	• interface units • IP network • router • sensors • server • switch.
Network resources may include:	• files • printers • software.

Enterprise procedures may include:	• enterprise security specifications
	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Network addressing scheme may include:	• dynamic • static

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	• subnet.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Essential design and installation information may include:	• configuration • design • installation • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4241A Design network projects

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to plan and design projects for access, building and core telecommunications networks.

The unit includes legacy, current and emerging technologies and practices. It also includes use of access network deployment data, technology, equipment, capacity management and network management information sources.

The project may be for a new installation or to upgrade the technology or the capacity of an existing network or subsystem to facilitate convergence to the next generation network (NGN).

Application of the Unit

Technical staff and their subcontractors from private and public organisations apply the skills and knowledge in this unit. They combine technical planning and design skills with broader organisational skills to plan and design projects for a service provider, such as a major carrier or other communications service providers.

Technical officers, communications workers or engineers may be responsible for small projects or parts of larger projects on NGN in the deployment of copper, wireless, hybrid fibre coaxial (HFC), fibre to the x (FTTx) and fibre networks.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Analyse different types of network technologies	1.1 Determine ***network*** characteristics using ***network information sources***
	1.2 Select techniques to provide service to greenfields, brownfields and rehabilitation projects for access networks
	1.3 Select techniques to provide for new service, capacity expansion and equipment recovery projects for building and core networks
	1.4 Produce a brief on how ***network architecture components*** relate to the larger network and their impact on the work
	1.5 Develop an installation activity schedule that complies with relevant regulations and standards to minimise disruption to the workplace
	1.6 Evaluate availability of ***equipment*** and ***technologies*** and establish compatibility with existing network equipment
2. Apply deployment and construction practices for network technologies	2.1 Review conduit and jointing chamber standards and practices for the access network
	2.2 Examine standards, practices and requirements for locating telecommunications infrastructure in the access network
	2.3 Examine standards, practices and requirements for locating and standing racks, cabinets and supporting infrastructure

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	2.4 Examine capacity and practices for cabling and patching twisted-pair, coaxial and fibre distribution frames
3. Review network standards and prepare a draft design	3.1 Review customer's ***network deployment rules*** and apply to a network design 3.2 Produce a preliminary plan or design on the deployment of the network that maintains integrity of access, building and core networks 3.3 Establish a solution for anticipated constraints through discussions with appropriate personnel 3.4 Review plan to ensure that it complies with requirements of ***applicable legislation, codes, regulations and standards*** required when working on network, and where appropriate make adjustments 3.5 Produce final project design that includes recommendations agreed with the customer

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - evaluate different types of technical data
  - interpret data results
  - interpret technical and non-technical documentation and write summary reports in required formats
  - select and compare benefits and limitations of access equipment
- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - negotiate approvals and contract arrangements with suppliers, contractors, customers and consultants
  - negotiate with customers, stakeholders and colleagues
  - work in a team environment for organisational objectives
- literacy skills to:
  - document technical requirements and procedures
  - interpret technical specifications and related documentation
  - read technical reports and incorporate findings in designs

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- numeracy skills to:
  - calculate hazardous induction and earth potential rise (EPR) zones
  - calculate transmission requirements and link budgets
  - develop accurate costing for designs
  - make engineering calculations for designs
- planning and organising skills to:
  - balance priorities of conflicting demands
  - develop cost-effective designs
  - plan workload
  - prioritise and monitor own work
  - schedule and coordinate activities of other parties
- problem-solving skills to account for unexpected variations to requirements
- technical skills to:
  - apply customer practices and procedures to project designs
  - apply network code systems
  - assign activity coding
  - produce CAD or other electronic drawings
  - read plans.
  -

Required knowledge

- access network issues and challenges
- commercial considerations of access network deployment
- common network topologies
- compatibility issues of technology and equipment
- criteria for exemption processes
- enterprise deployment rules and rationale
- major equipment components of modern access architecture
- monitoring techniques to manage the access network
- network architectures and geographical categorisation
- network capacity and capability management
- network capacity limitation of various platforms
- network information sources
- network technology and equipment
- product capability and availability
- telecommunications legislation, Acts, regulations and their sources.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify and document the most suitable network technology to be deployed for a given requirement • apply established planning, design and management techniques for the deployment of a project • produce a project design that complies with the techniques, rules and standards of the deployed network.
Context of and specific resources for assessment	Assessment must ensure: • network planning and design documentation and other site-related documentation • equipment specifications • live network or training facilities with simulated network • organisational guidelines • access to relevant standards and practices documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate planning, designing and managing the deployment of access network architecture • review of reports completed by the candidate for differing examples of access networks • review of final deployment plan prepared by the candidate outlining recommendations for the customer • oral or written questioning to assess knowledge of equipment and technologies as used within the access network • presentation by candidate of their considerations of the standards and practices relevant to the design.
Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, for example: • ICTNPL4109A Evaluate the capability of access networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Network may refer to:	• broadband:
	  • wireless fidelity (WiFi)
	  • world interoperability for microwave access (WiMAX)
	• copper:
	  • coaxial

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	• hybrid fibre coaxial (HFC) • twisted-pair • digital services: • asymmetrical digital subscriber lines (ADSL) • digital subscriber lines (DSL) • next generation network (NGN): • broadband access • data transfer • internet protocol (IP) based systems • internet protocol private branch exchange (IP PBX) • internet protocol TV (IPTV) • mobile data • mobile telephony • multimedia • video • voice over internet protocol (VoIP) • optical: • fibre to the node (FTTN) • fibre to the premises (FTTP) • FTTx • HFC • wireless networks: • cellular • microwave • radio • satellite.
Network information sources may include:	• network management databases for: • capacity assessment data • network performance data • traffic dimensioning data • network management tools.
Network architecture components may include:	• copper network: • copper cable • lead-in • lightning protection • line power supply • loading coils • main distribution frame • pair gain system

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	• ethernet broadband remote access server (EBRAS)
	• HFC network
	• IP edge
	• optical:
	  • add/drop multiplexer
	  • broadband passive optical network (BPON)
	  • cross connect unit
	  • distribution/lead-in multi-port (DLM/LM)
	  • fibre access points
	  • fibre distribution hub (FDH)
	  • dense wavelength division multiplexing (DWDM) systems
	  • cloud network
	  • gigabit passive optical network (GPON)
	  • high density/optical fibre distribution frame (HD/OFDF)
	  • home optical network terminal
	  • optical distribution network
	  • optical fibre
	  • optical receiver
	  • packet optical line terminal (P-OLT)
	  • video optical line terminal (V-OLT)
	  • wave division multiplexing (WDM)
	• wireless network:
	  • antennae
	  • dish
	  • headend
	  • hubs and nodes
	  • radio frequency (RF) amplifier
	  • radio towers and huts
	  • RF transmitters and receivers
	  • satellite
	  • tap
	• waveguide
	• video service centre.

Equipment may include:	• digital
	• IP-based
	• optical:
	  • add/drop multiplexers
	  • amplifiers

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	• filters • receivers • splitters/combiners • switches • transmitters • wireless: • amplifiers • filters • microwave • receivers • RF broadband • satellite • transmitters.
Technologies may include:	• digital subscriber lines: • ADSL • DSL • IP broadband: • IPTV • VoIP • WiFi • WiMAX • mobile radio • optical transmission systems: • DWDM • gigabit ethernet passive optical network GEPON • GPON • WDM.
Network deployment rules may relate to:	• exemption process criteria • restricted site access: • financial institutions • government offices • rail corridor • research establishments • separation from other services: • electricity • fire equipment • gas • other telecommunications service providers • water.

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Applicable legislation, codes, regulations and standards may include:	• AS Communications Cabling Manual (CCM) Volume 1 • AS/ACIF S008:2006 • AS/ACIF S009:2006 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • Australian Communications Industry Forum (ACIF) standards and codes • cabling security codes and regulations • EPA, waterways, rail, land access, and national parks • federal, state and local regulations • fire regulations • industry drafting codes of practice • mining legislation • noise abatement and heritage legislation • Telecommunications Act 1998 • Telecommunications code of practice • WHS Acts and relevant codes and standards.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4242A Conduct site surveys to identify carrier installation requirements

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to survey a site to identify and document installation requirements for telecommunications infrastructure projects.

Application of the Unit

Technical staff who identify requirements for carrier telecommunications installations apply the skills and knowledge in this unit.

This unit applies to access, building and core installation projects within a carrier access network. It may be applied to carrier, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN) and multimedia.

This unit is one in a sequence of units that cover network design activities, including:

- design drawings and specifications
- designing a dense wavelength division multiplexing (DWDM) system
- designing infrastructure
- estimating and quoting
- site surveys.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Obtain access to work site	1.1 Notify parties if necessary to arrange access to site to discuss installation requirements and identify ***carrier network systems***
	1.2 Assess site-specific safety requirements and enterprise work health and safety (WHS) processes and procedures
	1.3 Use ***network information systems*** to obtain ***planning data***
2. Identify existing infrastructure	2.1 Confirm details of the installation with stakeholders
	2.2 Verify site conditions and building construction
	2.3 Locate and record existing facilities and systems
	2.4 Confirm installation locations and identify ***barriers to planned network extension***
	2.5 Integrate ***existing network*** and floor plans into documentation where available
3. Integrate existing infrastructure into design brief	3.1 Review existing plans, drawings and databases against the design brief
	3.2 Calculate capacity of existing facilities against proposed usage to ensure appropriate design decisions for new installation

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	3.3 Incorporate all data into new installation design 3.4 Mark up plans and prepare report on new installation design 3.5 Develop contingency plans for anticipated constraints
4. Review design for compliance with standards and legislation	4.1 Examine standards, practices and requirements for locating telecommunications infrastructure in the access network 4.2 Review installation design to ensure compliance with requirements of federal, state and local regulations, ***relevant legislation***, codes and standards 4.3 Initiate any special studies or investigations necessary for the completion of the project
5. Complete required reports and documentation	5.1 Complete required documents promptly and accurately according to ***planning parameters*** 5.2 Obtain carrier confirmation of documented requirements 5.3 Distribute design documentation to stakeholders promptly 5.4 Obtain ***project plan*** sign-off from carrier

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to identify details relating to the project from approved network plan
- communication skills to discuss project brief with the customer
- learning skills to:
  - develop and study planning options, considering present and future needs
  - identify barriers to plan realisation
- literacy skills to write project briefs
- numeracy skills to:
  - analyse site survey data
  - develop cost estimates and operating budgets according to enterprise policy
  - undertake cost-benefit studies to inform the decision-making process
- planning skills to review current and new technology, facilities and features when developing options
- problem-solving skills to:
  - address and analyse specific customer requirements

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    - assess current access network conditions
- research skills to:
    - analyse impact on planning processes
    - establish cabling requirements
    - evaluate requirements of relevant legislation and associated operational codes
    - inspect installed equipment
    - obtain and evaluate information relating to new technology or technology features
    - obtain geographical information
- technical skills to apply the three phases of project management to the project brief.
-

Required knowledge

- detailed knowledge of:
    - content and format of project briefs, reports and charters
    - procedures for developing cost estimates and operating budgets according to enterprise policy
    - project management software systems
    - telecommunications carrier infrastructure
    - theory of project management
- overview knowledge of:
    - current and emerging challenges facing technology
    - influence of local and international economic conditions and financial authorities on the telecommunications industry
    - legislation, codes of practice and other formal agreements that impact on the work activity
    - manufacturer requirements for safe operation of equipment
- procedures for responding to typical issues and challenges that occur on site, including:
    - barricading
    - damage to site
    - obtaining access
    - problematic weather
    - safety management
    - vegetation and mud
    - waste management.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate existing infrastructure on an installation site • integrate existing infrastructure into an installation design • develop design specifications for an installation project • engage stakeholders and carriers in design approval process.
Context of and specific resources for assessment	Assessment must ensure: • a network planning area, systems and deployment rules and standards • relevant databases, licensing requirements and other site-related procedures.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking an assessment of an access network • review of documents prepared by the candidate, capturing the network design requirements for a range of project types • review of solutions developed by the candidate that address network shortfalls • oral or written questioning to assess knowledge of planning the access network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4108A Plan the deployment of access network architectures • ICTNPL4109A Evaluate the capability of access networks. Aboriginal people and other people from a non-English speaking background may have second language issues.

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	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Carrier network systems may refer to:	• broadband:
	  • wireless fidelity (WiFi)
	  • world interoperability for microwave access (WiMAX)
	• copper:
	  • coaxial
	  • hybrid fibre coaxial (HFC)
	  • twisted-pair
	• digital services:
	  • asymmetrical digital subscriber lines (ADSL)
	  • digital subscriber lines (DSL)
	• internet protocol (IP) network:
	  • computer

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	• IP private branch exchange (IP PBX) • internet protocol TV (IPTV) • voice over internet protocol (VoIP) • optical: • fibre to the x (FTTx) • fibre to the node (FTTN) • fibre to the premises (FTTP) • HFC • point-to-point network • point-to-multipoint network • wireless networks: • cellular • microwave • radio • satellite.
Network information systems may include:	• network management databases for: • capacity assessment data • network performance data • traffic dimensioning data • network management tools.
Planning data may relate to:	• current and proposed network growth • demographic growth • traffic quantity and flow.
Barriers to planned network extensions may include:	• building availability • environmental considerations • financial constraints • government policy • heritage legislation restrictions • land acquisition constraints • material availability • planning approvals • technology availability.
Existing network may include:	• access network technology and exchange switching and transmission systems • boundaries between access and inter-exchange networks.
Relevant legislation may include:	• Australian Communications and Media Authority (ACMA) standard TS 14 • Australian standards applying to radiation hazards • heritage legislation • industrial awards and conditions

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	• International Standards ISO 9001:2008 • International Telecommunications Union (ITU) recommendations • National Parks Act • Privacy Act • state, territory and federal Environment Acts • Telecommunications Act and relevant codes • WHS.

Planning parameters may relate to:	• network criteria cover:
	  • network change
	  • network growth
	  • network reduction
	  • sites, buildings and structures
	• organisational policies, procedures and guidelines
	• planning priorities driven by:
	  • customer demand
	  • enterprise policy
	  • legislative requirements
	  • marketing initiatives
	  • network conditions
	  • revenue projections
	  • planning processes, documented within enterprise process manuals.

Project plan may include:	• activities • finance • labour • materials.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4243A Prepare design drawings and specifications for telecommunications installations

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to prepare design drawings and specifications for a telecommunications installation.

Application of the Unit

Technical staff who prepare design drawings and specifications for a telecommunications installation apply the skills and knowledge in this unit.

This unit applies to access, building and core network installations within the carrier network. It may be applied to carrier, commercial and industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia.

This unit is one in a sequence of units that cover network design activities, including:

- design drawings and specifications
- designing a dense wavelength division multiplexing (DWDM) system
- designing infrastructure
- estimating and quoting
- site survey.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Gather information on existing and proposed installation	1.1 Inspect site to confirm plans where possible 1.2 Review existing ***plans, drawings and databases*** against the design brief
2. Determine installation options	2.1 Identify installation options from the design brief and the customer 2.2 Assess installation options against customer requirements and requirements of ***relevant legislation, codes, regulations and standards*** 2.3 Establish and assess the cost of options against customer's budget 2.4 Select most suitable option based on function, cost, standards and customer deployment rules
3. Prepare and supply drawings and specifications	3.1 Prepare clear and accurate installation drawings indicating proposed facilities and services 3.2 Prepare detailed ***design specifications*** for the network installation that include scheduled and non-scheduled codes to facilitate costing 3.3 Provide drawings and specifications to relevant parties and file copies for later reference according to ***company policies***

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4. Verify specifications with customer	4.1 Verify prepared documentation with customer 4.2 Obtain authorisation and approval from customer to proceed according to company policy 4.3 Issue design to the field with authority to construct

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to read and interpret drawings related to:
  - network coding system and identifiers
  - network layouts
  - frame locations
  - network locations
- communication skills to liaise with internal and external stakeholders on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to:
  - take and analyse measurements
  - prepare accurate costings
- planning and organising skills to organise and maintain equipment
- problem-solving skills to solve equipment and logistics challenges
- task-management skills to:
  - adhere to safety requirements
  - work systematically with required attention to detail
- technical skills to prepare design drawings and specifications.
-

Required knowledge

- detailed knowledge of carrier network practices, procedures and systems, including databases and deployment rules
- legislation, codes of practice and other formal agreements that impact on the work activity, including schedule of rates and contract requirements
- Telecommunications Act and codes of practice
- procedures for responding to typical issues and challenges that occur on site, including:

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- barricading
- damage to site
- obtaining access
- problematic weather
- safety management
- vegetation and mud
- waste management.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine installation options • produce schematics and plan drawings • access database and knowledge systems for network information • produce design drawings and specifications • verify specifications with customer.
Context of and specific resources for assessment	Assessment must ensure: • sites where network installation may be conducted • use of equipment currently used in industry • relevant regulations, company policies and cabling specifications that impact on network installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a design project completed by the candidate • oral or written questioning to assess knowledge of design options • direct observation of the candidate assessing design requirements

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	• review of design drawings and specification for a network installation prepared by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Plans, drawings and databases may include:	• design drawings covering:
	  • developers' drawings
	  • existing cable and conduit plans
	  • external plant drawings

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	• fibre distribution hub (FDH) schematics • floor plan drawings • new estate plans • schematics • other drawing terminology in use, including: • cable plan • termination drawing • multi-ports • floor plan drawings, which may be formal or informal, and may include: • box locations • cable routes • frame location • location and entry points of risers • location of existing cabling and equipment • service delivery points • multi-dwelling unit (MDU) specifications, which may include: • capacity of cable • engineering calculations • estimated labour hours • proprietary system requirements • support requirements • termination system • type of cable • volume of cable • support system schematic drawings, which may be formal or informal, and may include: • frame capacities • frame locations • proposed cable routes • site locations.
Relevant legislation, codes, regulations and standards include:	• AS Communications Cabling Manual (CCM) Volume 1 • AS/ACIF S008:2006 • AS/ACIF S009:2006 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006

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	• AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • Australian Communications Industry Forum (ACIF) standards and codes • cabling security codes and regulations • EPA, waterways, rail, land access, and national parks • federal, state and local regulations • fire regulations • industry drafting codes of practice • mining legislation • noise abatement and heritage legislation • Telecommunications Act 1997.
Design specifications may include:	• capacity for future expansion • contingencies during installation • required services • work health and safety requirements.

Company policies may refer to:	• industry standards, including:
	  • appropriate Australian standards and ACIF technical standards
	  • regulated or industry codes of practice
	• relevant parties, including:
	  • builder
	  • cabler
	  • contractor
	  • customer
	  • relevant regulatory authority.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4244A Estimate and quote for carrier telecommunications equipment installations

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to estimate and quote for carrier telecommunications equipment installation.

It involves preparing detailed estimates and quotes and updating schematic drawings and specifications.

Application of the Unit

Technical staff who estimate and quote for carrier equipment installation apply the skills and knowledge in this unit.

This unit applies to indoor and outdoor installation within a carrier network. It may be applied to large scale commercial and industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), multimedia, fibre to the x (FTTx), radio and satellite installations.

This unit is one in a sequence of units that cover network design activities including:

- design drawings and specifications
- designing a dense wavelength division multiplexing (DWDM) system
- designing infrastructure
- estimating and quoting
- site survey.

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Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Confirm and update schematic drawings and specifications	1.1 Review existing specifications and drawings for completeness 1.2 Prepare additional drawings and specifications for installation if required 1.3 Compare drawings and specifications with design brief to confirm requirements 1.4 Confirm cable and location details with the carrier
2. Cost resources and establish availability	2.1 Cost scheduled items using schedule of rates 2.2 Obtain quotes and supply dates for non-scheduled items 2.3 Estimate labour costs based on company practices 2.4 Negotiate costing with suppliers 2.5 Cross-check costings to ensure supply proposal matches ***carrier specification***

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3. Prepare estimates for carrier quote	3.1 Prepare estimates allowing for ***contingencies*** during installation and requirements of ***relevant legislation, codes, regulations and standards*** 3.2 Ensure estimates will return a profit on installation where appropriate
4. Prepare quote and confirm with carrier	4.1 Prepare a project installation quote from estimates to meet carrier installation requirements 4.2 Negotiate ***changes and variations*** to meet carrier and company needs
5. Obtain approval and initiate installation project	5.1 Obtain carrier's approval for project design drawings and estimate 5.2 Issue design drawings and specifications with authority to construct

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to read and interpret drawings related to carrier's telecommunications equipment
- communication skills to liaise and negotiate with carriers and suppliers on technical and operational matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to estimate and quote for telecommunications installation
- problem-solving skills to solve equipment and logistics challenges
- task-management skills to:
  - adhere to safety requirements
  - work systematically with required attention to detail
- technical skills to estimate requirements for carrier telecommunications equipment installation.
-

Required knowledge

- features of carrier telecommunications equipment

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- manufacturer requirements for safe operation of equipment
- procedures for responding to typical issues and challenges that occur on site, including:
  - barricading
  - damage to site
  - obtaining access
  - problematic weather
  - safety management
  - vegetation and mud
  - waste management
- processes and techniques required to prepare plans, estimates and quotes for installations
- sources of legislation, codes of practice and other formal agreements relating to installing carrier telecommunications equipment that impact on the work activity
- typical issues and challenges that occur when dealing with carriers.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare detailed estimates, and updated schematic drawings and specifications, including material and labour costs for telecommunications installations • negotiate with contractors on material availability and pricing for carrier network installations • complete detailed quotes for installations that allow for changes and variations • prepare and confirm quote with carrier.
Context of and specific resources for assessment	Assessment must ensure: • relevant databases, licensing requirements and other site-related documentation • sites on which estimates and quotes may be conducted.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are

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	appropriate for this unit: • review of a hands-on project completed by the candidate • review of written estimates and quotes with completed documentation • oral or written questioning on the estimate and quote process.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTCBL2017B Alter services to existing cable system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Carrier specification may include:	• cable
	• connectors
	• cost per cable length installed per outlet
	• equipment types:
	  • bandwidth managers
	  • digital subscriber line (DSL):
	  • asymmetrical DSL (ADSL)
	  • digital broadcasting
	  • computer telephony integration (CTI) technologies
	  • modems
	  • network equipment
	  • private automatic branch exchange (PABX)
	  • radio frequency (RF) equipment
	  • single line telephones
	  • telephone systems
	  • radio systems
	  • optical systems, including FTTx
	  • video and data
	• existing builders or electrical contractors schedule
	• frames
	• requirements for:
	  • equipment
	  • labour
	  • materials
	  • other resources
	• scope of works
	• support system
	• wireless networks:
	  • cellular
	  • microwave
	  • radio
	  • satellite

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	• timeframes.
Contingencies may include:	• need for integration with existing building works schedules where available • requirements for installation method or of any proprietary system being installed • relevant constraints.
Relevant legislation, codes, regulations and standards may include:	• AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • Australian Communications Industry Forum (ACIF) standards and codes • cabling security codes and regulations • compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6, 6A, 7 or 7A and unshielded twisted pairs (UTP) • Environment Protection Acts • fire regulations • Institute of Electrical and Electronics Engineers (IEEE) • mining legislation • noise abatement and heritage legislation • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Telecommunications Act and code of practice • Trade Practices Act • WHS Acts and relevant codes and standards.
Changes and variations may include:	• availability • delivery • disputes • insurance • maintenance • network/system security implications • preparation of manuals

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	• restricted site access • testing requirements • time penalties.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4245A Design infrastructure for telecommunications network installations

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to design supporting infrastructure for telecommunications network installations.

This includes carrier grade switching, transmission and access equipment and associated media, power and monitoring equipment and alarm systems, fibre distribution hubs (FDHs), and remote power feeds.

Application of the Unit

Field officers, design technicians and technical supervisors from carriers, contractors and other service providers apply the skills and knowledge in this unit.

This unit may apply to switching, transmission and radio networks and the various transmission paths, including cable, optical fibre, radio, microwave and satellite.

This unit is one in a sequence of units that cover network design activities including:

- design drawings and specifications
- designing a dense wavelength division multiplexing (DWDM) system
- designing infrastructure
- estimating and quoting
- site survey.

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Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority.

If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare for design of infrastructure work	1.1 Review preparation to ensure work complies with requirements of ***relevant legislation, codes, regulations and standards***
	1.2 Notify ***customer*** to arrange site access and obtain plans and specifications
	1.3 Conduct ***site survey*** to verify that ***infrastructure*** design requirements can be met
	1.4 Identify site ***hazards*** and notify appropriate personnel to make site safe
	1.5 Develop a design activity schedule to minimise disruption to the workplace according to relevant regulations and

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	standards 1.6 Discuss ***material supplies, safety equipment, resources, tools and test equipment*** with the construction group so that they are available when required for installation
2. Design network equipment infrastructure	2.1 Prepare infrastructure designs according to electrical safety and work health and safety (WHS) and environmental requirements after consultation with operational staff 2.2 Design metal superstructure to house equipment according to manufacturer specifications 2.3 Design cable pathways, including cable distribution frames and support materials, according to specifications
3. Design power infrastructure	3.1 Design power supply and earthing according to specifications and standard electrical practices 3.2 Design battery and rectifier equipment for project according to manufacturer and WHS requirements 3.3 Design high Ohmeric distribution (HOD) and associated power distribution systems
4. Design and monitor DC power distribution work	4.1 Design ***power distribution work*** to meet electrical safety requirements and certifications 4.2 Monitor electrical work by ***qualified personnel*** to ensure compliance with installation plan 4.3 Identify and rectify faults where possible or escalate according to enterprise policy
5. Complete documentation and restore site	5.1 Attach infrastructure ***labels and designations*** according to enterprise requirements 5.2 Complete inspection sheets and declare asset ready for next stage of installation using appropriate sign-off documentation 5.3 Clean up and prepare site in readiness for next installation phase 5.4 Notify carrier and obtain sign-off

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

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- analytical skills to compare and evaluate most effective technical solutions
- communication skills to:
  - liaise with carriers to ensure requirements are known
  - negotiate approvals and contract arrangements with suppliers and contractors
- literacy skills to:
  - document technical requirements and procedures
  - interpret technical specifications and related documentation
- numeracy skills to calculate budget requirements and limitations
- planning and organising skills to:
  - make site access and equipment delivery arrangements
  - set out project requirements and priorities
- problem-solving skills to account for unexpected variations to requirements
- technical skills to:
  - perform cabling and terminating designs
  - use design tools to:
    - affix supports, cable trays and racks to surfaces
    - assemble infrastructure
    - work with construction materials.
    -

Required knowledge

- cabling types, connectors and cabling structures
- common carrier telecommunications applications and related equipment
- connections to carrier infrastructure or equipment
- current legislation relating to installation of telecommunications equipment and connection to carrier services
- environmental impacts, including options for green ICT installations
- interface and interconnect solutions
- network power requirements and electrical safety
- network topologies
- overview knowledge of network and transmission equipment
- warranty information for equipment supplies and contractor work guarantees
- WHS requirements for:
  - confined spaces
  - electrical safety
  - heights
  - lifting
  - materials handling
  - physical hazards.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• conduct a site survey to identify infrastructure features, including:
	  • potential earthing locations
	  • cable routes
	  • locations for cables trays, data cabinets, telecommunication enclosures, and distributors
	• design infrastructure for access network
	• design protective earth and functional earth installations
	• design power infrastructure
	• design and monitor DC power distribution work.

Context of and specific resources for assessment	Assessment must ensure: • site where installation of supporting infrastructure may be conducted • use of plant, tools and equipment currently used in industry • relevant regulatory and equipment documentation that impacts on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate designing metal superstructure to house equipment • direct observation of the candidate designing protective earth and functional earth installations • review of design drawings prepared by the candidate • oral or written questioning to assess knowledge of design issues, types of systems and applications.
Guidance information	Holistic assessment with other units relevant to the industry

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for assessment	sector, workplace and job role is recommended, for example: • ICTNPL4247A Apply compliance requirements to telecommunications work • ICTTEN4241A Design network projects • ICTTEN4242A Conduct site surveys to identify carrier installation requirements • ICTTEN4243A Prepare design drawings and specifications for telecommunications installations • ICTTEN4244A Estimate and quote for carrier telecommunications equipment installations • ICTTEN4246A Design dense wavelength division multiplexing installations. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and standards may include:	• appropriate licences:
	  • crane
	  • forklift
	  • winch
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/ACIF S008:2006
	• AS/ACIF S009:2006
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS IEC 61935.1:2006
	• AS/NZS IEC 61935.2:2006
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• Australian Construction Industry Forum (ACIF) standards and codes
	• cabling security codes and regulations
	• Environment Protection Acts
	• WHS Acts and relevant codes and standards.

Customer may be:	• architect • asset manager • builder • nominated representative • project manager • service provider.
Site survey may include:	• access • cable tunnels • equipment bays • floor layout • floor loadings • lighting

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	• preparation area • roof structures • ventilation requirements • wall structures.
Infrastructure may include:	• air conditioning requirements • alarm panels • cable entries • distribution frames • duct and cable trays • electrical supply • equipment racks • power supplies • radio structure.
Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water • natural gas and other gas build-up • needle stick injury • optical fibre cable, which may contain hazardous light • radio frequency (RF) equipment emitting radiation • remote power feeding services that operate at above telecommunications network voltage (TNV) • vermin.
Material supplies may include:	• back shelf cards • cable racks • cable trays, nuts and bolts • distribution frames or blocks • earth terminal and rod • frames and cabinets • insulation blocks • iron support structures • jumper wire • lacing, twine and cable ties • patch panels • termination blocks.
Safety equipment may include:	• electrical isolators • elevated work platforms (EWP) • harnesses

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	• manual lifters
	• personal protective equipment:
	  • acid proof clothing
	  • earmuffs
	  • face masks
	  • gloves
	  • head protection
	  • kneepads
	  • safety boots
	  • safety glasses
	• safety barriers.

Resources may include:	• finance • labour • materials • tools and test equipment • vehicles.

Tools and test equipment may relate to:	• test equipment:
	  • anti-static testers
	  • cable testers
	  • displacement tools
	  • humidity and temperature testers
	  • insulation testers
	  • load testers
	  • multimeters
	  • optical fibre power meters
	  • oscilloscopes
	  • tong meters
	  • volt meters
	• tools:
	  • anti-static wrist strap
	  • PC board or sub-rack removal tool
	  • pliers
	  • power drills
	  • screwdrivers
	  • sockets
	  • soldering irons
	  • spanners.

WHS and environmental requirements may relate	• decommissioning and isolating work site and lines before work begins • environmental considerations:

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to:	• clean-up protection • stormwater protection • waste management • identifying other services, including power and gas • safety equipment: • flashing lights • gas and other hazard detection equipment • safety barriers • trench guards • warning signs and tapes • witches hats • safe work practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • special access requirements • suitable light and ventilation.
Power distribution work may include:	• 240V rectifier panels • back-up motor generator set • certifying electrical installation • installation of power distribution panel and cables • termination and connection of power cables to equipment • testing of electrical cabling.
Qualified personnel may include:	• confined spaces worker • electrical contractor • internal electrician • lines worker • power company staff • track worker.
Labels and designations may include:	• cabinets • cables • distribution panels • racks • vendor labels.

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Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN4246A Design dense wavelength division multiplexing installations

Modification History

Release	Comments
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to design a dense wavelength division multiplexing (DWDM) system in optical networks.

Application of the Unit

Telecommunications technical staff who design systems for the installation of long haul or metropolitan area DWDM equipment apply the skills and knowledge in this unit.

This unit is one in a sequence of units that cover network design activities, including:

- design drawings and specifications
- designing a DWDM system
- designing infrastructure
- estimating and quoting
- site survey.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Nil

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Obtain access to work site safely and with authority from site owner	1.1 Obtain and review DWDM installation brief 1.2 Determine ***site*** access requirements 1.3 Notify parties if necessary to arrange access to site to discuss DWDM installation requirements 1.4 Assess site-specific safety requirements and enterprise work health and safety (WHS) processes and procedures
2. Prepare to install design DWDM units	2.1 Survey location for DWDM installation and scope the installation parameters 2.2 Identify suitable location for DWDM ***equipment racks*** 2.3 Determine number and location of shelves and cards in the racks 2.4 Determine capacity of the optical distribution frames (ODFs), patching and network management system (NMS) connections for the installation 2.5 Determine ***power feed options***
3. Design DWDM units and associated cabling	3.1 Design DWDM racks, including locations and layout 3.2 Examine standards, practices and requirements for designing DWDM systems 3.3 Design DWDM shelf and card positions from customer and manufacturer documents 3.4 Design supporting ***patch panel*** and jumpering schemes 3.5 Include appropriate ***ancillary equipment and connections***

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	in design specifications 3.6 Prepare detailed design drawings for racks, shelves and cards from manufacturer and carrier documents 3.7 Prepare detailed design drawings for patching, jumpering and power feeds from manufacturer and carrier documents
4. Review design for compliance with standards and legislation	4.1 Confirm that DWDM installation design meets the brief 4.2 Review installation design to ensure compliance with requirements of federal, state and local regulations, relevant ***legislation***, codes and standards

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to interpret technical documentation
- technical skills to:
  - assemble and secure standard telecommunications equipment rack, associated ironwork and optical fibre support ducting
  - clean optical fibre connector
  - examine optical fibre connector for contamination and assess whether cleaning is required
  - prepare and connect power and ground wires
  - use a digital multimeter to measure DC and AC voltage and to check continuity.
  -

Required knowledge

- DWDM principles of operation
- electrostatic discharge: implications and precautions
- optical fibre connector: types and characteristics
- optical fibre: types and characteristics
- principles of safe measurement of optical power from laser transmission systems
- specific WHS requirements that impact on the safe inspection of optical connectors.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • design a DWDM installation and associated cabling according to installation brief and installation site conditions • design DWDM system power and ground connections • complete and confirm installation design report.
Context of and specific resources for assessment	Assessment must ensure: • suitable site for DWDM equipment installation • access to tools and equipment required for installation • a range of optical fibres to suit the installation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate preparing designs for DWDM systems • review of DWDM designs prepared by the candidate • oral or written questioning of the candidate to assess knowledge of DWDM design practices.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTBWN3088B Install optical fibre splitters in fibre distribution hubs • ICTTEN3056A Install telecommunications network equipment. Aboriginal people and other people from a non-English

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	speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Site may include:	• optical add drop multiplexer (OADM) site • terminal site.
Equipment racks may include:	• 19 inch type • 23 inch type • 535 mm (ETSI rack) type.
Power feed options may include:	• battery options • earthing requirements • primary power sources • rectifier and transformer requirements • separations form other services.
Patch panels may include:	• rack mounted • wall mounted.

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Ancillary equipment and connections may include:	• air filter • alarm connections • C/L band splitter tray • cooling fan assembly • coupler tray • craft terminal • data communications connections • equaliser tray • ethernet hub • fibre management trays • optical attenuators • optical fibre patch cords • optical multiplexer • optical service channel tray • telemetry connections • variable optical attenuators.
Legislation may include:	• AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS – relevant codes • Australian building codes and regulations • cabling security codes and regulations • Comms Alliance (CA) standards and codes • relevant international standards where they are enforced • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Telecommunications Act and code of practice • WHS Acts and relevant codes and standards.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN5024A Provide consultancy and technical support in the customer premises equipment sector

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes skills and knowledge required to provide consultancy to a client wishing to install or upgrade telecommunications equipment on their premises. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technicians involved in planning and consultancy with organisations deploying converging technologies integrating data, wireless, optical and internet protocol (IP) networks apply the skills and knowledge in this unit. This unit applies to installation of cabling and equipment within customer premises in domestic, commercial or industrial installations. Communications applications include digital and analog, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN), and multimedia.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan to provide consultancy and technical support in the CPE sector	1.1. Obtain consultancy requirements from the client 1.2. Establish relationship with ***industry*** experts to maintain currency of latest industry innovations in the customer premises equipment (CPE) sector 1.3. Access sources of ***product and technical information*** relating to change and innovation 1.4. Access and evaluate latest data relating to change and innovation in the CPE sector for company use

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ELEMENT	PERFORMANCE CRITERIA
	within an appropriate timeframe
2. Assess customer needs	2.1. Develop knowledge and understanding of the client's business to provide an accurate solution according to the requirements 2.2. Investigate communication requirements including ***networks***, based on business needs and demands 2.3. Ascertain client's ***physical and financial parameters*** 2.4. Present reports and recommendations within client's timeframes
3. Provide consultancy and expert advice	3.1. Provide timely and accurate expert ***consultancy*** and advice to ***company staff and clients*** 3.2. Provide communication solutions that meet client's requirements and that meet ***relevant legislation***, ***codes***, ***regulations and standards*** 3.3. Provide alternative solutions for clients where their needs cannot be better met in an innovative way 3.4. Provide a report on advice and solutions that match both the physical and financial demands of the client 3.5. Consult with the client for an ***agreed solution***
4. Control and manage product and technical information	4.1. Provide all relevant personnel with the latest product and technical information 4.2. Monitor the information flow process to ensure that appropriate personnel have access to the latest data 4.3. Provide the client with final consultancy reports and recommendations

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with customers to ensure requirements are known and can be met within timeframes • literacy skills to interpret technical specifications and related documentation • numeracy skills to make calculations for dimensioning, cost and financial

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REQUIRED SKILLS AND KNOWLEDGE

considerations
• planning and organisation skills to make site access arrangements and plan and prioritise own work
• problem solving skills to develop communications solutions
• research skills to gain and maintain relevant and current technical product knowledge
• technical skills to:
  • interpret drawings related to customer's telecommunications equipment
  • provide expert advice on installation and upgrade
  • use databases and diagnostic equipment

Required knowledge
• common customer telecommunications applications and related equipment • connections to carrier infrastructure or equipment • current legislation relating to installation of telecommunications equipment and connection to carrier services • enterprise operations and policies • IP networks • new and emerging technologies • overview knowledge of customer premise equipment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• provide consultancy advice related to full range of CPE products including:
	  • product models and equipment types
	  • peripherals
	  • facilities including network facilities
	  • system features

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EVIDENCE GUIDE	
	• provide alternative solutions where customer's needs cannot be met precisely • prepare clear and concise reports to customers complete with recommendations and supporting data, including full financial considerations • provide regular updates to both company personnel and clients as to the latest product and technical information.

Context of and specific resources for assessment	Assessment must ensure:
	• site with:
	  • network or computer layout documentation and premises plans
	  • network components
	  • equipment specifications
	  • organisational guidelines
	  • business plan or model
	• relevant legislation.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking a practical exercise • review of reports completed by the candidate for different test examples and situations • oral or written questioning to assess knowledge of planning, types of systems and applications.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN5204A Produce technical solutions from business specifications. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Industry may include:	• communications • information technology • multimedia industries.

Product and technical information relates to:	• CPE product
	• facilities including:
	  • network facilities
	  • system features
	• peripherals
	• product models and equipment types.

Networks may be:	• external • internal • in Australia • overseas.

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RANGE STATEMENT	

Physical and financial parameters may include:	• physical parameters:
	  • building size
	  • equipment inventory
	  • new equipment requirement
	  • power requirements
	  • site access
	  • size of organisation
	  • staffing
	• financial parameters:
	  • capital expenditure
	  • current budget allocation
	  • current return on investment
	  • forecast fund allocation
	  • future return on investment
	  • operational costs.

Consultancy may be:	• direct to a customer • through a third party considering provision of consultant's company product • supported by explanatory documentation.
Company staff and clients may include:	• own or partner company staff • sales and technical staff.
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • Australian Standards AS 3901, 3902 • fire regulations • heritage legislation • International Standards ISO 9000, 9001

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RANGE STATEMENT	
	• OHS • Trade Practices Legislation.
Agreed solution includes:	• cost details • equipment requirements • procurements information • recommended vendors • return on investment (RoI) information.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5037A Design a telecommunications project

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to scope requirements, assess land site suitability, arrange acquisition of site and produce building design plans for a telecommunications building project. Building facilities include exchange building, call centre building, computer centre, mobile phone tower, cellular base station hut, radio transmitter and satellite station. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical design skills with organisational skills to apply planning principles for provisioning of the various building projects and technologies within a telecommunications network to meet future customer demands. Technical officers or engineers may be responsible for small projects or parts of larger projects and for the operational and engineering of the telecommunications network in general.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope design options	1.1. Determine the nature, purpose and type of the new ***facilities*** in the proposed project from project specifications obtained from planners 1.2. Analyse project brief to scope the requirements of the project and consider design options with consideration to ***legislation*** governing carriers in Australia 1.3. Evaluate design requirements to determine optimal

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ELEMENT	PERFORMANCE CRITERIA
	site selection for the project to house facilities 1.4. Arrange for an ***environmental impact study*** (***EIS***) to be conducted on the selected site with project requirements to assess the suitability of the site
2. Evaluate and arrange for land acquisition	2.1. Evaluate the findings of the EIS to determine the suitability of the land for the project 2.2. Prepare a justification report on a favourable EIS and consult affected property owners to establish a base for negotiation 2.3. Determine the potential for land ***acquisition or purchase*** from analysis of previously gathered data and EIS findings and ensure compliance with regulation from legislation
3. Analyse area and select design option	3.1. Analyse physical attributes of the area, possible ***environmental impacts*** and previously collected data to prepare design options 3.2. Prepare field sketch according to enterprise requirements and develop solutions to any obvious physical impediment to construction 3.3. Produce ***design options*** for the area that are viable for the enterprise and recommend a preferred option with justifications 3.4. Evaluate selection of preferred option to ensure that enterprise business strategy outcomes and policies are satisfied
4. Notify interested parties	4.1. Assess ***resources*** available for project implementation to ensure that works are within the enterprise's schedule 4.2. Notify ***interested parties*** of the type, extent and duration of the proposed works according to enterprise policy 4.3. Obtain all required written permission from interested parties and forward to those who will carry out the job
5. Produce design plan and documentation	5.1. Prepare ***design plan*** to enterprise requirements including relevant ***geographical and topological information*** 5.2. Indicate location and specification of works and network equipment accurately and clearly 5.3. Specify resources needed to undertake the project 5.4. Update ***enterprise information systems*** according to enterprise guidelines and industry practice

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ELEMENT	PERFORMANCE CRITERIA
	5.5. Produce a complete ***design report*** and present to management for approval

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to liaise with internal and external personnel on technical and operational matters
• literacy skills to read and interpret legislation, write reports and prepare design plan
• planning and organisational skills to plan, prioritise and monitor own work
• problem solving and contingency management skills to adapt requirements to particular building facilities
• research skills to interrogate databases and investigate different building services
• technical skills to:
  • evaluate design requirements
  • evaluate findings of EIS
  • scope requirements
  • use computer assisted design (CAD) software

Required knowledge
• Access Networks • Australian building codes and regulations • CAD software • Core Networks • Environmental Protection Act • heritage protection listings • EIS • legislation relevant to project • network performance and capacity • networks planning and procedures • site surveys • technological innovations and development • Telecommunications Act 1997

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • scope design options • recommend acquisition of land • prepare justification report including evaluation of EIS findings • produce design options • prepare completed building design plan for a telecommunications project.
Context of, and specific resources for assessment	Assessment must ensure: • sites on which projects may be designed • CAD drawing facilities • relevant databases, legislative requirements and other site and project related documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking design tasks • review of drawings, plans and specifications prepared by the candidate • oral or written questioning to assess knowledge of the design process • review of a completed building design plan for a telecommunications project prepared by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL4110A Evaluate the planning requirements for provisioning a telecommunications building facility • ICTNPL4111A Develop provisioning of

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EVIDENCE GUIDE	
	telecommunications building works project • ICTNPL4150A Apply knowledge of regulation and legislation for the telecommunications industry. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Facilities may include:	• call centre building • cellular base station hut • computer centre

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RANGE STATEMENT	
	• exchange building • mobile phone tower • radio transmitter • satellite station.
Legislation may include:	• ACMA technical standards • Australian building codes and regulations • Australian Communications Industry Forum (ACIF) standards and codes • Environmental Protection Acts • Telecommunications Act 1997.
Environmental impact study (***EIS***) may include:	• aboriginal sacred site • contaminated site • fauna • flora • heavily populated area • heritage protected site • mining • national parks • power lines • profile • protected species habitat • terrain.
Acquisition or purchase may be regulated by:	• enterprise policies • federal agencies • finance rules • local council • procurement rules.
Environmental impacts may include:	• access to site • drainage • environment • flood mitigation • habitats • heritage values • noise • power requirements • radio frequency (RF) radiation • seasonal changes • traffic generation • visual impact.

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RANGE STATEMENT	

Design options may refer to:	• building access
	• building structures
	• emergency evacuation provision
	• equipment
	• equipment floor plan
	• floor loadings
	• labour
	• material
	• rack layout
	• radio towers
	• services:
	  • air conditioning
	  • building alarm
	  • cable access
	  • emergency power plant
	  • fire services
	  • power
	• special requirements of equipment technologies
	• time.

Resources may include:	• funding • labour • major equipment and materials • support services • test equipment • time.
Interested parties may include:	• community groups • local councils • local residents and property owners • other service providers • state and federal agencies.
Design plan may include:	• air conditioning • cable access • cabling racks and trays • emergency power plant • equipment floor plan • equipment list • fire services • network alarm

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RANGE STATEMENT	
	• network management system • power • rack layout • radio towers • test equipment facility.
Geographical and topological information may include:	• dams • fences • flood prone • hazards • location of other services and plant • potential hazards • potential soil erosion areas • survey marks • water ways.
Enterprise information systems may be:	• hard copy • maps • plans • software database • text or image based.
Design report may include:	• analysis of design options • evaluation report of EIS findings • recommendations for preferred design options • site acquisition procedure.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5038A Design an electronic system for a telecommunications network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design additional telecommunications network equipment and assess compatibility with existing infrastructure. It includes processes for assessing need for additional equipment, such as voice over internet protocol (VoIP), biometric identification, radio frequency identification (RFID) and security system equipment. It involves checking specifications and compatibility with the network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit. This unit applies to a switching, transmission or radio network and the various transmission paths including cable, optical fibre, radio, microwave and satellite that support it.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate system needs	1.1. ***Determine need*** for ***additional electronic equipment*** from telecommunications project plan 1.2. Specify purpose of equipment and ascertain need for additional network equipment with ***customer***
2. Analyse network and select design option	2.1. Analyse ***possible impacts*** on network and network service requirements 2.2. Generate options for system design that are realistic for the enterprise and network

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ELEMENT	PERFORMANCE CRITERIA
	2.3. Evaluate and select preferred option based on enterprise business strategy outcomes, service policy and compliance with relevant legislation 2.4. Discuss and confirm selected option with customer
3. Assess system compatibility	3.1. Assess ***compatibility*** of each equipment unit and intended use with other installed units from system plans, equipment manuals, installation environment and industry knowledge 3.2. Modify design accordingly 3.3. Provide customer with design and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - manage unexpected configuration anomalies
- technical skills to:
  - analyse the impact of additional telecommunications equipment on the network
  - assess compatibility between existing and additional equipment
  - determine customer requirements and a design specification
  - identify the technical requirements, constraints and manageability issues for a given customer network requirement

Required knowledge

- electrical and optical properties to be measured
- integration, compatibility and interoperability of equipment
- legislation and licensing relevant to installation of telecommunications equipment including spectrum allocation

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REQUIRED SKILLS AND KNOWLEDGE
• power requirements and electrical safety • transmission type and signals that may be encountered

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate system need for additional electronic equipment and design options • analyse network and design systems • assess system compatibility.
Context of and specific resources for assessment	Assessment must ensure: • telecommunications network where additional equipment design may be conducted • relevant regulatory and equipment documentation that impact on electronic system design.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking network analysis and design • review of reports completed by the candidate • oral or written questioning to assess knowledge of types of systems and application and compatibility issues.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. Aboriginal people and other people from a non-English speaking background may have second language issues.

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EVIDENCE GUIDE	
	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Determine need may include:	• customer requirements • existing infrastructure • network growth forecasts • test results.

Additional electronic equipment may include:	• radio networks:
	  • fixed
	  • mobile
	• switching
	• various transmission paths:

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RANGE STATEMENT	
	• cable • microwave • optical fibre • radio • satellite • transmission.
Customer may include:	• a carrier • customer representative • internal organisational customer.
Possible impacts may relate to:	• age and construction • building facility location • distances between units and installations • impacts on existing services and customers • need for outages • ownership of installation site • site type.
Compatibility may relate to:	• electrical interfaces • protocols.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5058A Acceptance test new systems and equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to acceptance test telecommunications equipment. It involves the method of ensuring new system readiness through the application of appropriate inspections and tests to confirm compliance and performance. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit. This unit applies to switching, transmission, radio and internet protocol (IP) based networks and the various transmission paths. It also applies to carrier grade, enterprise grade or customer equipment.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to conduct acceptance testing	1.1. Obtain ***installation and commissioning documents*** and planning specifications from ***appropriate personnel*** to ensure the ***installed system*** is as planned and specified 1.2. Visually inspect new installation and verify compliance of the system against ***relevant legislation***, ***codes***, ***regulations and standards*** 1.3. Select and obtain required ***test equipment*** for suitability of acceptance testing 1.4. Prepare acceptance schedule and ***test criteria*** in consultation with appropriate personnel
2. Conduct acceptance	2.1. Undertake and analyse ***performance tests*** to ensure

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ELEMENT	PERFORMANCE CRITERIA
testing	measurements meet with predetermined specifications and approved operating margins 2.2. Verify performance levels to be within tolerance specifications 2.3. Test ***protection mechanisms*** to ensure performance criteria meets the specified standard 2.4. Test ***alarms*** for satisfactory operation 2.5. Refer identified problems to appropriate personnel for remedial action 2.6. Record all acceptance test procedures and results
3. Complete administrative tasks	3.1. Complete acceptance documentation including recommendations 3.2. Notify appropriate personnel and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test equipment settings and readings
- communication skills to:
  - liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
  - prepare reports and technical documentation
- literacy skills to interpret technical specifications, standards documents and related documentation
- numeracy skills to make calculations and necessary calibration changes
- planning and organisation skills to develop activity plans to undertake inspections and tests in efficient manner
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to correctly handle, connect and calibrate test equipment

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REQUIRED SKILLS AND KNOWLEDGE
Required knowledge
• cabling, terminations and supporting structures that may be encountered in the system under inspection • common performance levels and standards • electrical and or optical properties to be measured • occupational health and safety (OHS) issues appropriate to the environment under inspection • overview of typical network topologies, switching, routing and transmission techniques • transmission type and signals that may be encountered • various test equipment types suitable for tests to be made

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • inspect new installation and verify compliance against installation plans • prepare acceptance schedule and test criteria • undertake relevant acceptance tests and analysis against specified performance criteria complying with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites where acceptance tests may be conducted • use of testing equipment currently used in industry • relevant regulatory and equipment documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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EVIDENCE GUIDE	
	• direct observation of the candidate undertaking acceptance tests • review of reports and plans completed by the candidate for different scenarios and situations • oral or written questioning to assess knowledge of tests and inspections types of systems and applications • review of a completed acceptance documentation for systems and equipment prepared by the candidate including recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5059A Commission telecommunications network equipment • ICTTEN5092A Undertake planned outage management. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Installation and commissioning documents may include:	• agreed modifications to original design plan • commissioning test results • preliminary test results • recommendations from commissioning procedures.
Appropriate personnel may include:	• network manager • planning manager • project manager.
Installed system may include:	• Access Network • broadband access network • IP networks • radio network • switching • transmission • wireless access network.
Relevant legislation, ***codes***, ***regulations and standards*** include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • International Standards ISO 9000 and 9001 • International Telecommunications Union (ITU) standards • OHS • Privacy Act • private property law.
Test equipment may include:	• digital analysers • global system for mobiles (GSM) spectrum frequency synthesiser • optical fibre power meters • optical time domain reflectometer (OTDR) • protocol analysers • spectrum analysers.

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RANGE STATEMENT	
Test criteria may include:	• live traffic tests • normal and extreme load tests • test environment • test margins and errors.

Performance tests may include:	• compliance tests:
	  • electromagnetic compatibility (EMC)
	  • electromagnetic interference (EMI)
	• stability tests
	• transmission tests.

Protection mechanisms may include:	• uninterrupted power supply (UPS) • earth leakage breakers • earth protection • redundant standby equipment • software back up and restore.
Alarms may include:	• audible alarms • on-screen display and monitoring systems • visual indicators.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5059A Commission telecommunications network equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively inspect and test telecommunications network equipment. It includes processes for checking plans, obtaining and proper handling of equipment and supplies, testing procedures and administrative tasks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit in the installation of new, additional and replacement equipment. This unit may apply to switching, transmission and fixed and mobile radio network and the various transmission paths i.e. cable, optical fibre, radio, microwave and satellite.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for commissioning procedures	1.1. Prepare for work following occupational health and safety (***OHS***) ***requirements*** 1.2. Organise resources based on existing and potential site ***hazards*** 1.3. Notify ***network operations personnel*** for site access and network specifications 1.4. Determine from specifications the type and complexity of the ***network equipment*** 1.5. Establish commissioning dates and confirm with all parties 1.6. Determine commissioning parameters according to specification and establish ***planned outage*** if

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ELEMENT	PERFORMANCE CRITERIA
	required 1.7. Obtain ***test equipment*** and check for suitability and accuracy 1.8. Produce a preliminary commissioning plan according to manufacturer's instructions and company guidelines for discussion with the customer 1.9. Inform ***affected customers*** of impending action and likely timing and impact by the work
2. Organise planned outages if necessary	2.1. Negotiate outage times with appropriate groups and affected customers to minimise any disruptions 2.2. Develop ***contingency plans*** if required and arrange for emergency communications 2.3. Notify alarm management centre of action planned 2.4. Obtain authority to proceed from the relevant control centre and notify customers affected by the outage
3. Complete installation procedures of network equipment	3.1. Install applications programmes and management data according to specification to complete installation procedures 3.2. Complete all ***hardware connections*** according to commissioning instructions 3.3. Undertake all specified ***performance tests*** to ensure operation meets all prescribed parameters and specifications as detailed in the original design brief 3.4. Undertake tests to verify compatibility between the hardware and the software 3.5. Correct performance defects or bring to the attention of designers for corrective action
4. Complete commissioning procedures with network management	4.1. Test alarms in conjunction with network management and operational groups to maintain network integrity 4.2. Simulate traffic tests through the new installation to emulate a live network 4.3. Test installed specific equipment features and operations administration maintenance system according to instructions 4.4. Diagnose, repair or escalate faults detected to the appropriate area when fault cannot be clearly diagnosed or repaired 4.5. Initiate vendor related tests where required
5. Finalise	5.1. Complete ***administrative tasks*** as required by

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ELEMENT	PERFORMANCE CRITERIA
commissioning tasks	enterprise 5.2. Undertake operational staff training where required 5.3. Restore site to customers satisfaction 5.4. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test equipment settings and readings
- communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- numeracy skills to make calculations and evaluate test results
- problem solving to account for unexpected faults or equipment configuration anomalies
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - correctly test and carry out commissioning procedures
  - use hand tools for removing and securing equipment covers

Required knowledge

- electrical and or optical properties to be measured
- extensive range of networking equipment
- legislation and licensing surrounding installation of telecommunications equipment including spectrum allocation
- network operation procedures
- power requirements and electrical safety
- transmission type and signals that may be encountered

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REQUIRED SKILLS AND KNOWLEDGE
• various test equipment types suitable for tests to be made

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • interact with enterprise personnel, customers and other contractors keeping a customer focus and consideration of customer needs • produce outage management plan and contingency plan • negotiate activity on the network and timing of commissioning • commission networking equipment to plan or specification • implement test plan, and interpret and analyse results against expected outcomes • test alarms and alarm regime • analyse faults, problems and anomalies and provide solutions • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites on which installation and commissioning procedures can be conducted • relevant regulatory and equipment documentation that impact on commissioning • use of testing equipment currently used in industry.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate completing

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EVIDENCE GUIDE	
	commissioning procedures of network equipment • review of reports completed by the candidate outlining test plan and test results complete with analysis of faults with solutions • oral or written questioning to assess knowledge of commissioning procedures and types of systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN5058A Acceptance test new system and equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different

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RANGE STATEMENT	
work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

OHS requirements may relate to:	• identifying other services, including power and gas
	• need for decommissioning and isolate worksite and lines prior to commencement
	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • leather
	  • plastic
	  • rubber
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses for laser work
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• safety equipment
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• special access requirements
	• suitable light and ventilation.

Hazards may include:	• earth potential rise (EPR): • event at a site, such as an electrical

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RANGE STATEMENT	

	distribution substation, may expose telecommunications personnel, users or plant to hazardous voltages
	• optical fibre cable:
	  • bare fibres
	  • hazardous laser light
	• radio frequency (RF) equipment emitting radiation
	• remote power feeding services which operate at above telecommunications network voltage (TNV).

Network operations personnel may include:	• alarm operations • network operations centre staff • network operations manager • project manager.

Network equipment may include:	• broadband
	• cellular radio
	• computer network:
	  • gateways
	  • router
	  • servers
	  • switches
	  • voice over internet protocol (VoIP)
	  • wireless local area network (LAN)
	• multiplexing
	• network management
	• optical transmission
	• switching
	• transmission.

Planned outage may relate to:	• allocation of additional services and support
	• notification to affected customers
	• plan for:
	  • redundant path
	  • standby equipment.

Test equipment may include:	• adaptors • analog transmission measuring sets • communication system analysers • digital analysers • error meter

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RANGE STATEMENT	
	• global system for mobiles (GSM) spectrum frequency synthesiser • lap top computer • laser source • microwave link analyser • modulator tester • multimeters • optical attenuators • optical fibre power meters • oscillator • oscilloscopes • optical time domain reflectometer (OTDR) • pattern generators • power meters • RF band noise measurer • RF microwave test sets • RF sweep tester • spectrum analysers • sweep test coaxial and wave guide antenna systems • standing wave ratio (SWR) meters • transmitter/receiver filter combiner equipment.
Affected customers may include:	• building owner • communications consultant • contractor to a major supplier • end users • equipment owner • operations staff.

Contingency plans may include:	• additional notification to affected customers
	• provision of:
	  • additional services
	  • additional technical support
	  • redundant path
	  • standby equipment.

Hardware connections may refer to:	• connecting equipment to the appropriate transmission bearers with distant end notification • checking alarms associated with the bearer and infrastructure • installing artificial links and dismantle on

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RANGE STATEMENT	
	completion of the commissioning process.
Performance tests may include:	• bit error rate (BER) • crosstalk • impedance • loopback • power level • return loss • wire maps.
Administrative tasks may refer to:	• checking correct labelling of all equipment and amending • completing job orders and submitting to appropriate enterprise organisational unit • completing test sheets and logging test instrument usage • following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • recording test results and updating appropriate data bases • tasks complying with enterprise requirements and policy • updating design specifications and returning to design area.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5060A Integrate new systems and equipment into the telecommunications network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to integrate new telecommunications equipment into an existing installation over a number of phases. It involves procedures to ensure operability of the system while minimising impact on affected customers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from telecommunications carriers, contractors or other service providers apply the skills and knowledge in this unit. It involves the installation of new, additional and replacement equipment in telecommunications systems and networks, including support and administrative infrastructures. It particularly applies to integration of new and emerging internet protocol (IP) based technologies.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan integration strategy	1.1. Determine the nature and scope of the integration activity of the ***systems*** from ***appropriate personnel***
	1.2. Prepare an ***integration management plan*** in agreement with appropriate personnel
	1.3. Obtain ***outage management plan*** if available otherwise prepare a ***contingency plan*** to ensure the system integration according to plan
	1.4. Identify affected systems, ***traffic*** and ***customers***

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ELEMENT	PERFORMANCE CRITERIA
	1.5. Notify alarm management centre of action planned and obtain authority to proceed 1.6. Notify customers affected by the outage of time and likely duration
2. Integrate and test new system in the network	2.1. Plan and conduct activities over a set of integration phases in a safe manner and according to the integration management plan 2.2. Load operational software according to specification to ensure interoperability of new and existing system 2.3. Undertake ***tests*** by simulating network traffic and ensure test results are recorded and stored according to enterprise requirements 2.4. Analyse test results and ensure that the parameters established have all been met 2.5. Evaluate problems during testing phase and rectify or escalate procedure 2.6. Analyse ***alarms*** for fault conditions in conjunction with network management centre 2.7. Locate and detect faults within capability or escalate according to enterprise policy 2.8. Check operations administrative maintenance system and alarms are connected according to instruction manual 2.9. Activate new alarms and deactivate old alarms
3. Complete administrative tasks	3.1. Complete integration records according to manufacturer's specification and enterprise policy and make recommendations for improvement for planning 3.2. Notify project completion to appropriate personnel and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to interpret test equipment settings and readings

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REQUIRED SKILLS AND KNOWLEDGE

• communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
• literacy skills to interpret technical specifications and related documentation
• numeracy skills to make calculations and necessary calibration changes
• planning and organisation skills to arrange site access and equipment delivery
• problem solving skills to account for unexpected faults
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • load software
  • locate and detect faults
  • simulate network traffic
  • test and diagnose faults in new technologies
  • undertake tests

Required knowledge
• connections to carrier infrastructure or customer interface units (CIU) • electrical and or optical properties to be measured • OHS considerations, including electrical, optical and electromagnetic radiation (EMR) safety • telecommunication network equipment and emerging technology networks • test equipment types suitable for tests to be made • typical performance parameters and faults that may be encountered in network equipment and related connection and transmission media

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop a contingency plan • implement an integration management plan • test systems and equipment and associated features being integrated • apply enterprise escalation and outage procedures • negotiate procedures and activity on the network and timing of integration • integrate new systems and equipment to plan and specifications.
Context of and specific resources for assessment	Assessment must ensure: • a network and equipment for integration • equipment and systems manuals, specifications and enterprise policy.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking integration and testing of new systems and equipment • review of test results and records completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5061A Cut over new and replacement network equipment. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally

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EVIDENCE GUIDE	
	appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Systems may include:	• billing network • cabling network • computer network • control systems • network management • radio network • security network • switching • transmission • wireless access network.
Appropriate personnel may include:	• network manager • planning manager • project consultant • project manager • vendor contact.

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RANGE STATEMENT	

Integration management plan may include:	• additional resources
	• deployment strategy in phases
	• integration activities:
	  • address interoperability issues
	  • install new system and equipment
	  • test new system and equipment
	• integration processes
	• risks
	• roles and responsibilities of personnel
	• software tools
	• system outage
	• test hardware
	• vendor input
	• vendor support
	• vendor warranty.

Outage management plan may include:	• alternate transmission path • contingency plan • customers affected • emergency communications • integration plan • outage duration • outage times • parts of network affected • system back up • systems affected.
Contingency plan may include:	• network operations notified • redundancy backup solution • system expert on standby • vendor on standby.
Traffic may refer to:	• call attempts • call holding times • call volumes • circuit occupancy • data throughput in bits • frames, active sessions • packet volumes.
Customers may include:	• contractor • end users • other divisions of the company

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RANGE STATEMENT	
	• small, medium or large organisations • vendor or supplier • wholesale service providers.

Tests may include:	• alarms
	• end to end tests
	• performance:
	  • bit error rate (BER)
	  • data transmission
	  • quality of service (QoS)
	• regression
	• system recovery
	• traffic flow simulation:
	  • congestion
	  • delay
	  • packet loss.

Alarms may include:	• audible alarms • on-screen alerts in computer-based performance monitoring systems • visual indicators.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5061A Cut over new and replacement network equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively cut over and test telecommunications network equipment in a short period of time. It includes processes for checking plans, obtaining equipment and supplies, testing procedures and administrative tasks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit. It involves the fast change over of new and existing equipment in telecommunications networks including digital switching and transmission, wireless and optical networks. It particularly applies to integration of new and emerging internet protocol (IP) based technologies.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan the cut over strategy	1.1. Determine the nature and scope of the cut over activity from ***appropriate personnel***
	1.2. Prepare a ***cut over management plan*** in agreement with appropriate personnel
	1.3. Obtain ***outage management plan*** if available otherwise prepare a ***contingency plan*** to ensure the

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ELEMENT	PERFORMANCE CRITERIA
	system integration proceeds according to plan 1.4. Notify alarm management centre of action planned and obtain authority to proceed 1.5. Notify ***customers*** affected by the outage of time and likely duration
2. Cut over and test equipment into service	2.1. Perform cut over activities in a safe manner with minimal interruption to service and according to the cut over management plan 2.2. Conduct ***tests*** specified in the cut over plan according to technical manuals and specifications 2.3. Record and assess test results and ensure problems identified during cut over are rectified or escalated according to enterprise procedures 2.4. Analyse alarms for fault conditions in conjunction with network management centre 2.5. Enact contingency plans in the event of major problems during cut over
3. Complete administrative tasks	3.1. Complete test result sheets and hand over to operational personnel according to enterprise requirements 3.2. Ensure site is cleaned and ready for operational staff 3.3. Complete work documentation and administrative tasks and forward to the appropriate area according to enterprise policy 3.4. Notify project completion to appropriate personnel and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to interpret test equipment settings and readings • communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes • literacy skills to interpret technical specifications and related documentation • numeracy skills to make calculations and necessary calibration changes

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REQUIRED SKILLS AND KNOWLEDGE

• planning and organisation skills to make site access and equipment delivery arrangements
• problem solving skills to account for unexpected faults or equipment configuration anomalies
• safety awareness skills to:
  • apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  • select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  • work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
• technical skills to:
  • analyse alarms
  • conduct tests
  • correctly handle, connect and calibrate test equipment
  • perform cut over activities

Required knowledge
• electrical and optical properties to be measured • legislation and licensing surrounding installation of telecommunications equipment • power requirements and electrical safety • test equipment types suitable for tests to be made • transmission hierarchy and switching principles • transmission type and signals that may be encountered

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop a contingency plan • implement a cut over plan and an outage plan

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EVIDENCE GUIDE	
	• apply enterprise escalation and outage procedures • cut over and test network equipment within an industry acceptable time period.
Context of and specific resources for assessment	Assessment must ensure: • a network and equipment for cut over • equipment currently used in industry • systems manuals, specifications and enterprise policy.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking cut over preparations and processes • review of cut over test results and records completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5060A Integrate new systems and equipment into the telecommunications network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those

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EVIDENCE GUIDE	
	required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate personnel may include:	• network manager • planning manager • project consultant • project manager • vendor contact.

Cut over management plan may include:	• additional resources
	• cut over activities:
	  • address interoperability issues
	  • install new system and equipment
	  • test new system and equipment
	• integration processes
	• rapid deployment strategy
	• risks
	• roles and responsibilities of personnel
	• software tools
	• system outage
	• test hardware
	• vendor input
	• vendor support
	• vendor warranty.

Outage management plan may include:	• alternate transmission path • contingency plan

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RANGE STATEMENT	
	• customers affected • cut over plan • emergency communications • outage duration • outage times • parts of network affected • system backup • systems affected.
Contingency plan may include:	• network operations notification • redundancy backup solution • system expert on standby • vendor on standby.
Customers may include:	• contractor • end users • other divisions of the company • small, medium or large organisations • vendor or supplier • wholesale service providers.

Tests may include:	• alarms
	• end to end
	• performance:
	  • bit error rate (BER)
	  • data transmission
	  • quality of service (QoS)
	• traffic flow:
	  • congestion
	  • delay
	  • latency
	  • packet loss.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5083A Locate, diagnose and rectify complex faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to locate, diagnose and rectify complex faults in telecommunications networks and equipment. It includes identification of faults in upstream or downstream services that may require involvement of third party providers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Telecommunications officers, installers, maintenance staff and manufacturer or equipment specialists apply the skills and knowledge in this unit. It may be applied by those in advisory roles and technical rectification roles. Networks include cabling, customer premises equipment (CPE), Access, telephony, broadband deployment, local area networks (LAN), wide area networks (WAN) and internet protocol (IP) networks for enterprise and customer systems and installations.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to locate and rectify complex faults	1.1. Prepare for given work according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Notify ***client*** to arrange access to site 1.3. Obtain report of any action taken by first fault repairer and subsequent result 1.4. Obtain fault history to establish any fault patterns 1.5. Obtain all available data on the ***system equipment*** to assist with fault diagnosis 1.6. Develop strategies for identification and repair in discussion with ***other engineering and technical personnel*** 1.7. Obtain ***tools*** and ***test equipment*** relevant to the

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ELEMENT	PERFORMANCE CRITERIA
	identified system type and fault 1.8. Set up equipment according to manufacturer's specifications and reconfigure as required
2. Locate and diagnose faults	2.1. Use methodical work practice suitable for system and problem type to identify ***system fault*** 2.2. Isolate and ***test*** fault progressively to remove likely variables from assessment and record test results 2.3. Refer faults that may involve third party ***services*** if required 2.4. Diagnose fault in the shortest time possible with minimum inconvenience to other client activity 2.5. Provide regular progress reports to client 2.6. Raise fault identification to a national support level within a specified timeframe if required 2.7. Undertake guidance from national support in fault diagnosis as required 2.8. Negotiate any necessary system downtime with the client
3. Rectify fault	3.1. Determine options to rectify fault including any system downtime and present to client for decision 3.2. Rectify fault totally, partially or provide temporary solution 3.3. Replace or repair faulty parts or equipment according to service agreement 3.4. Reprogram equipment as required 3.5. Dismantle and remove any temporary service in a safe and efficient manner where appropriate 3.6. Perform repair under national support guidance as required 3.7. Perform routine checks to identify likelihood of further or likely problems 3.8. Rectify any further problems identified or bring to the attention of the customer for decision on further action necessary
4. Clean up worksite and complete records	4.1. Produce a report on fault diagnosis and rectification 4.2. Remove and dispose of waste and debris from worksite according to ***environmental requirements*** 4.3. Ensure changes made to the work area during fault repair are restored to the client's satisfaction 4.4. Complete all ***records***, explain and justify faults and rectification action taken

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - listen and liaise with clients on technical and operational matters
  - negotiate with other repairers and support staff
  - raise occupational health and safety (OHS) matters
- literacy skills to:
  - explain and justify faults and rectification actions
  - incorporate technical language into written tasks such as records and reports
  - interpret technical documentation and standards
- numeracy skills to interpret technical data, such as specifications of equipment operations
- problem solving skills to apply methodology in fault diagnosis
- research skills to access technical information and sources to assist fault identification
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to select and use appropriate methods for fault identification and rectification

Required knowledge

- fault escalation procedures
- fault finding techniques and of test equipment
- fault types and rectification
- safety requirements and standards
- service agreements
- types of networks and equipment:
  - Access
  - broadband deployment

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REQUIRED SKILLS AND KNOWLEDGE
• cabling • CPE • IP networks for enterprise and customer systems and installations • LAN • telephony • WANs • workplace environment and practices

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • methodically analyse fault details and diagnose potential faults • conduct advanced tests to determine complex network fault • isolate and locate the fault logically • rectify faults using appropriate organisational procedures and OHS requirements • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment of this unit requires: • sites on which fault diagnostics may be conducted • use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on complex fault repairs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate applying safety aspects to the locating and rectifying the faults

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EVIDENCE GUIDE	
	• oral or written questioning of the candidate to assess knowledge of types of faults and implications • evaluation of report prepared by the candidate including test result interpretation • written reports prepared by the candidate outlining fault rectification methodologies and recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5058A Acceptance test new systems and equipment • ICTTEN5059A Commission telecommunications network equipment • ICTTEN5092A Undertake planned outage management. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes
	• AS Communications Cabling Manual (CCM) Volume 1
	• AS/NZS 3000:2007
	• AS/NZS 3080:2003 - Telecommunications Installations - Generic cabling for commercial premises, clause 10.3.2 includes:
	  • colour codes used to identify the various types of fibre
	  • signals these cables would normally carry
	• AS/NZS 3084:2003
	• AS/NZS 3085.1:2004
	• AS/NZS ISO/IEC 14763.3:2007
	• AS/NZS ISO/IEC 15018:2005
	• AS/NZS ISO/IEC 24702:2007
	• cabling security codes and regulations.
	• OHS
	• regulated or industry codes of practice including appropriate Australian Communications and Media Authority (ACMA) technical standards
	• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.

Client may include:	• enterprise personnel • fault centre • network operations centre staff • reporter of fault • site manager.
System equipment may include	• asynchronous transfer mode (ATM) or frame relay (FR) switch • carrier network • CPE network

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RANGE STATEMENT	

	• gateways
	• multiplexing
	• optical transmission
	• radio network equipment
	• routers
	• servers
	• transmission paths:
	  • cable
	  • microwave
	  • optic fibre
	  • radio
	  • satellite
	• wireless broadband.

Other engineering or technical personnel may include:	• carrier or service provider staff • electrical contractor • equipment manufacturer • equipment supplier • external customer • on site operation staff.
Tools may include:	• adaptors • laser source • light meter • optical attenuators • transmitter or receiver filter combiner.
Test equipment may include:	• analogue transmission measuring sets • cable tester • digital analysers • error meter • frequency measurer • global system for mobiles (GSM) spectrum frequency synthesiser • microwave link analyser • modulator tester • multimeters • network management set • optical fibre power meters • optical time domain reflectometer (OTDR) • pattern generators • portable computer

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RANGE STATEMENT	
	• power meters • protocol analysers • radio frequency (RF) band noise measurer • RF microwave test sets • RF sweep tester • spectrum analysers • sweep tester for coaxial • standing wave ratio (SWR) meters • time domain reflectometer (TDR) • video tester.
System fault may include:	• 'out of specification' faults • dynamic loops • intermittent performance problems • latency • network dropout • severe cable or transmission path damage • system configuration problems • system equipment failure or partial failure • traffic congestion.

Test may include:	• bit error rate
	• equipment self diagnostics
	• protocol analysis
	• return loss
	• signal level:
	  • electrical
	  • optical
	  • RF
	• signal to noise
	• TDR
	• test data (ping)
	• testing functionality of:
	  • individual equipment
	  • system
	  • transmission paths, including egress or ingress via third party provider services.

Services may include:	• ATM interface • fibre to premises equipment • hybrid fibre coaxial (HFC) cable and modem • ISDN (PRA) interface unit

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RANGE STATEMENT	
	• microwave equipment • satellite receiver • synchronous digital hierarchy (SDH) interface • telephone line • wireless modem • wireless transceiver equipment.
Environmental requirements include:	• clean-up management • dust • noise • waste management.
Records may include:	• service agreement • trouble ticket • work order • written site log.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5084A Provide expert advice and support on complex faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to provide expert advice and support on complex faults on cabling and customer premises equipment (CPE). It involves a methodical approach to the diagnosis of complex faults and organising repair or replacement of defective parts or equipment. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Telecommunications officers, installers, maintenance staff and manufacturer or equipment specialists apply the skills and knowledge in this unit. This unit may be applied by those in advisory roles and technical rectification roles. Networks include cabling, CPE, Access, telephony, broadband deployment, local area networks (LAN), wide area networks (WAN) and internet protocol (IP) networks for enterprise and customer systems and installations. This unit may be applied to domestic, commercial or industrial installations.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Establish background information	1.1. Notify ***client*** to identify ***type of fault*** and occurrence 1.2. Obtain report of any action taken by first fault repairer and subsequent result 1.3. Analyse fault history in order to establish any ***fault patterns*** including questioning personnel involved in ***previous fault repair*** if relevant

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ELEMENT	PERFORMANCE CRITERIA
	1.4. Develop strategies for identification and repair using advice from ***other engineering and technical personnel***
	1.5. Refer to ***relevant legislation***, ***codes***, ***regulations and standards*** relating to repair
	1.6. Inform customer of issues and possible solutions
2. Undertake fault diagnostic	2.1. Isolate fault progressively using a ***fault identification approach*** to remove likely variables from assessment
	2.2. ***Identify fault*** in the shortest time possible or escalate to appropriate level
	2.3. Seek back up support from the product manufacturer when required
3. Organise fault rectification	3.1. Determine options to ***rectify fault***, including any downtime and present to customer for decision
	3.2. Replace or repair defective parts or equipment according to service agreement
	3.3. Reprogram equipment as required
	3.4. Complete work in a manner which is safe both to the repairer and to the customer
	3.5. Dismantle and remove temporary service in a safe and efficient manner where appropriate
	3.6. Provide on site repair staff with clear and precise instructions on fault rectification where appropriate
4. Document fault details	4.1. Record details of fault and actions taken to both find and repair and store for future reference
	4.2. Advise product manufacturer of fault and repair details if applicable
	4.3. Recommend changes to product/product model design where appropriate
	4.4. Advise client and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE
Required skills

• communication skills to liaise with internal and external personnel on technical and operational matters
• literacy skills to interpret technical documentation, equipment manuals and specifications
• numeracy skills to take and analyse measurements
• planning and organisational skills to organise and maintain equipment
• problem solving skills to solve equipment and logistics problems
• task management skills to work systematically with required attention to detail and adherence to all safety requirements
• technical skills to:
  • interpret drawings related to customer's telecommunications equipment
  • provide expert advice on fault clearance
  • use databases
  • use diagnostic equipment

Required knowledge
• features and operating requirements of test equipment • information required to operate remote diagnostic equipment according to a test specification • legislation, codes of practice and other formal agreements that impact on the work activity • manufacturer's requirements for effective operation of equipment • specific occupational health and safety (OHS) requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur on site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• methodically identify and rank likely causes of faults
	• analyse and interpret test results
	• apply enterprise escalation and outage procedures
	• prioritise fault rectification in a timely manner and report progress
	• organise repair of fault and conduct of tests to verify outcomes
	• prepare documentation of fault:
	  • nature
	  • location
	  • likely causes
	  • repair methodology
	  • recommendations relating to system redesign or specification.

Context of, and specific resources for assessment	Assessment must ensure: • sites on which fault diagnostics may be conducted • use of testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on complex fault repairs.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of a complex CPE fault project completed by the candidate • review of an oral and written report with completed documentation • direct observation of the candidate providing expert advice and support on complex CPE faults.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5083A Locate, diagnose and rectify complex faults. Aboriginal people and other people from a non-English speaking background may have second language issues.

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EVIDENCE GUIDE	
	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Client may include:	• asset owner • government department • private organisation • small or medium enterprise (SME).
Type of fault may include:	• compatibility • equipment • level 2 or level 3 • network • software • system.

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RANGE STATEMENT	
Fault patterns are either:	• of a spurious nature and have failed to be fixed or detected either remotely or on site • of a recurring nature and previous efforts to repair have failed.

Previous fault repair may include:	• atmospheric conditions
	• bad connections
	• building works
	• equipment failure
	• faulty circuit board
	• faulty parts
	• incorrect terminations
	• jumpering
	• near end crosstalk
	• operator error
	• other likely fault areas:
	  • building cabling (including main distribution frame (MDF))
	  • carriers
	  • external cable
	  • MDF jumpers
	• power supply
	• program errors
	• recent additions to system
	• software problems
	• time of fault.

Other engineering or technical personnel may include:	• carrier or service provider staff • electrical contractor • equipment manufacturer • equipment supplier • external customer • on site operation staff.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) electromagnetic radiation (EMR) standard • Australian building codes and regulations • Australian standards

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RANGE STATEMENT	
	• enterprise standards • environmental protection • equipment standards • fire regulations • heritage legislation • international standards • intrinsically safe lightning protection • local government • OHS • Radcoms Act • site engineering standard • Telecoms Act • WIs, CIs, business operating procedures (BOPs), radiocommunications assignment and licensing instructions (Ralis), assignment guidelines, spectrum planning reports.

Fault identification approach may include:	• level 1:
	  • first in network maintenance
	  • has a time specification for fault identification (approx 1 hour)
	• level 2 maintenance or repair:
	  • usually involves a higher skilled operator
	  • level of maintenance or repair applies when the fault cannot be located within the specified first in maintenance timeframe or where the fault is intermittent or recurring
	• level 3:
	  • usually located at a national level within a company
	  • very highest level of skill is required at this level
	  • work on faults that cannot be located or fixed at the first two levels - spurious faults
	  • fault location and identification is usually undertaken remotely from the site using the on site repair person to undertake the work
	• using fault finding methodology
	• using available data:
	  • customer and repairer questioning details
	  • customer records
	  • details of system checks

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RANGE STATEMENT	
	• equipment/product manuals • log books • software program • test data • using customer's specifications and system documentation: • contract document • specification schedules • system configuration diagrams and site installation records • floor distributor panel (FDP) log book data • intermediate distribution frame (IDF) • MDF • system program.
Identify fault is most often undertaken:	• as part of a service agreement: • maintenance agreements between communication companies and their clients • on a fee for service basis as agreed with a client: • usually involve charges relating to labour and parts • remotely from the customer premises using resident fault repairers to undertake the actual work • under warranty as specified by the equipment manufacturer or supplier.
Rectify fault may include:	• component replacement • equipment reprogram • functionality tests • repair • replacement and/or modification • software redesign • visual inspections.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5092A Undertake planned outage management

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake planned outage management in telecommunications networks resulting from maintenance, network upgrades or cut overs. It involves strategies for dealing with customers, operational staff and associated system restoration. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff who manage planned outages resulting from network maintenance and upgrades apply the skills and knowledge in this unit. It involves the management of planned outages resulting from the fast change over of new and existing equipment in telecommunications networks including digital switching and transmission, wireless and optical networks. It is particularly relevant to integration of new and emerging internet protocol (IP) based technologies.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for implementation of planned outage	1.1. Determine the requirements and purpose of the ***outage*** from the ***outage plan*** obtained from ***relevant personnel*** 1.2. Analyse all ***relevant data*** to determine the ***likely impact*** of the outage on clients and the network 1.3. Notify customer of outage work and disruption to service 1.4. Prepare for contingencies according to the

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ELEMENT	PERFORMANCE CRITERIA
	contingency plan as specified in the outage plan
2. Implement planned outage	2.1. Conduct and monitor outage work as prescribed and implement contingency plan if required 2.2. Restore system to normal operational status and conduct performance tests of the system according to specifications 2.3. Analyse test results and certify system is operating to manufacturer's specifications 2.4. Notify relevant personnel of competed outage work and of service restoration
3. Undertake administrative tasks	3.1. Document problems that occurred during outage or restoration of service and report these as continuous improvement according to enterprise ***quality assurance*** policy 3.2. Complete required ***documentation*** and update records to reflect any changes made in the course of service restoration according to enterprise policy

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test equipment setups, settings and instrument readings
- communication and negotiation skills to liaise with customers and technical staff to ensure service level agreement requirements are known and can be met within timeframes
- literacy skills to read and interpret technical specifications and related documentation
- numeracy skills to make calculations and necessary calibration changes
- planning and organisation skills to implement outage management plan and contingency plan
- problem solving skills to account for unexpected faults or equipment configuration anomalies
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities

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REQUIRED SKILLS AND KNOWLEDGE
• work systematically with required attention to detail without injury to self or others, or damage to goods or equipment • technical skills to correctly handle, connect and calibrate test equipment
Required knowledge
• electrical and optical principles • legislation and licensing surrounding installation of telecommunications equipment • power requirements and electrical safety • protection switching • telecommunications networks • test equipment types suitable for tests to be made • transmission hierarchy and switching principles • transmission type and signals that may be encountered

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement outage plan, complying with service assurance guidelines and all related OHS requirements and work practices • conduct performance tests to verify normal operation.
Context of and specific resources for assessment	Assessment must ensure: • sites on which outage management may be conducted • use of testing equipment currently used in industry • manufacturer's and enterprise equipment documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate conducting

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EVIDENCE GUIDE	
	performance tests to verify normal operation • review of outage plans completed by the candidate for different scenarios and situations • oral or written questioning to assess knowledge of likely impact of outage on both the customer and the network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5061A Cut over new and replacement network equipment • ICTTEN6044A Coordinate fault rectification and restoration of service following network outages. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Outage may include:	• loss of service to customers • planned outage due to network upgrade or maintenance • service level agreements • unplanned outage due to a network fault.
Outage plan may include:	• affected parties • contingency plan • impact analysis • network operations centre (NOC) role • restoration • systems to be shut down • timelines.
Relevant personnel may include:	• design engineer • NOC • project manager.
Relevant data may include:	• alarm conditions • client reports • environmental factors • historical data • industry and vendor profile • NOC reports • service level degradation • technical reports • test results from remote interrogation.

Likely impact may include:	• customer impact:
	  • disruption of service
	  • intermittent performance
	  • loss of service and revenue
	• network impact:
	  • congestion
	  • drop out
	  • errors

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RANGE STATEMENT	
	• excessive latency • limited coverage • no transmission • poor grade of service • poor signal quality • routing problems.

Contingency plan may include:	• additional notification to affected customers
	• provision of:
	  • additional services
	  • additional technical support
	  • redundant path
	  • standby equipment.

Quality assurance may include:	• acting on logs, reports and other data to guide ongoing quality improvements • updating logs and completing reporting on installation or maintenance activities.
Documentation may include:	• completing job orders and submitting to appropriate enterprise organisational unit • completing test sheets according to specification and logging test instrument usage • following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • recording test results and updating appropriate data bases • updating design specifications and returning to design area as required by enterprise requirements.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5147A Administer a data communications network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to manage and administer a data communications network in a local area network (LAN) or wide area network (WAN). The activity may involve new facilities and applications for an existing network or new infrastructure for convergence to Next Generation Networks (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who administer a data communications network (LAN or WAN) apply the skills and knowledge in this unit. It may make use of enterprise procedures and flow charts, third party test routines analysing performance and functionality of a live data communications network.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Install and configure a network	1.1. Prepare the physical and logical structure of a LAN design to resolve hardware and software compatibility conflicts 1.2. Prepare file server and install ***network*** server ***software*** 1.3. Execute workstation boot procedures and verify network and work station functionality 1.4. Document network physical connections and workstation characteristics
2. Set up network facilities	2.1. Configure set-up procedures for a network print server, network printer and a shared file system 2.2. Connect a bridge or router between two networks

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ELEMENT	PERFORMANCE CRITERIA
	2.3. Set up a gateway for a network 2.4. Set up a logical disk or volume structure
3. Administer user accounts	3.1. Create a user account and a user log script 3.2. Produce a document of network users for notification of their access rights and privileges 3.3. Add and delete users to maintain an update user list 3.4. Establish disk quotas for users 3.5. Develop common user security procedures and set up user profiles
4. Install common applications	4.1. Install and configure an ***application*** in client-server mode 4.2. Establish security and multiple access to an application 4.3. Set up and configure an email client and a browser for the client
5. Install and configure systems applications	5.1. Configure a ***backup system*** for redundancy according to customer policy 5.2. Administer disk fault tolerance and redundancy techniques
6. Maintain system integrity	6.1. Implement system integrity and system monitoring techniques to provide a reliable customer data network 6.2. Use diagnostic software to detect and isolate system faults 6.3. Produce a report to the customer on the network performance and fault occurrence with recommendations for improving the integrity of the data communications network

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical and operational matters

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REQUIRED SKILLS AND KNOWLEDGE

• literacy skills to interpret technical documentation, such as software and hardware manuals and specifications and relevant enterprise policy and documentation
• numeracy skills to take and analyse measurements
• planning and organisational skills to organise testing and contingency plans
• problem solving skills to solve software, hardware and logistics problems
• safety awareness skills to follow occupational health and safety (OHS) requirements and work practices
• task management skills to work systematically with required attention to detail
• technical skills to:
  • set up data communications network
  • use third party diagnostic programs and equipment and perform fault clearance.

Required knowledge
• features and operating requirements of data communications software and hardware for network systems • manufacturer's requirements of testing software and equipment • specific OHS requirements relating to the activity and site conditions • test methods and performance requirements • typical issues and challenges that occur when administering a data communications network

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • establish and configure a data communications network • set up and maintain systems, facilities, applications, and software • administer user accounts • diagnose and isolate system faults.

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EVIDENCE GUIDE	
Context of and specific resources for assessment	Assessment must ensure: • sites where communications network and systems user accounts can be administered • use of equipment currently used in industry • relevant regulations and company policies that impact on communications network activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of report prepared by the candidate outlining network performance and fault occurrence with recommendations for improvement • oral or written questioning to assess knowledge of establishment and administration of communications network • direct observation of the candidate performing installation of network (LAN or WAN), applications, and backup, and administering network system testing.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5200A Install, configure and test a local area network switch • ICTTEN5201A Install, configure and test a server. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required

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EVIDENCE GUIDE	
	knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Network may include:	• billing network
	• computers and communications technology:
	  • applications and systems software
	  • bridge
	  • cabling
	  • network printer
	  • remote user equipment
	  • router
	  • servers
	  • switch
	  • workstations
	• internet protocol (IP) access network
	• LAN
	• mesh network
	• multi protocol label switching (MPLS) network
	• storage network
	• WAN.

Software may include:	• free downloads • open source • patches

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RANGE STATEMENT	
	• proprietary.
Application may include:	• applications in NGN delivering multiple services: ◦ broadband access ◦ data transfer ◦ internet protocol TV (IPTV) ◦ mobile data ◦ multimedia • voice over IP (VoIP).
Backup system may be:	• local backup • remote backup.

Unit Sector(s)

Unit sector	Telecommunications

Flow charts

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5168A Design and implement an enterprise voice over internet protocol and a unified communications network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design and implement the infrastructure for enterprise voice over internet protocol (VoIP) and unified communications (UC) systems to meet business requirements using converging network technologies. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Telecommunications or IT technicians with significant technical expertise apply the skills and knowledge in this unit. They combine technical expertise with a range of analytical, research and planning skills to develop and tailor IP convergence solutions for particular business needs. This unit applies to individuals working to design and implement the infrastructure to enable enterprises to use VoIP and other packet-based services. It also applies to enterprises outlaying capital looking for return on investment by reducing operating costs and improved unified internet protocol (IP) based communication systems.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units	

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan and design VoIP infrastructure to meet business requirements	1.1. Ascertain ***end-user requirements*** in consultation with client 1.2. Select VoIP infrastructure in line with business and end-user requirements, within budget limitations 1.3. Select ***protocols for converged networks*** 1.4. Select ***hardware***, ***software***, ***network*** and security ***requirements*** according to agreed business and end-user specifications 1.5. Investigate ***factors*** affecting bandwidth and calculate bandwidth usage for various codecs, including considerations of overhead, connection quality and connection speeds

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ELEMENT	PERFORMANCE CRITERIA
2. Install and configure VoIP infrastructure to meet business requirements	2.1. Implement telephone number mapping (ENUM), number portability, end point addressing, path selection, calling classes and overlapping number ranges 2.2. Install, configure and test ***gatekeepers*** 2.3. Install and test ***convergent terminal equipment*** and software 2.4. Install software and configure and test VoIP services 2.5. Configure security access levels to safeguard data, making use of appropriate tools
3. Configure a UC network	3.1. Obtain the topology and components of a UC network 3.2. Analyse the potential of IP multimedia subsystem (IMS) network architecture to enable the convergence of voice, video and data applications and various mobile network technologies over IP based layer 3.3. Incorporate the use of a communications server to provide ***real-time multimedia communications*** 3.4. Select common videoconferencing codecs according to standards and practices 3.5. Select ***voice and video conferencing hardware*** 3.6. Implement IP-private branch exchange (PBX) functionalities in the UC network
4. Test and evaluate the performance of convergent networks	4.1. Develop possible ***network congestion solutions*** for common network congestions to meet quality of service (QoS) specified 4.2. Provide solutions for problems in contacting emergency services 4.3. Analyse network traffic and resolve problems using packet sniffer, monitoring software and hardware solutions 4.4. Troubleshoot convergent communications over wireless networks 4.5. Analyse types and effects of ***attacks***, including ***man-in-the-middle attacks*** 4.6. Plan ways to counteract denial of service (DoS) and distributed DoS (DDoS) attacks 4.7. Predict the impact of virtual local area network (VLAN) hopping, media access control (MAC) address movements, additions and changes on

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ELEMENT	PERFORMANCE CRITERIA
	network
5. Test and verify the security access levels	5.1. Analyse types of intrusion detection 5.2. Monitor and evaluate capability and reliability of security systems 5.3. Make system alterations to ensure protection against known and potential threats 5.4. Verify and test that user settings conform to security policies 5.5. Backup, upgrade and scan systems to minimise attacks
6. Complete documentation and sign off procedures	6.1. Complete required records and notify customer 6.2. Remove installation waste and debris from worksite and dispose of according to environmental requirements to maintain safe worksite conditions 6.3. Reinstate site according to customer and company requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate network traffic protocols and bandwidth considerations
- communications skills to liaise with clients and determine business requirements
- planning and organisational skills to plan, design and implement VoIP infrastructure
- project planning skills in relation to setting benchmarks and identifying scope
- problem solving skills in a predictable range of network problems
- research skills for identifying, analysing and evaluating broad features of a particular business domain and best practice in networking technologies
- technical skills to :
  - compare session initiation protocol (SIP), H323 and media gateway control protocol (MGCP) or media gateway control (Megaco)
  - configure a VoIP and a UC network and assess the performance of convergent networks and test and verify security access levels
  - define latency, jitter and wander and implement methods for reducing or

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REQUIRED SKILLS AND KNOWLEDGE
eliminating them using jitter buffer, QoS, traffic shaping and VLANs • describe the format of a SIP uniform resource identifier (URI) • evaluate and implement SIP trunking to connect enterprise internet protocol (IP)-based communications systems over long distances • identify common G.7xx codes and describe the impact of compression on voice quality • identify the components of SIP • identify the functions of signalling protocols for converged networks
Required knowledge
• broad knowledge of: • client business domain, business function and organisation • current and emerging industry accepted hardware and software products • current and emerging transmission technologies and protocols • networking technologies

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • design and implement the infrastructure for enterprise VoIP and UC systems to meet business requirements using converged networks • apply knowledge of current networking, transmission technologies and protocols • evaluate network traffic protocols and bandwidth considerations • configure a UC network • assess the performance of convergent networks • test and verify security access levels.
Context of and specific resources for	Assessment must ensure:

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EVIDENCE GUIDE	
assessment	• live network • networked computers • network design documentation • equipment specifications • network components.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of report prepared by the candidate outlining design process undertaken, including challenges faced and how these were addressed • direct observation of the candidate installing and configuring VoIP infrastructure and configuring a UC network • evaluation of system designed and implemented by the candidate in terms of performance and suitability of for business needs.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5201A Install, configure and test a server. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

End-user requirements may include:	• how and what the organisation wants in regard to:
	  • preventative maintenance and diagnostic policy
	  • problem solution processes
	  • return on investment (RoI)
	  • roles and technical responsibilities in the IT department
	  • vendor and product service level support agreements
	  • work environment.

Protocols for converged networks may include:	• H225 • H320 • H323 • H450 • Megaco • MGCP • SIP.
Hardware may include:	• cable or DSL modems • IP phones • modems • multi-layer switches • networks • other connectivity devices • personal computers

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RANGE STATEMENT	
	• remote sites • routers • servers • switches • wireless devices • workstations.
Software may include:	• commercial software applications • communications software • in-house or customised software • networking device operating systems • organisation-specific software • packaged software.
Network may include:	• data and voice • internet • large and small LANs • national wide area networks (WANs) • private lines • use of public switched telephone network (PSTN) for dial-up modems only • virtual private networks (VPNs).
Requirements may include:	• reference to the business, system, application, network or people in the organisation • simple addition or upgrade to a major new installation.
Factors may include:	• codec choice • compression • latency • packet reordering • protocol incompatibility • QoS issues.
Gatekeepers may include:	• call manager • media gateway • media gateway controller (call agent) • signalling gateway (SG).
Convergent terminal equipment may include:	• analogue telephone adapter (ATA) • IP phones • single line adapter • soft phones: • personal digital assistant (PDA)

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RANGE STATEMENT	
	• wireless fidelity (WiFi).
Real-time multimedia communications may include:	• directory look-up • email • file exchange • instant messaging (IM) • presence • video conferencing.
Voice and video conferencing hardware may include:	• multi-point control unit (MCU) • session border controller (SBC) • set-top box.
Network congestion solutions may include:	• changing configurations • monitoring network traffic and protocols • upgrades.
Attacks may include:	• brute force and dictionary attacks • illicit servers • man-in-the-middle attacks • unsolicited calls • viruses • voicemail compromises.
Man-in-the-middle attacks include:	• packet sniffing • registration hijacking • TP connection hijacking.

Unit Sector(s)

Unit sector	Telecommunications

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5200A Install, configure and test a local area network switch

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake local area network (LAN) switch installation and configuration as part of the upgrade in an existing network or the implementation of a new network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers employed by telecommunications companies and IT networking provisioning companies who carry out installation, maintenance and upgrade of ICT networks apply the skills and knowledge in this unit. It involves LAN switch installation, configuration and testing in field work. It also applies to switching protocols and diagnostics required for integrating new and converging functionalities to the network.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install the network switch	1.1. Prepare for installation in line with site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures 1.2. Notify customer to arrange access to site 1.3. Document the ***topology*** of the LAN 1.4. Obtain current and future ***network capacity*** predictions according to current and future business requirements from the ***appropriate person*** 1.5. Specify the number and type of ***switch*** required, with reference to future network requirements 1.6. Specify the requirements for network management and security, as prescribed by organisational policy

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ELEMENT	PERFORMANCE CRITERIA
	1.7. Select the switch and switch operating system software version with the appropriate features according to required specifications
2. Install and configure the network switch	2.1. Assemble, rack mount and connect switch and ***peripherals*** according to manufacturer's requirements 2.2. Connect ***user*** to access points using ***cable*** that meets the appropriate ***standard*** 2.3. Establish a valid network connection with other network devices 2.4. Configure a network internet protocol (IP) address for the switch 2.5. Install or configure simple network management protocol (SNMP) agent software, on each switch, to collect network traffic data for the management information base (MIB) from that segment of the network and relay it to the management console 2.6. Install and configure SNMP management console software on a computer designated to be the network manager's main console, to collect network traffic data from the switch acting as agents 2.7. Manually configure the user access ports of the switch for speed and for full or half-duplex operation
3. Test the network switch and reconfigure the network	3.1. Test the switch and other network devices according to manufacturer's requirements and organisational guidelines 3.2. Test to ensure that there is connectivity across the network 3.3. Modify the network to verify SNMP management software 3.4. Make adjustments to the network, depending on test and troubleshooting results
4. Complete documentation and clean up worksite	4.1. Tabulate test results and complete all user reports 4.2. Complete report and notify client of status of the network 4.3. Clean up and restore worksite to client's satisfaction 4.4. Secure sign off from appropriate person

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- research skills to interrogate vendor databases and websites to implement different configuration requirements to meet security levels
- communication skills to liaise with internal and external personnel on technical, operational and business related matters
- literacy skills to read and interpret technical documentation and write reports in required formats
- numeracy skills to take test measurements, interpret results and evaluate performance and interoperability of network
- planning and organisational skills to plan, prioritise and monitor own work
- problem solving and contingency management skills to adapt configuration procedures to requirements of network and reconfigure depending on differing operational contingencies, risk situations and environments
- technical skills to:
  - install and configure network switch
  - select switch and switch operating system
  - specify requirements for network management and security
  - test switch and other network devices

Required knowledge

- advantages and disadvantages of switches over hubs
- Australian Computer Society Code of Ethics
- common network cable types and connectors
- common network topologies
- differences between standard and intelligent (i.e. configurable) switches and between switches and hubs
- documentation skills for networks
- implementation and configuration of networks
- providing the network with redundant paths for reliability and the way routers and switches manage these paths

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and prepare for the LAN switch installation task • select a LAN Switch to meet the client business specifications • install switches without the network losing connectivity or failing • install and test the switch that ensures interoperability within the network • use a range of switch configurations • apply solutions to a variety of switch-related problems • report on the status of the completed installation and seek sign off and customer satisfaction • use switches • apply solutions to defined switching problems.
Context of and specific resources for assessment	Assessment must ensure: • site where switch installation must be may be conducted • use of field measurement equipment currently used in industry • relevant switch specifications, technical requirements for a network, switch, cabling, networked (LAN) computers, workstations, servers and WAN service point of presence.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing, configuring and testing a LAN switch • oral or written questioning of required skills and knowledge • evaluation of report prepared by the candidate outlining testing procedures, results and recommendations to network changes.
Guidance information for	Holistic assessment with other units relevant to the

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EVIDENCE GUIDE	
assessment	industry sector, workplace and job role is recommended, for example: • ICTTEN4198A Install, configure and test an internet protocol network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Topology may include:	• bus • hierarchical

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RANGE STATEMENT	
	• hybrid • ring • star.

Network capacity may include:	• expandability:
	  • number of available uplink ports
	• hardware reliability
	• LAN topology support:
	  • AppleTalk
	  • Ethernet
	  • FDDI
	  • Token Ring
	• port bandwidth capabilities
	  • 100 megabits per second)
	• redundant power supply (AC/DC).

Appropriate person may include:	• authorised business representative • client • IT support manager • network Administrator • network manager • small or medium enterprise (SME) customer • small office home office (SOHO) customer • supervisor.
Switch by vendors may include:	• 3Com • Accton • Bay • Cisco • DLink • Intel • NetGear • System 3000 Ethernet.

Peripherals may include:	• Bluetooth devices
	• fax
	• Firewire (IEEE 1394)
	• input equipment may include:
	  • mouse
	  • pens
	  • touch pad
	• laptops and desktop computers
	• mobile phones

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RANGE STATEMENT	
	• modems • multimedia kits • palmtops and personal digital assistants (PDAs) • personal computer • printers • scanners • speakers • tape cartridges • universal serial bus (USB).
User may include:	• department within the organisation • person within a department • third party.
Cable may include:	• Category 5e, 6 or 7 • crossover • fibre • shielded twisted pairs (STP) • straight through • unshielded twisted pairs (UTP).
Standard may include:	• EIA/TIA 568A • EIA/TIA 568B.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5201A Install, configure and test a server

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and configure a server as part of an upgrade to an existing network or the implementation of a new network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers employed by telecommunications companies and IT networking provisioning companies who carry out installation, maintenance and upgrade of ICT networks apply the skills and knowledge in this unit when working on: • server installation, configuration and testing in field work • server operating systems, protocols and diagnostics required for integrating new and converging functionalities to the network.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to install a server	1.1. Prepare for work in line with site specific safety requirements and enterprise occupational health and safety (OHS) processes and procedures 1.2. Notify customer to arrange access to site 1.3. Obtain ***server applications*** and features from ***appropriate person*** 1.4. Choose the most suitable ***server*** with reference to required server application and server features 1.5. Choose the most suitable ***network operating system*** features with reference to required server solution and technical ***requirements*** 1.6. Provide alternative server solutions with reference to

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ELEMENT	PERFORMANCE CRITERIA
	required server application and server features 1.7. Review required installation options 1.8. Analyse data migration requirements 1.9. Apply backup and recovery requirements with reference to organisational policy 1.10. Analyse education and training requirements for support staff and in line with ***client***, requirements and relevant enterprise policies 1.11. Create and document a deployment plan 1.12. Advise ***user*** group of deployment and potential down times
2. Install and configure the server	2.1. Backup and restore local data in preparation for installation 2.2. Install and configure the server as required by technical requirements and functional specifications 2.3. Install and undertake configuration activities using relevant operating system and application upgrades 2.4. Reconnect and reconfigure relevant connectivity devices
3. Test the server and reconfigure the network	3.1. Run the ***system*** testing for benchmarking against client specification and requirements according to test plan, and record outcomes 3.2. Analyse the error report and make changes as required 3.3. Test required changes or additions 3.4. Validate changes or additions against specifications
4. Complete documentation and clean up work site	4.1. Make and document server ***configuration*** and operational changes 4.2. Tabulate test results and complete all documentations for users 4.3. Complete client report and notify of status of the network 4.4. Clean up and restore worksite to client's satisfaction 4.5. Secure sign-off from appropriate person

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical, operational and business related matters
- literacy skills to interpret technical documentation and write reports in required formats
- numeracy skills to take test measurements, interpret results and evaluate performance and interoperability of network
- planning and organisational skills to plan, prioritise and monitor own work
- problem solving and contingency management skills to adapt configuration procedures to requirements of network and reconfigure depending on differing operational contingencies, risk situations and environments
- research skills to interrogate vendor databases and websites to implement different configuration requirements to meet security levels
- technical skills to select and use server diagnostic test, application software and hardware to suit different network applications

Required knowledge

- Australian Computer Society Code of Ethics
- common network:
  - cable types and connectors
  - topologies
- compatibility issues and resolution procedures
- desktop applications and operating systems as required
- documentation skills for networks
- enterprise communication/training systems in relation to training and advising staff involved in the deployment
- features of:
  - current network operating systems (NOS)
  - current server applications compatibility issues and resolution procedures
- implementation and configuration of servers
- system backup procedures

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse server and network operational issues • apply user applications and relate user needs when configuring a server • create technical and user documentation • install and configure server • test server and reconfigure network • troubleshoot server and network failures.

Context of and specific resources for assessment	Assessment must ensure:
	• site where server installation may be conducted
	• relevant server specifications:
	  • cabling
	  • networked (LAN) computers
	  • server diagnostic software
	  • switch
	  • technical requirements for a network
	  • WAN service point of presence
	  • workstations
	• relevant regulatory documentation that impacts on installation activities.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing or updating network • oral or written questioning of required skills and knowledge • evaluation of report prepared by the candidate outlining testing procedures, test results and recommendation to network changes.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
	for example: • ICTTEN4198A Install, configure and test an internet protocol network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Server applications may include:	• database and data warehousing • directory services • file sharing

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RANGE STATEMENT	
	• line of business applications • management • messaging • network and remote access • printer sharing • terminal services • web services.
Appropriate person may include:	• authorised business representative • client • IT support manager • network administrator • network manager • small or medium enterprise (SME) customer • small office home office (SOHO) customer • supervisor.
Server may include:	• application or web servers • BEA Weblogic servers • email servers • file and print servers • firewall servers • FTP servers • IBM VisualAge and WebSphere • Novell NDS servers • proxy or cache servers.
Network operating system may include latest versions of:	• Apple OS • Linux OS • Unix OS • Windows OS.
Requirements may be in reference to:	• application • business • database • network • people in the organisation • platform • system.
Client may include:	• external organisations • individuals • internal departments • internal employees.

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RANGE STATEMENT	
User may include:	• department within the organisation • person within a department • third party.
System may include:	• application service provider • applications • databases • gateways • internet service provider (ISP) • operating systems • servers.
Configuration may include:	• access control needs • cache sizes • consumers and suppliers • database cache • directory configuration • domain name system (DNS) • entry cache • hostnames • IP addresses • large objects • lightweight directory access protocol (LDAP) clients • log file rotation • NetBIOS naming • network connectivity issues • port numbers • root domain name (DN) • search and write performance • server domains.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5203A Dimension and design a radio frequency identification system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake a radio frequency identification (RFID) installation, configuration and testing. This could be part of the upgrade to an existing or the implementation of a new logistical or security network using RFID technology according to design specifications. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers in field work who carry out installation, maintenance and upgrade of ICT networks apply the skills and knowledge in this unit to integrate new and converging functionalities to a network. They would be employed by telecommunications and IT networking provisioning companies specialising in RFID technology.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to dimension and design an RFID system	1.1. Obtain ***business requirements*** for the ***client*** from an ***appropriate person*** for the design of the ***RFID system*** 1.2. Research ***RFID technologies***, their functionalities and the different implementations of configurations 1.3. Select suitable software and hardware types to ensure that the proposed system is designed to meet business requirements 1.4. Conduct a survey of available interrogators or readers, tags and wireless units
2. Dimension and design an RFID	2.1. Select the most appropriate interrogators or readers for the given specification to ensure their

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ELEMENT	PERFORMANCE CRITERIA
system	compatibility with current network infrastructure if applicable 2.2. Minimise interrogator to interrogator interference 2.3. Verify that antenna geometry and footprint are consistent with the chosen design 2.4. Minimise sources of interference 2.5. Incorporate into the ***RFID design*** the use of anti-collision protocols 2.6. Customise appropriate ***tag to client requirements*** 2.7. Predict the performance for read distance, write distance and tag response time to confirm that these conform with client requirements 2.8. Select the ***optimal locations*** for an RFID tag to be placed on an item 2.9. Prepare a design proposal for the RFID system including ***specifications*** 2.10. Prepare a report containing design ***solutions*** and recommendations of preferred products, including the justification for recommendations 2.11. Submit report to client for approval
3. Document the specified design	3.1. Complete documentation according to client requirements 3.2. Inform client about standards applying to the design 3.3. Secure sign off of RFID design from appropriate person

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical, operational and business related matters • literacy skills to interpret technical documentation and write reports, design solutions and recommendations in required formats • numeracy skills to interpret technical specifications and evaluate possible design solutions for optimum RFID system

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REQUIRED SKILLS AND KNOWLEDGE

• planning and organisational skills to plan, prioritise and monitor own work
• problem solving and contingency management skills to adapt configuration procedures to requirements of RFID network
• research skills to interrogate RFID vendor databases and website to implement different configuration requirements to meet client design specifications
• technical skills to:
  • evaluate and select RFID interrogators, readers and wireless units
  • evaluate antenna designs and protocols for design considerations to suit particular RFID system

Required knowledge
• business process design • client business operations, business function and organisation • compatibility issues with existing system and resolution procedures • configuration of internet protocol (IP) networks • customer and business liaison • desktop applications and operating systems as required • linkage between operational processes • network protocols and operating systems • network topologies • radio spectrum and RFID frequencies • RF interference • RFID architecture • RFID hardware and software • RFID technologies incorporating substantial depth in network operating systems, protocols, interrogators and sensors, wireless technologies and cabling standards • RFID vendor product knowledge • security protocols, standards and data encryption

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • adapt RFID technologies to specified plan and design • evaluate RFID client specifications against accepted industry practices • include RFID architecture across a secure environment • encode RFID tags • attach encoded RFID tags and track the movement of tagged items • integrate RFID information into business applications • produce design information in configuring the network with IP addressing • produce information that can be shared between businesses • make recommendations and offer optimum design solutions.

Context of and specific resources for assessment	Assessment must ensure:
	• sites providing:
	  • client functional requirements
	  • RFID equipment specifications
	  • database software
	  • simulation software
	  • organisational guidelines
	  • network or computer layout documentation and premises plans.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking an RFID installation, configuration and testing • oral or written questioning to assess required knowledge • evaluation of research methodologies and the final design proposal prepared by the candidate outlining solutions and recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5204A Produce technical solutions from

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EVIDENCE GUIDE	
	business specifications. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Business requirements may include:	• application of RFID • business inventory • network or people in the organisation • systems currently in use
Client may include:	• external organisations

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RANGE STATEMENT	
	• individuals • internal departments • internal employees • logistic company • security organisation • warehouse.
Appropriate person may include:	• authorised business representative • client • IT support manager • network administrator • RFID network manager • small or medium enterprise (SME) customer • small office home office (SOHO) customer • supervisor.
RFID system may include:	• antenna • cabling • databases • interrogators or readers • power supplies • tags • wireless units.
RFID technologies may include:	• RFID and networking tools and equipment • RFID interrogators/readers and tags • servers and workstations.
RFID design may include:	• hardware upgrades • implementing a new system • new hardware • new software • simulation software • software upgrades • user training.
Tag to client requirements may include:	• encryption requirements • memory size • security.

Optimal locations may include:	• media and adhesive selection for tags
	• package contents
	• packaging:
	  • inserts
	  • items

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RANGE STATEMENT	
	• labels • tags • product to attach to: • liquids • metal • polarisation • tag orientation and location • tag stacking (shadowing).
Specifications may include:	• cable drops • device mounting locations • electrical specifications for: • adapters • interrogators • power units • readers • sensors • tags • wireless units • interrogation zone locations • RFID network topology • site diagrams.
Solutions may include:	• hardware upgrades • implementing a new system • new hardware • new software • software upgrades • user training.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5204A Produce technical solutions from business specifications

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to compile and evaluate the business specifications from a client and to produce business solutions for consideration. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers in field work who carry out network design and implementation of practical technical solutions of ICT networks apply the skills and knowledge in this unit. They would be employed by telecommunications and IT networking provisioning companies specialising in integrating the converging and emerging technologies of ICT networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to produce technical solutions from business specifications	1.1. Obtain ***business requirements*** and ***business specifications*** for the ***client*** from ***appropriate person*** 1.2. Research and identify the business model of the client 1.3. Determine technical specifications for business 1.4. Clarify and confirm the business ***problem*** and key stakeholders' ***requirements*** with stakeholders 1.5. Document business objectives and problem and confirm details with appropriate person
2. Evaluate the impact of the technical requirements	2.1. Review and assess business problems, opportunities and objectives 2.2. Determine ***technical requirements*** in respect of input and output, interface, process flow or quality

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ELEMENT	PERFORMANCE CRITERIA
	requirements 2.3. Analyse ***hardware***, ***software*** and ***network*** requirements 2.4. Build business platform based on software solutions 2.5. Investigate processes to be changed by the business solution 2.6. Produce an evaluation document on the ***impact*** of the technical requirements on the business
3. Produce technical business solutions	3.1. Develop ***technical solutions*** in response to problems and business requirements 3.2. Determine costs involved to implement the technical business solution 3.3. Investigate a range of supplier products to determine which one best meets technical requirements 3.4. Produce a report document on the technical solutions addressing the business specifications and recommendations against business requirements
4. Document and validate the agreed solutions	4.1. Forward technical requirements and solution overview to appropriate person for feedback 4.2. Analyse feedback and incorporate change as required 4.3. Document changes and distribute to appropriate person 4.4. Obtain sign off on final business solution

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical, operational and business related matters • literacy skills to interpret technical documentation and write reports, design solutions and recommendations in required formats • numeracy skills to interpret business requirements and specifications and evaluate possible technical design scenarios for optimum solution

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REQUIRED SKILLS AND KNOWLEDGE

• planning and organisational skills to plan, prioritise and monitor own work
• problem solving and contingency management skills to adapt varied business procedures to requirements
• research skills to interrogate vendor databases and website to implement different solutions to meet client business specifications
• technical skills to:
  • determine technical specifications
  • evaluate optimum solutions
  • produce technical solutions

Required knowledge

• business processes
• client business domain, business function and organisation
• compatibility issues and resolution procedures
• configuration of internet protocol (IP) networks
• customer and business liaison
• desktop applications and operating systems as required
• documenting technical specifications
• linkage between processes
• security protocols, standards and data encryption
• technologies, such as:
  • ICT network topologies
  • network protocols and operating systems
  • radio frequency (RF) networks and principles
  • optical networks and principles
  • mobile cellular networks
  • core networks
  • access networks
  • radio frequency identification (RFID) hardware and software.

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • adapt technologies to specified technical solutions • use site design software and hardware • evaluate client specifications against accepted industry practices • produce technical solutions from business specifications • produce information that can be shared between businesses • apply design concepts to business solutions • produce technical reports • make recommendations and offer optimum design solutions.
Context of and specific resources for assessment	Assessment must ensure: • client functional requirements • business specifications • database software • simulation software • organisational guidelines • network/computer layout • site design software and hardware • information on a range of ICT business solutions.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of evaluation document prepared by the candidate outlining the impact of technical requirements on the business • oral or written questioning assessing required knowledge • review of research methodologies and the final proposal prepared by the candidate outlining solutions and recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5203A Dimension and design a radio frequency identification system

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EVIDENCE GUIDE	
	• ICTOPN6128A Design a dense wavelength division multiplexing system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Business requirements may include:	• business application • business plan • existing system • mission statement • nature of the business

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RANGE STATEMENT	
	• network or people in the organisation.
Business specifications may include:	• budget allocation • budget costs estimate • future plan • growth forecast • technical requirements • timeline.
Client may include:	• external organisations • finance company • health industry • ICT company • individual people • internal departments • internal employees • manufacturing company • service industry.
Appropriate person may include:	• authorised business representative • client • ICT network administrator • ICT network manager • ICT support manager • small or medium enterprise (SME) customer • small office home office (SOHO) customer • supervisor.
Problem may refer to:	• application • business • business need or opportunity that needs to be addressed • network or people in the organisation • system.
Stakeholders may include:	• development team • project team • sponsor • user.
Requirements may be in reference to:	• application • business • database • network • people in the organisation

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RANGE STATEMENT	
	• platform • system.
Technical requirements may refer to:	• bandwidth • hardware problems • network growth • network security • network traffic congestions • new technologies • power usage • software problems • transmission dropouts • upgrades.

Hardware may include:	• cabling networks
	• internet protocol TV (IPTV)
	• multimedia
	• network elements:
	  • gateways
	  • local area network (LAN) switches
	  • routers
	  • servers
	  • wireless networks
	• optical networks
	• radio networks
	• RFID equipment
	• switching equipment
	• transmission equipment
	• voice and data equipment.

Software may include:	• commercial • customised software • in-house • packaged.
Network may include:	• broadband • data • ICT networks • internet • intranet • media • radio • RFID

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RANGE STATEMENT	
	• security • switching • telecommunications • transmission.
Impact may refer to:	• fewer downtimes • improved efficiency • improved response times • increased return on investment (RoI) • lower operational costs • more 'user friendly' network.

Technical solutions may include:	• audit requirements
	• changes to:
	  • network infrastructure
	  • security or privacy provisions
	• e-business or e-commerce solution
	• hardware upgrades
	• implementing a new system
	• inventory management
	• new hardware
	• new software
	• occupational health and safety (OHS) requirements
	• quality requirements
	• software upgrades
	• user training.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN5217A Plan a wireless mesh network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan a wireless mesh network comprised of radio nodes organised in a mesh topology. Wireless mesh networks provide users with secure wireless roaming beyond traditional wireless local area network (LAN) boundaries and are readily deployed in areas that lack wired backhaul. The mesh topology and ad-hoc routing give mesh networks stability, offer redundancy and have the ability to self-form and self-heal. Mesh networks enable local communities and those in remote areas to participate in a distributed shared network without the need for centralised management. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who work with wireless networking equipment or radio communications equipment apply the skills and knowledge in this unit to design a scalable wireless access network using mesh technology for growing communities. This may include planning officers and field officers from private and public organisations.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Research wireless mesh networks and formulate the system architecture	1.1. Confirm with regulatory spectrum management authority the ***specific regulations*** regarding radio characteristics 1.2. Contact customer to determine ***wireless mesh network*** design specifications 1.3. Evaluate the use of ***frequency bands*** for the

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ELEMENT	PERFORMANCE CRITERIA
	operation of the WMN 1.4. Evaluate and select the ***wireless technology***, ***internet protocol*** (***IP***) version and ***mesh routing protocol*** to satisfy design criteria 1.5. Specify and source the ***hardware and software requirements***
2. Prepare a detailed plan for the mesh network	2.1. Evaluate the maximum line of sight distances achievable between backbone nodes and between mesh nodes 2.2. Plan the sites where mesh nodes will be located and plot to scale on a map 2.3. Estimate the quantity and length of the links required between mesh nodes to ensure design is within specifications 2.4. Design backbone links in the mesh topology for scalability of future deployments 2.5. Select the location of the internet ***gateway*** for the network 2.6. Allocate operating frequencies at mesh nodes, backbone nodes and wireless access points for optimum network performance with minimal interference from adjacent network routers
3. Plan the IP addresses and subnet mask	3.1. Produce an addressing scheme and allocate IP addresses and subnet mask to mesh nodes, backbone nodes and access points 3.2. Produce a configuration scheme to secure the network
4. Document the mesh network	4.1. Document the plans and drawings for the mesh network 4.2. Produce an ***installation plan*** for the building of the mesh network 4.3. Following installation, configuration and testing of the mesh network, incorporate 'as built' amendments if appropriate

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analysis skills to evaluate information and make recommendations
- communication skills to liaise with vendors and installation personnel on technical and operational matters
- literacy skills to interpret technical documentation and write reports in required formats
- numeracy skills to perform calculations, interpret results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and that of others
- problem solving and contingency management skills to adapt testing procedures to requirements of particular situations and modify activities depending on operational contingencies, risk situations and environments
- technical skills to:
  - configure and set up IP addresses and subnet masks
  - install software
  - select and specify appropriate performance tests and test equipment

Required knowledge

- antenna gain, polarisation
- cable loss
- calculation of effective isotropic radiated power (EIRP)
- calculation of line of site radio range
- decibels and related units
- IP addressing and subnet masks
- network security and firewalls
- network topologies
- radio frequency (RF) frequency bands
- routing protocols
- transmission control protocol (TCP)-IP protocols
- wireless networking hardware, access points, wireless routers and gateway
- wireless protocols

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate and select wireless technology and mesh routing protocol • plan a wireless mesh network from a project brief • produce an IP addressing scheme • prepare an installation plan.
Context of and specific resources for assessment	Assessment must ensure: • sites where planning a wireless mesh network may be conducted • design criteria and other site related documentation • equipment specifications and technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate planning a wireless mesh network • review of plan prepared by the candidate outlining recommendations for the customer • review of IP addressing scheme prepared by the candidate • oral or written questioning to assess knowledge of equipment and technologies as used within the mesh network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4050A Install and configure a wireless mesh network • ICTRFN3055A Install a radio communications antenna and feedline.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Specific regulations may include:	• maximum allowable antenna gain • maximum allowable EIRP • maximum allowable power output for transmitter • use of the 2.4 GHz band • use of the 5.8 GHz band.
Wireless mesh network may	• client wireless mesh network - client nodes

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RANGE STATEMENT	
include:	perform routing • hybrid wireless mesh network - perform mesh and access functions • infrastructure wireless mesh network - mesh routers for the clients.
Frequency bands may include:	• multiple frequencies for access and transmission • same frequency for access and transmission • separate frequencies for access and transmission.
Wireless technology may include:	• 802.11a • 802.11b • 802.11g • 802.11n • 802.11s draft IEEE 802.11 amendment • 802.16.
Internet protocol (***IP***) may include:	• IPv4 • IPv6.
Mesh routing protocol may include:	• ad-hoc on-demand distance vector (AODV) • better approach to mobile ad-hoc networking (BATMAN) • dynamic source routing (DSR) • hybrid wireless mesh protocol (HWMP) • infrastructure wireless mesh protocol (IWMP) • optimised link state routing protocol (OLSR).

Hardware and software requirements may include:	• hardware:
	  • access points
	  • antenna polarisation
	  • directional microwave antennas
	  • omnidirectional microwave antennas
	  • wireless routers
	• software:
	  • open source software:
	  • FreeBSD
	  • Freifunk
	  • proprietary.

Gateway may include:	• asymmetric digital subscriber line (ADSL) • very small aperture terminal (VSAT).

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RANGE STATEMENT	

Installation plan may include:	• addressing scheme
	• configuration instructions and commands
	• frequency allocation plan
	• network element details:
	  • MAC address
	  • model, type and serial number
	• security implementation
	• siting of mesh routers and gateways
	• software version.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6036A Undertake qualification testing of new or enhanced equipment and systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to inspect and test internal telecommunications network equipment not previously installed in an Australian network. It involves assessing its suitability and compliance with local regulations and conditions for the carrier or asset owner. It involves processes for checking specifications, complex testing procedures and administrative tasks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit to verify the compliance of new equipment or systems to Australian standards. This unit applies to installation of both new, additional and replacement equipment. It may apply to switching, transmission, broadband, internet protocol (IP) networks, optical and radio networks.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Ensure conformity of international design to Australian standards	1.1. Assess original international design to verify compliance with Australian ***relevant legislation***, ***codes***, ***regulations and standards***
	1.2. ***Reconfigure international design*** in consultation with customer
	1.3. Rewrite design specifications to include configuration amendments
2. Plan and establish	2.1. Plan type and number of ***tests*** to ensure full trial of

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ELEMENT	PERFORMANCE CRITERIA
test regime	new or enhanced design and greatest coverage for minimal tests 2.2. Plan and establish ***test environment*** to ensure total validity of chosen tests 2.3. Design test regime of proposed system to test impact on existing systems 2.4. Confirm test regime in consultation with planners and verify that ***test equipment*** meets required standards
3. Undertake tests	3.1. Conduct and document tests including live system tests in logical and sequential order to planned test regime 3.2. Negotiate problems experienced during the test with system experts or designers to plan ***contingency activity*** according to enterprise policy 3.3. Prepare and submit trouble reports according to enterprise policy
4. Analyse test results	4.1. Analyse test results against design specifications and planned outcomes 4.2. Prepare a report referring major deficiencies to designers with recommendations for design change 4.3. Analyse minor variances, plan solutions and document changes to specifications
5. Retest design changes	5.1. Implement design and specification changes and conduct further tests as required 5.2. Analyse test results to verify compliance with updated design specifications 5.3. Document results of tests according to enterprise policy

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• assess compatibility and interoperability with existing system • interpret test equipment settings and readings • communication skills to liaise with internal personnel, technical staff, manufacturers and vendor engineers on technical, operational and business related matters • literacy skills to: • interpret technical specifications and related documentation • write reports and recommendations • numeracy skills to make calculations and necessary calibration changes • planning and organisational skills to plan, prioritise and monitor own work • technical skills to: • interpret engineering specifications • perform high level and complex testing • test and evaluate new technologies
Required knowledge
• Australian standards applicable to system and equipment compliance • connections to carrier infrastructure or equipment • design criteria • network and equipment tests for compliance • network architectures • relevant international standards

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • apply Australian standards to international designs • negotiate with equipment vendor and identify specific requirements • configure and set up test regimes

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EVIDENCE GUIDE	
	• identify and conduct tests including live system tests and interpret and analyse results • approach problem diagnosis systematically, eliminating causes • retest design changes • prepare report, including deficiencies, analysis and recommendations.
Context of and specific resources for assessment	Assessment must ensure: • test site where qualification testing of equipment and systems may be conducted • equipment currently used in industry • relevant Australian and international standards, codes, design specifications, manuals and reference materials.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral report and direct observation of the candidate establishing a test regime • direct observation of the candidate undertaking tests including live system test on equipment and systems • review of reports completed by the candidate for different equipment types, test results and situations, analysing results with recommendations and supporting reasons • oral or written questioning of the candidate to assess knowledge of qualification and testing procedures, types of systems and tests.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTNPL6046A Undertake network performance analysis. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) standards TS 14 • Australian electrical standards • International Standards ISO 9000 and ISO 9001 • International Telecommunications Union (ITU) recommendations • occupational health and safety (OHS) • Telecommunications Act and associated codes.

Reconfigure international design may involve:	• conforming to:
	  • Australian regulation, codes and standards
	  • international standards.

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RANGE STATEMENT	

Tests may include:	• network tests:
	  • bandwidth
	  • latency
	  • packet loss rate
	  • quality of service (QoS)
	  • redundancy
	  • uploads and downloads rate
	• switching tests:
	  • blocking
	  • call rate
	  • congestion
	  • drop out rate
	  • functionality
	  • QoS
	  • recovery rate
	• transmission tests:
	  • distortion
	  • interference
	  • optical transmission
	  • radio transmission
	  • signal to noise ratio
	  • transmitted power measurements.

Test environment may involve:	• laboratory situation with simulated test conditions • trialling in a model network with actual test conditions.
Test equipment may include:	• communication system analysers • global system for mobiles (GSM) spectrum frequency synthesizer • laser source • microwave link analyser • modulator tester • network analyser • optical fibre power meters • optical time domain reflectometer (OTDR) • pattern generators • power meters • protocol analyser • radio frequency (RF) band noise meter

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RANGE STATEMENT	
	• RF microwave test sets • RF sweep tester • spectrum analysers • sweep test coaxial and wave guide antenna systems.

Contingency activity may refer to:	• P1 blocking:
	  • referred to experts or trouble report issued
	  • submitted to designers
	• P2 customer perception problems:
	  • test continues
	  • trouble report sent to designers
	• P3 identifiable problem:
	  • work around problem or make minor changes
	• P4 minor:
	  • usually specification error
	  • change and document.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6042A Undertake system administration

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to conduct system administration to maintain the integrity of network support systems and software. The unit applies to both system platforms and applications of computer systems including local area networks (LAN) and wide area networks (WAN). Computer-based networks such as call centres, billing centres, customer records, internet protocol (IP) based media content managers for internet protocol TV (IPTV) and web sites all require efficient system administration to maintain a viable network. System administration involves proactive maintenance, providing application support, creating and deleting user accounts and special investigations. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	System administration support officers from service providers and large organisations apply the skills and knowledge in this unit to manage and administer the network and make recommendations for improved customer support.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Undertake proactive maintenance of system	1.1. Prepare ***methodology*** to undertake platform data base ***optimisation*** and ***administration*** effectively 1.2. Produce a ***cost benefit analysis*** of database optimisation schedule to evaluate the effective return on investment (RoI) benefit to the organisation 1.3. Produce training instructions for new users on methodology to ensure effective database optimisation and administration 1.4. Interrogate and monitor ***system platforms*** to determine error logs, aging time on processes, ***data base checks*** and system loadings 1.5. Notify appropriate personnel of ***problems*** with advice and guidance on likely solutions 1.6. Conduct ***measurements of the system*** from a user perspective on response times and initiate investigations on problem where ***specifications*** are not being met 1.7. Assess availability of ***data storage*** space and initiate appropriate action where required 1.8. Develop procedures for system backup and restoration, review for efficiency of operation and amend where required
2. Provide application support to system users	2.1. Produce a set of procedures for formal meetings with users on a regular basis for effectiveness to discuss user issues and provide support 2.2. Set up a ***user support network*** to provide responsive system administration to users on an ongoing basis as critical issues arise
3. Create and delete user accounts	3.1. Create a hierarchical ***user profiling system*** to manage user accounts effectively according to enterprise policy 3.2. Establish and monitor ***security*** procedures relating to access according to policy 3.3. Assess grounds for deletion of user accounts and determine necessary action
4. Undertake special investigations	4.1. Evaluate ***request for investigation*** to determine detail of action required 4.2. Prepare activity plan including timelines, specific goals, investigative team and resources required to conduct the investigation

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ELEMENT	PERFORMANCE CRITERIA
	4.3. Conduct investigation methodically according to plan and record the findings 4.4. Analyse findings and prepare and forward reports, including recommendations to the requesting body

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - perform cost benefit analysis of database
  - analyse findings of investigation
- communication skills to:
  - liaise with technical and other staff to ensure requirements are known
  - support users of applications
- initiative and enterprise skills to identify improvements to system administration tools and methods
- literacy skills to:
  - interpret technical specifications and related documentation and prepare reports and recommendations
  - produce training instructions
  - produce reports on system administration and investigations
- numeracy skills to make statistical calculations on traffic predictions
- planning and organisational skills to:
  - prepare methodology for data base optimisation and administration
  - develop support systems to manage user accounts
  - prepare activity plan for special investigations
- problem solving skills to:
  - overcome system problems
  - undertake special investigations
- technical skills to:
  - conduct database and data storage checks
  - develop user profiling system
  - interrogate and monitor system platforms:

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REQUIRED SKILLS AND KNOWLEDGE
• conduct measurements • monitor system loadings • monitor system platforms • provide system backup and restoration
Required knowledge

• back up systems
• computer knowledge
• meeting procedures
• methodology of system administration
• network management systems
• optimisation and administration database
• overview knowledge of telecommunications monitoring tools and telecommunications networks
• system:
  • investigation requests and actions
  • optimisation
• training instructions development
• user accounts security and profiling system

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • provide methodology for system maintenance • produce cost benefit analysis and training for database optimisation and administration • conduct system measurements • develop support processes for system users • manage user accounts and security procedures • investigate potential system administration problems

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EVIDENCE GUIDE	
	and make recommendations.
Context of and specific resources for assessment	Assessment must ensure: • a network for maintenance and analysis of special investigations • equipment and systems manuals, specifications and enterprise policy.
Method of assessment	The following assessment method is appropriate for this unit: • direct observation of the candidate undertaking system measurements and investigations • direct observation of the candidate providing application support, and creating and deleting user accounts • review of reports and recommendations completed by the candidate for special investigations • oral or written questioning to assess knowledge required to prepare methodology for system maintenance.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL6046A Undertake network performance analysis • ICTTEN6043A Undertake network traffic management • ICTTEN6044A Coordinate fault rectification and restoration of service following network outages • ICTTEN6045A Implement planned network changes with minimal impact to the customer. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the

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EVIDENCE GUIDE	
	candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Methodology may include:	• implementation • logical design • scoping • technical optimisation.

Optimisation refers to:	• steps:
	  • add indexes
	  • combine tables
	  • de-normalise
	  • sort
	  • store derived data
	  • use ranges.

Administration includes:	• administer users • awareness of database security • awareness of net and shared services • control database • create database

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RANGE STATEMENT	
	• install database software • manage database interfaces • manage schema objects and data • manipulate storage structures • monitor and resolve lock conflicts • perform database backup • perform database recovery • performance monitoring • proactive maintenance.
Cost benefit analysis indicators include:	• benefit cost ratio (BCR) • net benefit • net present value (NPV) • present value of benefits (PVB) • present value of costs (PVC)
System platforms may include:	• Command post • HP open view • Oracle • SUN Operating system • UNIX • Windows 2000 • Windows NT.

Data base checks refer to:	• use of system resources, such as:
	  • central processing unit (CPU)
	  • internal and external hard drives
	  • mesh networks
	  • RAM
	  • server farms
	  • servers.

Problems may include:	• authorisations • backups • CPU usage time • data retrieval • flaky sectors on hard drive • lockups • logons • security breaches.
Measurements of the system may refer to:	• simulated or live environment • dummy loading of data to measure response in various situations, such as adding new

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RANGE STATEMENT	
	customers to an existing data base.
Specifications refer to:	• speed of response and applications • vendor or platform and application specific.
Data storage may include:	• software and hardware variations • software redesign • storage area networks (SAN) • storage rearrangements.
User support network may include:	• email for logging issues • helpdesk for routine user support • hotline for critical system support • Wiki for collaborative and interactive user network and support.
User profiling system may include:	• allocation of users to specific groups • creation of customer user groups • creation of system access levels • creation of user profiles.
Security may include:	• encryption • firewall • logons with username and password • PINs • session initiation protocol (SIP).
Request for investigation may include:	• accessibility • availability • bandwidth allocation • data rate • filtering • network congestion • performance of platform • performance of platform application • remote access using virtual private network(VPN) • uploads and downloads.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6043A Undertake network traffic management

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to monitor, analyse and improve network performance for the purpose of effectively managing traffic flow in telecommunications networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from carriers, contractors or other service providers apply the skills and knowledge in this unit to manage network traffic and make recommendations for capacity planning. This unit applies to switching and transmission networks from a carrier or service provider.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate network capacity and traffic problems	1.1. Interrogate network alarms to identify any areas of route and circuit unavailability 1.2. Assess planned and unplanned outages to determine ***network*** unavailability and verify restoration times 1.3. Interrogate system to identify traffic status using network management system 1.4. Analyse system alert to identify real and potential traffic problems 1.5. Analyse customer complaints and traffic measurement ***data*** to identify network problems 1.6. Activate and deactivate semi permanent controls active in the network on a regular basis to simulate irregular traffic

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ELEMENT	PERFORMANCE CRITERIA
2. Develop strategies to overcome network traffic problems	2.1. Conduct ***traffic measurements*** across all identified routes 2.2. Analyse results including historical data to make assessment of traffic volume requirements 2.3. Determine specific thresholds, loading and grading levels to alter traffic flows 2.4. Liaise with ***personnel*** to determine amendments to plan based on funding parameters and budgeted levels 2.5. Develop strategies based on traffic analyses and patterns to control traffic and prevent congestion or other traffic problems 2.6. Develop strategies for recovery where traffic congestion occurs 2.7. Develop contingency plans to allow for problems during network changes
3. Apply short and long term solutions	3.1. Implement software changes according to planned strategy 3.2. Develop short term ad hoc solutions where temporary solution only is required 3.3. Implement action plan to ensure that reversal action can be initiated in the case of temporary solution 3.4. Implement contingency plan where required 3.5. Undertake ***monitoring*** of changes and take measurements to assess the outcome of variations 3.6. Prepare a report based on analysis of measurements for appropriate personnel with recommendations for further changes or actions 3.7. Review and monitor strategies regularly and initiate corrective action where required
4. Detect and take action on potential traffic congestion	4.1. Measure and analyse ***traffic loads*** to assess potential congestion problems and determine possible impact 4.2. Control traffic flow to prevent processor overloads 4.3. Evaluate potential traffic increases for impact on the network and develop contingencies to control traffic flow if required
5. Provide traffic indicators for capacity planning	5.1. Predict future potential traffic trends and requirements using data on current and historical traffic patterns 5.2. Identify potential network traffic problems and make recommendations to network planners

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ELEMENT	PERFORMANCE CRITERIA
	5.3. Complete reports with recommendations and forward to enterprise planners and account managers

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret statistical data to determine trends
- communication skills to liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
- literacy skills to read and interpret technical specifications and related documentation and prepare reports and planning documentation
- numeracy skills to make statistical calculations on traffic predictions
- planning and organisational skills to develop activity plans and strategies for traffic management
- problem solving skills to overcome network traffic problems
- research skills to identify traffic trends and network capacity
- technical skills to perform statistical measurements

Required knowledge

- customer policies and service level agreements
- planning principles
- traffic blocking, congestion and dimensioning principles
- traffic engineering
- traffic patterns
- transmission type and signals that may be encountered
- typical network topologies, switching, routing and transmission techniques
- various network management systems suitable for conducting traffic evaluations

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement a contingency plan • apply short and long term solutions to traffic problems • conduct traffic measurements • develop contingencies to control traffic flow • identify potential network traffic problems and make recommendations • provide information for capacity planning.
Context of and specific resources for assessment	Assessment must ensure: • a network and equipment for traffic monitoring and management • equipment and systems manuals, specifications and enterprise policy.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking traffic monitoring and management • review of report completed by the candidate containing analysis of traffic flow and recommendations for potential problems • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL6046A Undertake network performance analysis. Aboriginal people and other people from a non-English speaking background may have second language issues.

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EVIDENCE GUIDE	
	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Network may include:	• equipment associated with:
	  • code division multiple access (CDMA)
	  • emerging technologies
	  • Ethernet
	  • global system for mobiles (GSM)
	  • multiprotocol label switching (MPLS)
	  • synchronous digital hierarchy (SDH)
	  • transmission control protocol (TCP)/internet protocol (IP)
	• Next Generation Networks (NGN):

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RANGE STATEMENT	
	• broadband access • data transfer • IP based systems • IP private branch exchange (PBX) • internet protocol TV (IPTV) • mobile data • mobile telephony • multimedia • video • voice over internet protocol (VoIP) • radio: • fixed • mobile • satellite • switching • transmission.
Data may include:	• bit error rate (BER) • call completion rates • circuit occupancy rate • current measurements • customer queuing times • customer satisfaction level • data throughput levels • dropout rates • erlang • historical results • jitter • packet loss • propagation delay • route availability • route blocking • route congestion • signal to noise ratio.
Traffic measurements may use:	• communication system analysers • digital analysers • microwave link analyser • network management tool • optical fibre power meters • optical time domain multiplexing (OTDR)

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RANGE STATEMENT	
	• protocol analyser • radio frequency (RF) microwave test sets • RF sweep tester • spectrum analysers • traffic flow meter.
Personnel may include:	• customer care and support centres • customer provisioning • equipment vendors • finance department • network management • network operations • network planning • other network providers • sales or account management • senior management • traffic engineering • traffic management.
Monitoring may include:	• live tests via alarms • network management systems • real-time performance indicators • surveys • temporarily connected test equipment • trend data.
Traffic loads may refer to:	• active sessions • call attempts • call holding time • call volumes • circuit occupancy • data throughput in bits • frames • packet volumes.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6044A Coordinate fault rectification and restoration of service following network outages

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to identify, analyse and resolve service faults by coordinating fault rectification. It describes strategies for dealing with customers, operational staff and associated system restoration. Network faults in service provider Core and Access Networks impact on services provided to customers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff who coordinate fault rectification and restoration of service following network outages apply the skills and knowledge in this unit. This unit applies to network engineers, managers or senior operational staff who have high level technical skills and appropriate authority to coordinate the activities of maintenance personnel. It addresses compliance issues associated with service level agreements.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for restoration of client services	1.1. Evaluate ***relevant data*** to determine the ***nature of the fault*** and the extent of the outage 1.2. Assess ***impact*** of the fault on network and clients and establish priority of actions to be taken 1.3. Analyse alarm and other network data and record the ***details*** according to contractual agreements and enterprise policy 1.4. Prepare an ***action plan*** to manage the fault

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ELEMENT	PERFORMANCE CRITERIA
	rectification and restoration to minimise impact on the network and affected customer 1.5. Provide a ***central point*** for all rectification and restoration activity and information to coordinate action and progress 1.6. Prioritise service restoration based on assessment of contractual arrangements, including ***service level agreements*** with clients 1.7. Negotiate with client's account manager regarding repair arrangements where service level agreements cannot be met
2. Implement action plan for fault rectification and service restoration	2.1. Notify all ***relevant personnel and departments*** involved in the ***outage*** according to enterprise policy 2.2. Isolate affected alarms and monitor all associated alarms to confirm no additional problems occur 2.3. Locate and rectify fault following action plan backed up by contingency plan according to enterprise policy 2.4. Manage repair activity with appropriate technical support and adjust resource allocations or ***escalate*** if required to ensure effective restoration of network services within a specified timeline 2.5. Reset alarms and restore services to normal network configuration 2.6. ***Test and monitor*** network activity upon recovery to certify effective fault clearance and service restoration
3. Finalise administrative tasks	3.1. Complete ***administrative tasks*** according to enterprise instructions 3.2. Notify customers of fault rectification and service restoration according to service level agreement

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE
• analytical skills to interpret test equipment settings and readings • communication skills to liaise and negotiate with clients and internal staff to ensure requirements are known and can be met within specified timeframes • literacy skills to read and interpret technical specifications and related documentation • PC skills to communicate with network and enterprise database • planning and organisational skills to ensure timely updates and information are communicated to appropriate parties • problem solving skills to account for unexpected faults or equipment incompatibilities • research skills to gain and maintain relevant and current technical product knowledge • technical skills to operate and configure equipment
Required knowledge
• alarm conditions and the areas of the network or service they impact • connections to carrier infrastructure or equipment • customer care policies • electrical and optical principles • escalation procedures and appropriate tier level contacts • legislation and licensing surrounding installation of telecommunications equipment • network and transmission equipment • occupational health and safety (OHS) requirements and work practices relevant to fault rectification • power requirements and electrical safety • protection switching • telecommunications applications and related equipment • test equipment • transmission hierarchy and switching principles • typical performance parameters and faults that may be encountered

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare an action plan to manage fault rectification and service restoration • coordinate implementation of action plan and manage repair activities • apply escalation procedures.
Context of and specific resources for assessment	Assessment must ensure: • sites where fault rectification and restoration of service may be conducted • use of testing equipment currently used in industry • manufacturer's and enterprise documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate planning and conducting coordination tasks for fault rectification • review of service restoration plans completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN6045A Implement planned network changes with minimal impact to the customer. Aboriginal people and other people from a non English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant data may include:	• alarm urgency • client reports • environmental factors • historical data • industry and vendor • network operations centre (NOC) reports • service level degradation • technical reports • test results from remote interrogation.
Nature of the fault may include:	• distributed denial of service (DDoS) attack • failure of transmission equipment • fibre cut • radio frequency interference • return path amplifier failure in hybrid fibre coaxial (HFC) network • satellite transponder failure • uninterruptible power supply (UPS) failure.

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RANGE STATEMENT	

Impact may include:	• customer impact:
	  • disruption of service to residential customers
	  • intermittent performance
	  • loss of service and revenue to an enterprise
	• network impact:
	  • call drop out
	  • congestion
	  • errors
	  • excessive latency
	  • limited mobile phone coverage
	  • no transmission
	  • poor grade of service (GoS)
	  • poor signal quality
	  • routing problems.

Details may include:	• duration of outage • geographical footprint of service problems • initial time of outage • outcome of automatic switch-over to standby equipment • services impacted.
Action plan may include:	• contingency plan • engage additional services • engage additional technical support • manual switchover to redundant path • monitor and amend procedures • provision of standby equipment.
Central point may include:	• network operations centre • network operations manager • outage coordinator.
Service level agreements may include:	• amount of scheduled maintenance • compensation • guaranteed uptime • levels of availability • performance • technical response to faults.
Relevant personnel and departments may include:	• client • design engineer • NOC

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RANGE STATEMENT	
	• on site technical staff • other installations sharing same network traffic • project manager • specialist technical support staff.
Outage may be:	• planned outage in the case of network upgrade • unplanned outage as a result of a network failure or emergency disruption to service.
Escalate may refer to:	• greater involvement from the NOC specialist personnel • requesting vendor specialist technical support.
Test and monitor may include:	• alarm monitoring • congestion activity report • fault incidence report • network management report • traffic flow measurements.
Administrative tasks may include:	• analysing trending data • completing test sheets • logging test instrument usage • recording problems identified during repair process • undertaking cause and effect studies • updating database or system log with repair details.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6045A Implement planned network changes with minimal impact to the customer

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively upgrade network equipment, increase network capacity, install new network elements and change existing network elements with minimal impact to the customer. It involves the control of planned routine maintenance activities on the network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors from service providers, asset owners and contractors who upgrade or reconfigure new and existing equipment apply the skills and knowledge in this unit. This unit applies to specialist staff with high level technical skills and appropriate authority to coordinate the activities of maintenance personnel. It addresses compliance issues associated with service level agreements.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for network changes plan	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** for compliance when conducting work 1.2. Evaluate ***work order*** with ***relevant personnel*** and identify the ***likely effects*** on the ***network*** and ***impact*** on ***customers*** of the planned changes 1.3. Develop ***network engineering strategies*** including management of ***outages*** with involvement of the ***network operations centre*** (NOC) 1.4. Prepare and produce a network changes plan for approval according to ***enterprise practice***
2. Implement and test	2.1. Implement network changes according to network

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ELEMENT	PERFORMANCE CRITERIA
network changes prior to customer utilisation	engineering strategies following occupational health and safety (***OHS***) ***and environmental requirements*** with minimal impact to ***customer traffic*** 2.2. Conduct ***integration testing*** of newly installed equipment to ensure interoperability with existing equipment and network 2.3. Conduct ***performance test*** to assess the network changes as stated in ***manufacturer's specifications*** and enterprise ***acceptance testing*** procedures 2.4. Analyse test results and rectify problems or ***escalate*** according to enterprise procedures 2.5. Initiate ***quality assurance*** procedures to ensure confidence in quality of processes according to enterprise policy 2.6. Prepare reports for the appropriate area within the enterprise
3. Enable functionality of network changes to customer	3.1. Monitor ***network stability*** prior to connecting customer traffic and take action to rectify any problems 3.2. Enable full functionality of network changes to customer according to the network changes plan and monitor network to ensure continued stability 3.3. Prepare appropriate documentation according to enterprise requirements
4. Assess and report on implementation of network changes	4.1. Use monitoring data to evaluate the performance of the network changes and impact to customers according to network engineering strategies and customer requirements 4.2. Document the implementation of the planned network changes and recommend any further improvements as part of the enterprise's quality assurance system

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

• analytical skills to asses network changes and make recommendations
• communication skills to interact with enterprise personnel, customers and other contractors keeping a customer focus and consideration of customer needs
• literacy skills to read, interpret and use equipment and system manuals and specifications and relevant enterprise policy and documentation
• planning and organisational skills to coordinate all work groups associated with network change
• PC skills to load software and hardware
• problem solving skills to account for unexpected faults or equipment incompatibilities
• research skills to gain and maintain relevant and current technical product knowledge
• safety awareness skills to adhere to all related OHS requirements and work practices
• technical skills to:
  • conduct performance testing
  • correctly handle, connect and calibrate test equipment
  • interpret test results, diagnose and rectify faults
  • perform integration testing

Required knowledge
• compatibility and interoperability of system types • factors affecting network stability • hardware • internet protocol (IP) based networks • legislation and licensing relevant to work activity • optical networks • quality assurance procedures • software • test equipment types suitable for tests to be made • types of customer networks

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate planned network changes, including impact on customer • develop network engineering strategies to manage outages • implement network changes • conduct integration testing, analyse results and rectify faults • enable full functionality of network changes.
Context of and specific resources for assessment	Assessment must ensure: • sites where network changes may be conducted • use of testing equipment currently used in industry • systems manuals, specifications and enterprise policy.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate implementing network changes • review of network changes plan prepared by the candidate outlining network engineering strategies to manage outages • review of test results and documentation completed by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN6044A Coordinate fault rectification and restoration of service following network outages. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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EVIDENCE GUIDE	
	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may relate to:	• Australian Communications Industry Forum (ACIF) standards and codes • AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005

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RANGE STATEMENT	
	• AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • cabling security codes and regulations • compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5, 6, 6A, 7 or 7A, and unshielded twisted pairs (UTP) • Environmental Protection Acts • fire regulations • noise abatement and heritage legislation • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Trade Practices Act.
Work order may include:	• authority to proceed with change to the network • list of activities to be undertaken • schedule of activities.
Relevant personnel may include:	• carrier or service provider staff • electrical contractor • equipment manufacturer • equipment supplier • external customer • on site operation staff.
Likely effects may include:	• congestion • drop out • excessive latency • limited coverage • loss of coverage • loss of service • poor grade of service (GoS) • poor signal quality • routing problems.
Network may include:	• cellular mobile networks • data and voice • IP network • national wide area networks (WAN) • optical dense wavelength division multiplexing

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RANGE STATEMENT	
	(DWDM) networks • public switched telephone network (PSTN).
Impact may include:	• disruption of service to residential customers • intermittent performance • loss of service and revenue to an enterprise.
Customers may include:	• building owner • communications consultant • contractor to a major supplier • end users • equipment owner • householder • operations staff.
Network engineering strategies may include:	• provision of redundant path • rerouting of traffic • supply of temporary equipment to maintain minimal services.
Outages may include:	• loss of service to customers due to a network disruption • planned outage in the case of network upgrade • unplanned outage in relation to fault.

Network Operations Centre may include:	• engineering unit within a carrier responsible for:
	  • controlling the network
	  • coordinating repairs or changes to the network
	  • monitoring the network
	  • performing diagnostic tests.

Enterprise practice may include:	• procedures for implementing installation • procedures for implementing maintenance • reporting tasks.

OHS and environmental requirements may relate to:	• decommissioning and isolating worksite and lines prior to commencement
	• gas and other hazard detection equipment
	• identifying other services, including power and gas
	• safety equipment:
	  • flashing lights
	  • safety barriers
	  • trench guards

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RANGE STATEMENT	
	• warning signs and tapes • witches hats • safe working practices, such as the safe use and handling of: • asbestos • chemicals • materials • tools and equipment • work platforms • special access requirements • suitable light and ventilation • environmental considerations: • clean-up protection • noise, dust and clean-up management • stormwater protection • waste management.
Customer traffic may include:	• analog or digital forms of: • data • image • voice.
Integration testing may include:	• compatibility • interface units • interoperability.
Performance test may include:	• bandwidth • blocking • call rate • congestion • distortion • drop out rate • functionality • interference • latency • network tests • optical transmission tests • packet loss rate • quality of service (QoS) • radio transmission test • recovery rate • redundancy

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RANGE STATEMENT	
	• signal to noise ratio • switching tests • transmission tests • transmission tests • transmitted power measurements • upload and download rate.
Manufacturer's specifications may include:	• electrical • environmental parameters • mechanical • regulatory.
Acceptance testing may include:	• testing equipment following major upgrade • testing newly installed equipment.
Escalate may include:	• greater involvement from the NOC specialist personnel • requesting vendor specialist technical support.
Quality assurance may include:	• acting on logs, reports and other data to guide ongoing quality improvements • reporting on installation or maintenance activities • updating logs.
Network stability may include:	• alarm monitoring • congestion activity report • fault incidence report • network management report • traffic flow measurements.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6047A Manage a common channel signalling network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to manage common channel signalling (CCS) network to control multiple data channels. The most common CCS signalling methods in use are integrated services digital network (ISDN) and signalling system No.7 (SS7). ISDN signalling is used primarily on trunks connecting end-user private branch exchange (PBX) systems to a central office. SS7 is primarily used within the public switched telephone network (PSTN). The two signalling methods are very similar since they share a common background and in some cases, the same signalling messages are transmitted in both ISDN and SS7. Voice over internet protocol (VoIP) communications use configurations with multiple routers to communicate via VoIP and CCS over a digital primary rate interface (PRI). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical officers or engineers from private and public organisations apply the skills and knowledge in this unit. They combine technical skills with organisational skills to provide signalling facilities to interconnect telecommunications over trunked networks.

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	They may be responsible for small projects or parts of larger projects and their primarily roles are to provide trunked transmission paths for a reliable service to customers.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**

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ELEMENT	PERFORMANCE CRITERIA
1. Analyse signalling and digital path alarms and clear network faults	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** to prepare for the task 1.2. Activate alarm management system to produce a trouble report and verify CCS and data faults or problems 1.3. Investigate cause of alarm and analyse results to determine appropriate repair action and allocate resources 1.4. Monitor ***repair and restoration procedures*** to ensure commitment to specified timelines and initiate ***escalation procedures*** as appropriate and according to enterprise procedures 1.5. Reset alarms on completion of repair and monitor subsequent alarms to ensure no re-occurrence of the problem
2. Monitor integrity of data received on equipment ports	2.1. Activate alarm screens and monitor port times on a regular basis to ensure that procedures are running 2.2. Clear port blockage and problems on completion of planned works and log in appropriate database 2.3. Monitor repair and restoration procedures to ensure commitment to specified timelines and initiate escalation procedures as appropriate and according to enterprise procedures
3. Monitor and acceptance test repair	3.1. Verify network stabilisation throughout repair and monitor repair action to ensure minimal impact on the overall network 3.2. Undertake acceptance ***testing*** according to prescribed operating procedures 3.3. Monitor network stability on completion and refer problems to the appropriate area for action 3.4. Block alarms for out of service circuits
4. Coordinate CCS relationships	4.1. Log requests for relationship change and follow up problems with appropriate support staff 4.2. Monitor network stability and manage loading of data until the process is completed 4.3. Update models and enterprise systems
5. Coordinate CCS rearrangements	5.1. Log requests for ***rearrangements scenarios*** and verify feasibility of rearrangement 5.2. Enter details of rearrangement in appropriate system

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ELEMENT	PERFORMANCE CRITERIA
	and update system records 5.3. Monitor completed work for accuracy and network stability on completion 5.4. Produce a copy of ***documentation*** for future reference

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to interrogate and evaluate complex information from multiple sources and to develop positions and recommendations
• communication skills to:
  • liaise with vendors, customers, and technical experts on technical and operational matters
  • negotiate with other repair and support staff
• literacy skills to incorporate technical language into written tasks such as records and reports
• numeracy skills to interpret technical data
• planning and organisational skills to work in a methodical and logical manner
• research skills to access technical information and sources to assist fault identification
• technical skills to operate testing tools

Required knowledge

• acceptance tests
• alarm set ups
• CCS:
  • architecture
  • protocols
  • signalling
  • testing
• data and signalling pathways
• repair and restoration procedures
• routing architecture

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REQUIRED SKILLS AND KNOWLEDGE
• switching network equipment operation

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify and implement repair action within service assurance guidelines • analyse and interpret alarms including CCS and digital path • apply enterprise fault management priorities and escalation procedures • resolve problems in a methodical and logical manner • conduct appropriate tests and interpret results.
Context of and specific resources for assessment	Assessment must ensure: • site with CCS network • tests and equipment currently used in industry • relevant legislation, codes, regulations and standards.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate managing a CCS network • oral or written questioning of the candidate to assess required knowledge of CCS networks, testing and repair and restoration procedures • review of documentation and records completed by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

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EVIDENCE GUIDE	
	• ICTTEN6043A Undertake network traffic management • ICTTEN6044A Coordinate fault rectification and restoration of service following network outages. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards***	• Australian Communications and Media Authority (ACMA) standards as they apply to

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RANGE STATEMENT	
include:	carrier operation • International Standards ISO 9000 and ISO 9001 • International Telecommunications Union (ITU) recommendations network management series E410 • occupational health and safety (OHS) • Privacy Act.
Repair and restoration procedures may include:	• arranging test sequence • conducting clearance test • notifying network operation centre (NOC) • performing fault diagnosis • repairing or replacing affected component • restoring services • verifying alarm.

Escalation procedures may include:	• pass onto network specialist at NOC
	• verification of fault status:
	  • clearance likely to exceed set time
	  • fault too complex for local attention
	• vendor technical specialist.

Acceptance testing may include:	• compatibility • functionality • operational • performance.
Rearrangements scenarios may include:	• CCS SS7 violations • digital path alarms • digital information path (DIP) running errors • link conversions.
Documentation may include:	• alarm management system printouts • fault clearance methods • fault details • final fault clearance tests • recommendations • test results.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6091A Analyse and organise repair of highly complex telecommunications network faults

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively manage the repair of highly complex network faults. It involves identification of faults across all network types with collaboration from the network operations centre (NOC). Highly complex network faults could comprise of interference, compatibility, compliance, interoperability and traffic congestion issues. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to network engineers, telecommunications officers, installers, maintenance staff and manufacturers or equipment specialists. It also applies to NOC staff in advisory roles and technical rectification roles.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Research fault background	1.1. Analyse the current ***relevant data*** and previous actions taken by other personnel 1.2. Research areas of similarity to ***network fault*** 1.3. Develop commercial and technical strategies with the equipment vendor and ***NOC*** for diagnosing the fault 1.4. Obtain appropriate clearance and access to network equipment, software and firmware codes where they apply
2. Diagnose fault	2.1. Apply a methodical approach to isolate and diagnose the problem 2.2. ***Simulate the fault*** in a workshop or laboratory

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ELEMENT	PERFORMANCE CRITERIA
	environment if possible 2.3. Seek support from the vendor while the investigation progresses 2.4. Instruct on site technical staff to run appropriate ***tests*** and analyse results 2.5. Diagnose network fault using established ***methodical strategies*** in a timely fashion without undue disruption to other services 2.6. Develop a plan to rectify the fault
3. Organise fault rectification	3.1. Recommend the fault rectification plan to the NOC, including any ***outages***, seek approval and adjust plans accordingly 3.2. Instruct ***on site repairers*** with clear and methodical instructions on how to proceed in rectifying the fault 3.3. Organise the replacement or repair of faulty equipment with appropriate advice from vendors and manufacturers 3.4. Reconfigure replaced or repaired equipment and test the rectified fault to ensure required performance 3.5. Notify the NOC, affected customers and on site staff of the rectification of the fault
4. Report and document fault details and rectification	4.1. Notify vendors of repair details and recommend changes to equipment design where appropriate 4.2. Conduct cause and effect studies and forward results to the appropriate area for necessary action 4.3. Complete all ***administrative tasks*** and prepare a report including deficiencies, analysis and recommendations

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to interrogate and evaluate complex information from multiple sources and to develop positions and recommendations

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REQUIRED SKILLS AND KNOWLEDGE

- communication skills to:
  - liaise with vendors, customers, and technical experts on technical and operational matters
  - negotiate with other repair and support staff
  - raise occupational health and safety (OHS) matters
- literacy skills to:
  - explain and justify faults and rectification actions
  - incorporate technical language into written tasks such as records and reports
  - interpret technical documentation and standards
- numeracy skills to interpret technical data, such as specifications of equipment
- problem solving skills to apply methodology in fault diagnosis
- research skills to access technical information and sources to assist fault identification
- safety awareness skills to adhere to all related OHS requirements and work practices
- technical skills to:
  - instruct site technical staff to run appropriate tests
  - diagnose network fault using methodical strategies
  - develop a plan to rectify fault

Required knowledge

- fault escalation procedures
- fault finding techniques and use of test equipment
- fault types and rectification
- integrated packet optical transport networks (P-OTNs)
- International Telecommunication Union (ITU) ITU-T G.709 standard
- network protocols
- safety requirements and standards
- service agreements
- synchronous digital hierarchy (SDH)
- transmission control protocol (TCP)-internet protocol (IP)
- types of networks and equipment:
  - Access
  - broadband deployment
  - cabling
  - customer premises equipment (CPE)
  - IP networks for enterprise and customer systems and installations
  - local area networks (LAN)
  - telephony

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REQUIRED SKILLS AND KNOWLEDGE
• wide area networks (WAN) • workplace environment and practices

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • diagnose network fault using established methodical strategies to rank likely causes without undue disruption to other services • recommend fault rectification plan to the NOC • instruct on site repairers • facilitate the replacement or repair of faulty equipment with appropriate advice from vendors and manufacturers • facilitate the final testing of the rectified fault to ensure required performance • prepare report including deficiencies, analysis and recommendations.
Context of and specific resources for assessment	Assessment must ensure: • a site where highly complex network faults may be demonstrated and analysed without jeopardising live traffic • equipment currently used in industry • design specifications and manufacturer's manuals and reference materials.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral report and direct observation of the candidate establishing a test regime

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EVIDENCE GUIDE	
	• direct observation of the candidate undertaking tests on equipment and systems • review of reports completed by the candidate for different equipment types, test results and situations, analysing results with recommendations and supporting reasons.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTNPL6046A Undertake network performance analysis • ICTTEN6044A Coordinate fault rectification and restoration of service following network outages. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant data may relate to:	• alarm conditions • client reports • environmental factors • historical • industry and vendor • NOC • service level degradation • technical reports • test results from remote interrogation.
Network fault may include:	• compatibility • compliance • interference • intermittent performance problems • interoperability • network dropout • out of specification faults • software compatibility • system configuration problems • traffic congestion.

Network Operations Centre may include:	• engineering unit within a carrier responsible for:
	  • coordinating repairs or changes to the network
	  • monitoring the network
	  • performing diagnostic tests.

Simulate the fault may include:	• circuit simulation software • computer modelling • equipment test bed.
Tests may include:	• bandwidth • bit interleaved parity (BIP-8) error detection • blocking • call rate

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RANGE STATEMENT	
	• congestion • distortion • drop out rate • functionality • interference • intrusive through mode testing capability • latency • network tests • optical transmission • packet loss rate • quality of service (QoS) • radio transmission • recovery rate • redundancy • signal to noise ratio • transmitted power measurements • upload and download rates.
Methodical strategies may relate to:	• analysing test results • conducting tests • coordinating maintenance staff • isolating fault progressively to eliminate probable causes • monitoring path • reloading software • scheduling diagnosis for low traffic times • monitoring section • substituting hardware • trail trace identifier.
Outages may include:	• loss of service to customers due to a network fault or upgrade • planned outage in the case of network upgrade • unplanned outage in relation to faults.
On site repairers may include:	• carrier's engineers, technical officers and technicians • contractors • equipment vendors and manufacturers.
Administrative tasks may relate to:	• completing job orders and submitting to appropriate enterprise organisational unit • completing test sheets according to specification and logging test instrument usage

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RANGE STATEMENT	
	• correct labelling of all equipment and amending where required • following quality control procedures • handing over installation briefs, documents and equipment manuals to operational staff • recording test results and updating appropriate databases • tasks that comply to enterprise requirements and policy • update fault history log with details of fault and details of repair • updating design specifications and returning to design area as required by enterprise requirements.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6094A Verify new software and hardware releases

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to verify compliance and compatibility of software and hardware to an existing system. Installation may be new software and hardware releases for an existing system or new infrastructure for convergence to Next Generation Networks NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who verify new software and hardware releases apply the skills and knowledge in this unit. They may make use of software test routines and testing hardware for performance to manufacturer's and design specifications.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan the testing of new software releases	1.1. Obtain manuals, specifications and instructions associated with new releases and identify areas of uncertainty for confirmation with the vendor 1.2. Plan the ***testing environment*** of the software release and likely impact with network management centre 1.3. Determine resources required to assist with the test and negotiate their availability 1.4. Determine and plan outage and notify network management centre as required 1.5. Notify customers of impact on the network during the test 1.6. Develop contingency plans to cater for likely problems during the test

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ELEMENT	PERFORMANCE CRITERIA
2. Test software and hardware units	2.1. Load new software and conduct ***tests*** using appropriate ***test equipment*** according to vendor specifications 2.2. Evaluate test results to assess functionality and features of software and hardware according to vendor documentation 2.3. Test ***compatibility*** with existing network and take corrective action with vendor as required 2.4. Implement contingency plans in conjunction with network management if integrity of the network is compromised by the new release
3. Undertake administrative work	3.1. Document test results and store according to enterprise policy 3.2. Discuss ongoing or likely problems with the vendor and initiate follow up arrangements to ensure a permanent solution 3.3. Provide clearance for software and hardware release to be put in service in the system according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to interact with enterprise personnel, customers and other contractors, while maintaining a customer focus and consideration of customer needs
- literacy skills to interpret technical documentation, such as software and hardware manuals, specifications and relevant enterprise policy and documentation
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise testing and contingency plans
- problem solving skills to solve software, hardware and logistics problems
- safety awareness skills to follow occupational health and safety (OHS) requirements and work practices
- task management skills to work systematically with required attention to detail
- technical skills to:

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REQUIRED SKILLS AND KNOWLEDGE
• conduct tests on software and hardware units • load software • use diagnostic programs and equipment
Required knowledge
• features and operating requirements of testing routines and equipment, key performance indicators (KPIs) and service level agreements • information required to operate software and hardware according to a test specification • manufacturer's requirements for operation of equipment • specific organisational requirements relating to the activity and site conditions • system maintenance and upgrade procedures, codes of practice and other formal agreements that impact on the work activity • test methods, performance and integration requirements • typical issues and challenges that occur with new software and hardware releases

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop a plan for testing new software releases including functionality and performance under load conditions • develop a contingency plan recognising potential causes of problems and impact on service levels • test compatibility of software and hardware with existing system • analyse impact of integration of new hardware and software release on the network and make recommendations for improvement.
Context of and specific resources for assessment	Assessment must ensure: • a system to verify compliance and compatibility of

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EVIDENCE GUIDE	
	software and hardware • test equipment currently used in industry • systems manuals, vendor specifications and enterprise policy.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate testing compatibility of software and hardware with existing system and analysing problems arising • review of test regime, including test results with analysis and improvement recommendations prepared by the candidate • review of contingency plan prepared by candidate • oral or written questioning of the candidate to assess knowledge of test methods, performance and integration requirements.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN6045A Implement planned network changes with minimal impact to the customer. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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EVIDENCE GUIDE	
	Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Testing environment may include:	• live as a pilot
	• simulated controlled environment
	• staged
	• variables:
	  • availability of suitable location for testing
	  • compatibility of existing software and hardware
	  • nature of the release
	  • operational environment involved
	  • risks and uncertainty involved.

Tests may include:	• error check • full system • load testing of new system • performance • software performance using independent third party software • switching • traffic flow • transmission • transmitter power.
Test equipment may include:	• communication testers • network manager • protocol analyser

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RANGE STATEMENT	
	• transmission measuring sets.
Compatibility may include affect on:	• network • network management tools • new vendor network elements.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to specify the design of the required mobile cellular general packet radio service (GPRS), third-generation (3G) and fourth-generation (4G) network architectures. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who design and operate mobile wireless systems that meet the industry implementation of wireless convergence in telecommunications apply the knowledge and skills in this unit. They would be employed in the ICT industry by companies deploying convergence technologies in their Core and Access networks to meet their business needs.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units	

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan and prepare for the design of cellular mobile networks	1.1. Analyse the ***requirements*** of the mobile ***network*** 1.2. Examine ***technical characteristics*** of the GPRS ***systems*** 1.3. Develop network architecture for a ***GPRS network*** in addition to the ***circuit-switched*** domain of 2G 1.4. Review 3G structure and identify requirements of the network to provide a wide variety of services ranging from voice and paging services to interactive multimedia, including teleconferencing and internet access 1.5. Examine the technical characteristics, data rates, operating frequencies and multiplexing schemes of the 3G system 1.6. Establish the positioning and types of antennas,

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ELEMENT	PERFORMANCE CRITERIA
	terminals, processors, required protocols and ***architecture***, based on technical ***specifications*** and requirements
2. Design a GPRS (2.5G) cellular network	2.1. Investigate how 2.5G GPRS overlays the GSM network to transmit and receive transmission control protocol (TCP)/ internet protocol (IP) based data to and from GPRS mobile devices
3. Design a 3G cellular network	3.1. Develop the network architecture for a 3G network and explain the functions of the network elements 3.2. Integrate a 3G network with a wireless local area network (WLAN)
4. Research and evaluate design features of a proposed 4G cellular network	4.1. Investigate how a fully IP based 4G system will provide an end-to-end IP integrated solution for voice, data and streamed multimedia to end users roaming anytime and anywhere 4.2. Investigate access schemes of a 4G network 4.3. Investigate implication for IPv6. 4G support to greater number of IP based wireless devices with applications such as improved multicast, security and route minimisation capabilities 4.4. Investigate the use of ***advanced antenna systems*** to enable 4G with high rate, high reliability and long range communications
5. Produce reports for architectural design for cellular networks	5.1. ***Report*** on the impact of ***competing technologies*** on each other 5.2. Investigate the potential interoperability and global roaming issues that may be faced by GSM, 2.5G, 3G and 4G cellular technologies

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• design skills to technically enhance cellular networks to include IP convergence • group facilitation and presentation skills to transfer and collect information and gain consensus on concepts

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REQUIRED SKILLS AND KNOWLEDGE
• literacy and communication skills to analyse, evaluate and present information, when documenting network design and presenting it to senior managers, client users and sponsors for approval • problem solving skills to predict traffic and the impact on input and output devices and processors from current and future demand requirements • research skills to specify, analyse and evaluate broad features of current security issues and best practice in security devices, products and procedures • technical skills to operate cellular networks
Required knowledge

• broad knowledge of the client business domain when designing network
• current industry accepted network hardware and software products and their general features and capabilities, and detailed knowledge when designing a GPRS (2.5G) and 3G network
• current industry security products, devices and procedures and their general features and capabilities, and detailed knowledge when finalising GSM, GPRS (2.5G) and 3G network design
• detailed knowledge of current industry accepted cellular mobile network protocols
• technical characteristics of GPRS systems:
  • capability classes and multi-slot classes
  • coding schemes
  • data rates
  • management systems when evaluating roaming features
  • operating frequencies and modulation schemes
  • remote user issues when establishing siting and types of antennas, terminals, processors, required protocols and GPRS (2.5G) and 3G network architecture, based on technical specifications and user requirements
• theoretical concepts of three or more current industry network development and design methodologies when designing networks

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • design viable GPRS (2.5G) and 3G network solutions to meet particular business needs • research design features of 4G cellular networks.
Context of and specific resources for assessment	Assessment must ensure: • budget for designs for convergent cellular mobile networks • cellular mobile network structures • client requirements • expected traffic volume • information on a range of IT business solutions • technical specifications • vendors and vendor offerings and pricing.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning to assess knowledge of current industry networks and design methodologies • review of report prepared by the candidate outlining evaluation process undertaken, including challenges faced and how these were addressed • direct observation of the candidate undertaking multiple antenna positioning • evaluation of network designed by the candidate in terms of performance and suitability of business needs.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN6098A Monitor the capacity of and recommend changes to the mobile cellular network. • ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

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EVIDENCE GUIDE	
	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Requirements may include:	• application • network • system • the business.

Network may include:	• cellular mobile networks
	• internet
	• national WANs
	• public switched telephone network (PSTN):
	  • data
	  • voice.

Technical characteristics may	• capability classes

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RANGE STATEMENT	
include:	• coding schemes • data rates • operating frequencies and modulation schemes.
Systems may include:	• hardware components that run a cellular mobile network • software components that run a cellular mobile network.
GPRS network may include:	• GGSN of 2.5G and 3G • SGSN of 2.5G and 3G.

Circuit-switched may include:	• GSM core network:
	  • authentication centre (AUC)
	  • equipment identity register (EIR)
	  • home location register (HLR)
	  • mobile services switching centre (MSC)
	• public switched telephone network (PSTN) and associated signalling.

Architecture may include:	• configuration of GPRS (2.5G), 3G and 4G topologies
	• network management:
	  • global roaming issues faced by cellular technologies
	  • interoperability.

Specifications may include:	• current system functionality • technical requirements • user problem statement.
Advanced antenna systems may include:	• adaptive antennas • multiple input multiple output (MIMO).
Report may include:	• audit trails • client training • ISO, European Telecommunications Standards Institute (ETSI) and Australian standards • maintaining equipment inventory • naming standards • project management templates and report writing • satisfaction report • technical report • version control.
Competing technologies may	• 4G

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RANGE STATEMENT	
include:	• 802.11n • worldwide interoperability for microwave access (WiMAX).

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units	

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6172A Design and configure an IP-MPLS network with virtual private network tunnelling

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design an internet protocol-multiprotocol label switching (IP-MPLS) network, examine MLPS data flow and configure virtual private network (VPN) tunnelling. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to technical staff dimensioning an IP-MPLS Core Network for a carrier or an internet service provider (ISP). MPLS and VPNs are used to provide secure, reliable and fast IP services in technology convergence of data, voice and video. Relevant job roles include designer and installer of Next Generation Networks (NGN). These IP networks provide fast internet, voice over internet protocol (VoIP) and internet protocol TV (IPTV) services.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan and design a IP-MPLS network to meet business requirements	1.1. Determine the IP-MPLS ***network design requirements*** in consultation with ***enterprise customer***
	1.2. Optimise ***factors*** affecting design
	1.3. Use label stacking to route MPLS packets in the network to build of ***MPLS services***
	1.4. Dimension layer-3 generation of core backbone to allow MPLS IP-VPN to provide ***MPLS convergence*** services
	1.5. Use MPLS control plane to set up wavelengths
	1.6. Produce the design topology of a MPLS ***network*** to include the location and types of edge label switch

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ELEMENT	PERFORMANCE CRITERIA
	routers (LSR) and core LSRs in agreement with enterprise customer
2. Configure a MPLS network and verify traffic engineering (TE) considerations	2.1. Configure edge and core LSRs to provide secure methods of transporting IP packets in the MPLS network using ***layer 2 protocols*** 2.2. Configure the LSRs to provide toll bypass for convergence of voice and data over the IP network 2.3. Classify traffic in MPLS terms and configure the Edge LSR to sort traffic into forward equivalent classes (FECs) 2.4. Install and remove the two ***standardised signalling protocols*** for managing traffic engineering (TE) of MPLS paths 2.5. Configure the MPLS-TE to provide routing on diverse paths to avoid congestion and guarantee bandwidth services
3. Configure a VPN and provide a virtual private LAN service (VPLS)	3.1. Configure a MPLS VPN tunnel for a customer network to provide multipoint-to-multipoint VPN connectivity 3.2. Build a content hosting server into a MPLS based VPN to produce a media network 3.3. Use virtual private LAN services (VPLS) as a VPN method for wide area network (WAN) multipoint-to-multipoint Ethernet connectivity spanning across multiple metropolitan areas 3.4. Produce a VPLS topology using an internet protocol IP-MPLS cloud with provider edge (PE) routers connecting VPLS domains associated with enterprise customer
4. Complete documentation	4.1. Produce a final design plan including network elements, configuration details and recommendations for design changes 4.2. Notify customer and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE
Required skills

• analytical skills to use complex technical data to develop network designs
• communication skills to consult with customers
• literacy skills to read and write reports
• numeracy skills to use binary systems
• project planning skills to set benchmarks and identify scope
• problem solving skills to solve a range of predictable network problems
• research skills to identify, analyse and evaluate broad features of a particular business domain and best practice in networking technologies including hardware and software to be installed
• technical skills to:
  • deploy multipoint-to-multipoint VPLS domains via IP-MPLS cloud
  • implement and verify routing information protocol (RIP), enhanced interior gateway routing protocol (EIGRP), open shortest path first (OSPF) and border gateway protocol (BGP) operations
  • implement MPLS architecture across a WAN environment
  • implement secure VPN tunnels across the MPLS network

Required knowledge
• current industry-accepted hardware and software products • network operating systems and cabling standards • networking technologies • the customer business, domain, function and organisation effect on customer requirements and network equipment • transmission technologies and protocols

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • plan and design a MPLS network that meets business

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EVIDENCE GUIDE	
competency in this unit	requirements • configure and test the MPLS network according to specified guidelines • produce appropriate documentation • implement secure VPN tunnelling.
Context of and specific resources for assessment	Assessment must ensure: • a live network and networked computers • network design documentation, equipment specifications and organisational guidelines • network components, routers, switches and multi-layer switches.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate planning, designing and configuring a MPLS • review of documentation completed by the candidate • oral or written questioning of the candidate to assess required knowledge and skills.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN6216A Design and manage internet protocol TV in a service provider network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required

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EVIDENCE GUIDE	
	knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Network design requirements may include:	• bandwidth
	• firewalls
	• gateway to wireless local area networks (WLAN)
	• multi-layer switches
	• number and type of core and edge routers
	• number of channels
	• protocols:
	  • BGP
	  • label distribution protocol (LDP)
	  • OSPF
	  • resource reservation protocol (RSVP)
	• quality of service (QoS)
	• security
	• servers
	• switches
	• throughput.

Enterprise customer may include:	• banks • clubs • external organisations • hospitals

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RANGE STATEMENT	
	• internal departments • teaching institutions.

Factors may include:	• protocol incompatibility
	• QoS issues:
	  • loss rate
	  • latency
	  • jitter
	  • throughput
	• router availability.

MPLS services may include:	• any transport over MPLS (AToM):
	  • 802.1Q - Ethernet VLAN
	  • asynchronous transfer mode (ATM)
	  • Ethernet
	  • frame relay (FR)
	  • high-level data link control (HDLC)
	  • point-to-point protocol (PPP)
	• BGP MPLS VPN
	• Ethernet virtual circuit Ethernet over MPLS(EoMPLS) reroute link or node failure
	• link or node protection failure:
	  • link resilience
	  • node resilience
	• MVPN (multicast VPN)
	• QoS
	• traffic engineering:
	  • bandwidth utilisation
	  • capacity planning
	  • congestion
	  • virtual lines - toll bypass
	• VPLS.

MPLS convergence may include:	• ADSL cable • enterprise VoIP • FR-ATM transport • internet access • IPTV • VPN.
Network may include:	• data and voice • edge and core LSR

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RANGE STATEMENT	
	• hosting servers for media content • internet • large and small LANs • national WANs • private lines • use of the public switched telephone network (PSTN) for dial-up modems only • VPNs • wireless.
Layer 2 protocols may include:	• ATM • Ethernet • FR • generic routing encapsulation (GRE) • packet over SONET (POS) • PPP.
Standardised signalling protocols may include:	• CR-LDP • RSVP-TE.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6206A Produce an ICT network architecture design

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to compile, and evaluate the business specifications from a client and produce a set of architecture design solutions that will cater for present and future forecast demands. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Officers in field work who to carry out design and implementation of technical solutions of ICT networks apply the skills and knowledge in this unit for a practical solution in network design. They would be employed by telecommunications and IT networking provisioning companies specialising in integrating the converging and emerging technologies of ICT networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare to produce ICT architecture design	1.1. Obtain ***business specifications*** and ***business requirements*** for the ***client*** from ***appropriate person*** 1.2. Review specifications and requirements to identify the type of ***ICT network*** and network specifications required 1.3. Consult with key ***stakeholders*** to identify their requirements 1.4. Assess business problems, opportunities and objectives and confirm details with appropriate person
2. Produce the preliminary ICT network architecture design	2.1. Ascertain ***technical requirements***, including ***hardware***, ***software*** and ***network elements*** according to specifications

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ELEMENT	PERFORMANCE CRITERIA
	2.2. Select software solutions to suit business platform 2.3. Develop preliminary physical network diagrams as a preface to ***architecture*** blueprint 2.4. Produce a document on the possible ***impact*** of the network design on the business requirements
3. Evaluate preliminary design and likely performance using forecast demands	3.1. Predict forecast traffic demands and the impact on network design from current and future demand requirements 3.2. Benchmark the design using expected ***performance parameters*** 3.3. Review the design based on identification of the likely performance profile (best/worst) 3.4. Determine costs involved with a range of supplier products 3.5. Produce an evaluation report on predicted performance and costs of the network architecture design addressing the business specifications and recommendations
4. Finalise network design and obtain approval	4.1. Review the benchmarks and requirements and final design proposed 4.2. Determine the support and training requirements needed 4.3. Obtain the latest technical specifications and pricing by contacting possible vendors 4.4. Document the network design and present ***documentation*** to appropriate person for approval 4.5. Obtain sign off on final business solution

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with internal and external personnel on technical, operational and business related matters • literacy skills to read and interpret technical documentation and write reports, design solutions and recommendations

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REQUIRED SKILLS AND KNOWLEDGE

• numeracy skills to interpret business requirements and specifications and evaluate possible technical design scenarios for optimum solution
• planning and organisational skills to plan, prioritise and monitor own work
• problem solving and contingency management skills to adapt varied business procedures to requirements
• research skills to interrogate vendor databases and websites to implement different solutions to meet client business specifications
• technical skills to:
  • evaluate and make further recommendations for optimum solution
  • produce technical designs

Required knowledge

• broad technical knowledge of technologies:
  • Access Networks
  • Core Networks
  • ICT network topologies
  • mobile cellular networks
  • network protocols and operating systems
  • optical networks and principles
  • radio frequency (RF) technologies and principles
  • radio frequency identification (RFID) hardware and software
• business processes
• client business domain, business function and organisation
• compatibility issues and resolution procedures
• configuration of internet protocol (IP) networks
• customer and business liaison
• desktop applications and operating systems
• documenting technical specifications
• linkage between processes
• security protocols, standards and data encryption

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • adapt technologies to specified technical solutions • use site design software and hardware • evaluate client specifications against accepted industry practices • produce technical designs from business specifications • analyse feedback from client and make adjustment to the proposal • produce information that can be shared between businesses • apply design concepts to business solutions • produce technical reports • make recommendations and offer optimum design solutions.

Context of and specific resources for assessment	Assessment must ensure:
	• sites providing:
	  • client functional requirements
	  • business specifications
	  • database software
	  • simulation software
	  • organisational guidelines
	  • network or computer layout
	  • site design software and hardware
	  • information on a range of ICT business solutions.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of evaluation report prepared by the candidate on predicted performance and costs of the network architecture design outlining the business specifications and recommendations • oral or written questioning on required knowledge and skills • evaluation of research methodologies and the final proposal prepared by the candidate outlining

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EVIDENCE GUIDE	
	solutions and recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTOPN6128A Design a dense wavelength division multiplexing systems • ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks • ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the

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RANGE STATEMENT	
performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Business specifications may include:	• budget allocation • budget costs estimate • current system functionality • future plan • growth forecast • technical requirements • timeline • user problem statement.
Business requirements may include:	• business application • business plan • existing system • mission statement • nature of the business • network or people in the organisation.
Client may include:	• external organisations • ICT company • individuals • internal departments • internal employees • service industry.
Appropriate person may include:	• authorised business representative • client • ICT network administrator • ICT network manager • ICT support manager • small or medium enterprise (SME) customer • small office home office (SOHO) customer • supervisor.
ICT network may include:	• Access Network • broadband network • Core network • customer network • internet • intranet • multimedia • radio

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RANGE STATEMENT	
	• RFID • security • switching • telecommunications • transmission • voice, video and data.
Stakeholders may include:	• development team • project team • sponsor • user.
Technical requirements may refer to:	• bandwidth • hardware problems • network growth • network security • network traffic congestions • new technologies • power usage • software problems • transmission dropouts • upgrades.

Hardware may include:	• cabling network
	• cellular phone network
	• internet protocol TV (IPTV)
	• IT network elements:
	  • gateway
	  • local area network (LAN) switch
	  • router
	  • server
	  • wireless network
	• multimedia
	• optical network
	• radio network
	• RFID equipment
	• switching equipment
	• transmission equipment
	• voice and data equipment.

Software may include:	• commercial • customised software • in-house

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RANGE STATEMENT	
	• network management • operating system • packaged • patches • vendor propriety.

Network elements may include:	• add-drop multiplexer
	• antenna
	• base station
	• dense wavelength division multiplexing (DWDM) unit
	• encoder
	• IT network elements:
	  • gateway
	  • LAN switch
	  • router
	  • server
	  • wireless network
	• laser module
	• optical unit
	• protocol analyser
	• receiver
	• RF unit
	• RFID unit
	• splitter
	• transmitter.

Architecture may include but is not limited to:	• carrier network architecture:
	  • Access
	  • billing
	  • broadband
	  • broadcasting
	  • Core
	  • data
	  • optical
	  • wireless
	• configuration:
	  • large memory model
	  • requests per second
	  • small memory model
	• database software:

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RANGE STATEMENT	
	• Informix • Ingres, DB2 • Microsoft SQL server • mSQL • MySQL • Oracle • SQL server • Sybase • operating system: • Linux • Mac OS • Novell NetWare • Windows.
Impact may refer to:	• fewer downtimes • improved efficiency • improved response times • increased return on investment • lower operational costs • more 'user friendly' network.
Performance parameters may include:	• attenuation • bandwidth • bit error rate (BER) • congestion • data security • distortion • dropouts • interference • latency • packet loss • phase jitter • polarisation • quality of service - QoS • transmission data rate.
Documentation may include:	• audit trails • client training and satisfaction reports • costing details • design report • evaluation report and recommendations • implementation plan

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RANGE STATEMENT	
	• international standards • International Electrotechnical Commission (IEC) • Institute of Electrical and Electronics Engineers (IEEE) standards • Internet Engineering Task Force (IETF) standards • International Telecommunications Union (ITU) standards • Australian standards • naming standards • version control.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN6216A Design and manage internet protocol TV in a service provider network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design a multiprotocol label switching (MPLS) network for internet protocol TV (IPTV) and manage the delivery of IPTV services. This includes Core and Access Networks for the service provider. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff designing and dimensioning an IP-MPLS Core and Access Network for a service provider of IP services in technology convergence of data, voice and video apply the skills and knowledge in this unit. Relevant job roles include designer and installer of Next Generation Networks (NGN). These IP networks provide fast internet, voice over internet protocol (VoIP), IPTV and internet TV services.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Produce and evaluate design requirements for an IPTV network	1.1. Analyse the ***major video models*** and the impact the ***video challenges*** will have on the design of an IPTV network 1.2. Evaluate IPTV against other ***competing TV broadcast technologies*** to determine optimum design approach 1.3. Produce the ***topology of an IPTV network*** showing ***network architecture*** from the ***IPTV standards bodies*** and determine the design requirements 1.4. Plan the dimensioning of ***network parameters*** for multicast and unicast video delivery over broadband in a service provider network
2. Design an IPTV network for video on demand (VoD) delivery	2.1. Design the content delivery system (CDS) to cache IPTV content in each major metropolitan area for broadcast or streaming VoD models to eliminate performance variability

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ELEMENT	PERFORMANCE CRITERIA
	introduced by Internet transport or core peering relationships 2.2. Design a video network to provide VoD loads with ***network solutions*** using ***VoD design requirements*** 2.3. Design VoD application to meet bandwidth requirements and quality of service (QoS) requirements for commercial viability of IPTV network
3. Design and configure an MPLS IPTV network to meet business requirements	3.1. Determine the IP-MPLS ***network design requirements*** 3.2. Investigate ***factors*** that affect design considerations and ways they can be minimised 3.3. Produce the design topology of a ***MPLS network*** to provide secure methods of transporting IP packets using ***layer 2 protocols*** 3.4. Design an MPLS layer over the IP networking structure to combine the efficiency of multicast protocols with traffic engineering (TE) facilities to enable fast packet forwarding for real time video streaming applications
4. Manage the delivery of IPTV services	4.1. Determine the ***operational processes*** required to support IPTV by operators 4.2. Produce a plan of the management and customer support model including strategies dealing with the delivery of ***VoD issues*** 4.3. Produce a plan of a video network using ***video delivery strategies*** to deliver optimum average revenue per user (ARPU) to serve the demographic of an area and the ***nature of an operator's business*** 4.4. Manage and monitor video across the network using a ***management tool***

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to analyse and evaluate: • broad features of a particular business domain and best practice in networking technologies when hardware and software network components to be installed are identified

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REQUIRED SKILLS AND KNOWLEDGE

• competing video models over broadband networks
• literacy skills to produce plans
• problem solving skills to solve a predictable range of network problems
• project planning skills to set benchmarks and identify scope
• technical skills to:
  • deploy multipoint-to-multipoint VPLS domains via IP-MPLS cloud
  • design VoD facility for video delivery
  • dimension network parameters
  • implement and verify:
  • border gateway protocol (BGP)
  • enhanced interior gateway routing protocol (EIGRP)
  • Flash
  • hypertext transfer protocol (HTTP)
  • internet group management protocol (IGMP)
  • open shortest path first (OSPF)
  • real time streaming protocol (RTSP)
  • routing information protocol (RIP)
  • web cache communication protocol (WCCP) operations
  • implement MPLS architecture across a wide area network (WAN) environment
  • implement secure video streaming over MPLS network

Required knowledge
• competing video delivery over broadband networks • current industry-accepted hardware and software products • networking technologies incorporating detailed knowledge of network operating systems, IP networks and MPLS networks • transmission technologies and protocols

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce and evaluate design requirements for an IPTV network • design an IPTV network for VoD delivery • design and configure an MPLS IPTV network to meet business requirements • manage the delivery of IPTV services.
Context of and specific resources for assessment	Assessment must ensure: • protocols, configuration documents, management tools and standards • network and demographic trends, and customer demand data.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of design requirements and network designs completed by the candidate • oral and written questioning of the candidate on required knowledge • direct observation of the candidate designing and configuring and MPLS IPTV network and managing IPTV services.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN6172A Design and configure an IP-MPLS network with virtual private network tunnelling. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Major video models may refer to:	• broadcast video or multicast models replicating the behaviour of a Cable TV (CATV)system offering a customer multi-channel viewing • 'store for play' model or download model allowing the customer to load the video onto a local disk for viewing • VoD or unicast models allowing the customer to stream video in real-time as selected by the customer.
Video challenges may include:	• streaming video requiring real-time consistent network performance • user perception of video to be a continuous long term experience with complaints if any significant portion goes badly • video being bandwidth hungry as an application.
Competing TV broadcast technologies may include:	• CATV • internet TV or content delivery network • satellite TV.

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RANGE STATEMENT	
Topology of an IPTV network may include:	• digital subscriber line access multiplexer (DSLAM) • head end servers • home gateway • media centres • media content servers • MPLS routers • MPLS switches • set-top box (STB).

Network architecture may include:	• Access Networks:
	  • carrier Ethernet
	  • fibre to the x (FTTx)
	  • passive optical network (PON)
	  • wireless fidelity (WiFi)
	  • worldwide interoperability for microwave access (WiMAX)
	  • x digital subscriber line (DSL)
	• core distribution network (MPLS)
	• internet TV or content delivery network (CDN):
	  • CDN applications:
	  • hyper syndicated video
	  • session shifting
	  • user generated content
	  • internet delivery protocols:
	  • Flash (RTMP, RTMPE, RTMPT and RTMPTE)
	  • HTTP
	  • RTSP
	  • internet video formats:
	  • video compression protocols (Flash, MPEG-2, MPEG-4, H.264and VC-1)
	  • video encapsulation (MP4, WMV, AVI, SWF, FLV)
	• terminal device:
	  • home gateway
	  • media centre
	  • STB.

IPTV standards bodies may	• third generation partnership project (3GPP) - IP

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RANGE STATEMENT	
include:	multimedia subsystem (IMS) • 3PPP • DVB • European Telecommunications Standards Institute (ETSI) • Home Gateway Initiative (HGI) • International Telecommunications Union (ITU-T) • Open IPTV Forum (OIPF) • Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Network parameters may include:	• broadcast system:
	  • acquisition video quality (MPEG 2 - 6 to 20 Mbps)
	  • distribution video quality required(H.264 2 to 8 Mbps)
	  • level of redundancy
	  • number of standards definition (SD) and high definition (HD) linear channels
	• CDS:
	  • amount and location of vault storage required
	  • number of VoD titles (SD and HD)
	  • placement of streaming caches reduces network bandwidth
	  • storage and stream redundancy required
	  • streaming capacity based on peak concurrent streams required
	• conditional access system:
	  • number of concurrent leases
	  • number of STBs
	  • peak transactions per second
	• headend control system:
	  • number of STBs changing channels
	  • number of STBs rebooting at one time
	• network requirements:
	  • access and customer links
	  • bandwidth across the core
	  • number of linear channels viewed at a given

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RANGE STATEMENT	
	time • placement of VoD streamers to save bandwidth.
Network solutions may include:	• dense wavelength division multiplexing (DWDM) application on optical fibre • network capacity • separation of VoD to other applications • size of pipe • star rather than mesh topology.

VoD design requirements may refer to:	• delivery model:
	  • characteristics of customer access network and metro connection network
	• management and support model:
	  • ways of ordering, supporting and billing
	• service model:
	  • appliances to which video is delivered to
	  • nature of content
	  • video format.

Network design requirements may include:	• bandwidth
	• number and type of core and edge routers
	• number of channels
	• protocols:
	  • BGP
	  • IGMP
	  • label distribution protocol (LDP)
	  • OSPF
	  • resource reservation protocol (RSVP)
	  • RTSP
	  • WCCP
	• quality of service (QoS)
	• security
	• throughput.

Factors may include:	• protocol incompatibility
	• QoS issues:
	  • jitter
	  • latency
	  • loss rate
	  • throughput

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RANGE STATEMENT	
	• router availability.
MPLS network may include location and type of:	• core label switch routers (Core LSR) • edge label switch routers (Edge LSR) • hosting servers for media content.
Layer 2 protocols may include:	• asynchronous transfer mode (ATM) • Ethernet • frame relay • IGMP • packet over SONET (POS) • point to multipoint for IPTV (p2mp) • PPP - unicast for VoD streaming • protocol independent multicast (PIM) • spanning-tree protocol (STP).
Operational processes may include:	• content management • customer support • network operations • service activation • service delivery.
VoD issues may include:	• congestion level problems • customer care costs • packet loss problems • practices towards reduction of customer complaints • QoS issues • responsibility for customer care.

Video delivery strategies may include:	• delivery dimension:
	  • linear RF format or IPTV
	  • multicast or unicast
	  • streamed or download
	• mobility dimension:
	  • fixed
	  • mobile
	  • both
	• technology dimension:
	  • Ethernet or tunnel infrastructure (BRAS)
	  • using IP infrastructure (DHCP)
	  • combination of both.

Nature of an operator's business	• access network • broadcast or VoD strategy

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RANGE STATEMENT	
may include:	• content and media production • content delivery • core network • home network.
Management tool may include:	• Network and video service management for end to end video network management (ROSA) • vulnerability assessment management service (VAMS).

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7193B Plan a transmission network

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to analyse requirements and plan a telecommunication transmission network for a service provider.

The plan may be for a project associated with a new installation or an upgrade of capacity or technology in an existing network or for convergence to Next Generation Networks (NGN).

Application of the Unit

Technical officers, supervisors and engineers who plan transmission networks apply the skills and knowledge in this unit.

Transmission networks for service providers include optical Ethernet, dense wavelength division multiplexing (DWDM) and fibre to the x (FTTx) optical networks and wireless networks, such as microwave, satellite and worldwide interoperability for microwave access (WiMAX).

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Scope the project	1.1 Obtain ***relevant legislation, codes, regulations and standards*** and follow occupational health and safety (OHS) and environmental requirements for the given work 1.2 Obtain ***project brief*** from ***appropriate person*** 1.3 Evaluate potential transmission options and select the most suitable type of ***transmission network*** that meets the criteria outlined in the project brief 1.4 Analyse the ***limitations*** of the transmission path characteristics and develop solutions for transmission impairments 1.5 Produce a report outlining the reasons for the selection of a transmission network together with a shortlist of suitable equipment vendors and products 1.6 Obtain the traffic load from ***network information sources*** or forecasts and ***dimension*** the proposed network service 1.7 Produce a brief on the relationship between ***transmission network architecture components*** and the overall network and their impact on the work 1.8 Evaluate the ***equipment type*** and ***technologies*** to determine availability, cost and compatibility with existing network equipment

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	1.9 Determine ***resources*** and equipment needed for the work according to ***enterprise procedures*** and check for correct operation and safety 1.10 Assess the capacity limitation of various platforms in the context of the work to optimise maximum network performance 1.11 Determine product capability and calculate allowable capacity of transmission network to allow for network growth
2. Produce a link budget	2.1 Analyse the transmission system using equipment and vendor's specifications to produce a ***link budget*** and assess the resulting margin 2.2 Document the results of the link budget analysis
3. Produce deployment plan for transmission network	3.1 Conduct planning work using current equipment components and complying with transmission network deployment rules and exemption process criteria 3.2 Produce a preliminary plan on the deployment of the network that maintains integrity of the transmission network 3.3 Establish a solution to unexpected situations through discussion with appropriate personnel, with consideration to job specifications, safety and enterprise procedures 3.4 Review plan to ensure that it complies with all standards and codes required when working on network access and make adjustments where appropriate
4. Complete work	4.1 Produce final deployment plan including recommendations agreed with the customer 4.2 Provide a report on ***network management*** and ***performance monitoring*** system to be incorporated in the transmission network to ensure the network is performing at optimum level

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - analyse transmission situations

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  - review and evaluate different options for transmission networks
  - select and compare benefits and limitations of one transmission method over another
- communication skills to:
  - interact with design team personnel and equipment vendors
  - maintain a customer focus and consider customer needs
- literacy skills to:
  - read and interpret technical and non-technical documentation
  - write summary reports in required formats
- numeracy skills to undertake link budget calculations, interpret results and evaluate different types of technical data
- PC skills to search databases of suitable equipment and vendors
- planning and organisational skills to plan and monitor own work and that of others
- problem solving skills to manage unexpected situations
- research skills to gather data on networks
- task management skills to work logically and systematically with required attention to detail
- technical skills to identify the technologies that constitute a transmission network.
-

Required knowledge

- alternating current and transmission line theory
- awareness of emerging telecommunications switching and transmission technologies including microwave radio, optical fibre and satellite
- capacity and capability management
- capacity limitation of various platforms
- commercial considerations of Access Network deployment
- common switching and transmission support services
- compatibility issues of technology and equipment
- currency of technology and equipment use
- data transmission
- digital multiplexing techniques and hierarchies
- enterprise deployment rules
- exemption process criteria
- network topologies
- product capability and availability that are allowable within a transmission network
- telecommunications:
  - alarm management
  - bearers
  - performance monitoring systems
  - transmission:
    - architectures and geographical categorisation

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- information sources
- technology and equipment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate potential transmission options and select the most suitable type of transmission network • analyse the effect of transmission path characteristics on transmission systems and develop solutions for transmission impairments • select appropriate testing regimes for transmission technologies • determine key multiplexing features of transmission technologies • develop a transmission network work plan.
Context of and specific resources for assessment	Assessment must ensure: • site where transmission network may be planned • equipment and system manuals and specifications • legislation and documentation to plan a transmission network.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate planning the deployment of a transmission network • review of reports completed by the candidate for differing transmission network examples • review of final deployment plan prepared by the candidate outlining recommendations for the customer • oral or written questioning to assess knowledge of

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	equipment and technologies as used within the transmission network.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTRFN7182B Produce a radio link budget. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Relevant legislation, codes, regulations and	• Australian Communications Industry Forum (ACIF) standards and codes

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standards include:	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Radiation Protection Standard – Maximum Exposure Levels to Radio Frequency Fields – 3 kHz to 300 GHz • AS Communications Cabling Manual (CCM) Volume 1 • Australian building codes and regulations • Environmental Protection Acts • fire regulations • OHS • relevant international standards • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Project brief may include:	• access to existing services • details of budgeted costs • details of the grade of service required • location of intermediate add-drop points • location of transmission terminals • network topology • presence of existing services • protection methods • traffic bit rate • traffic protocols.
Appropriate person may include:	• network engineer • project engineer • project manager.

Transmission network may include:	• Core Network
	• geostationary
	• long haul network
	• mesh network
	• metropolitan area network
	• optical fibre:
	  • passive optical network (PON)
	  • submarine cable
	  • terrestrial cable
	• point-to-point link
	• satellite
	• ring network
	• hybrid fibre coaxial (HFC) network
	• terrestrial microwave:
	  • licensed
	  • unlicensed

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	• WiMAX.

Limitations may include:	• optical:
	  • chromatic dispersion
	  • four-wave mixing
	  • polarisation mode dispersion (PMD)
	• satellite:
	  • loss of orbital position
	  • rain attenuation
	  • terrestrial interference
	• wireless and terrestrial microwave:
	  • atmospheric absorption
	  • fading
	  • terrestrial interference.

Network information sources may include:	• network management databases for:
	  • capacity assessment data
	  • network performance data
	  • traffic dimensioning data
	• network management tools.

Dimension may include:	• allowance for future growth • capacity of the channels • number of channels required.

Transmission network architecture components may include:	• earth command and control station
	• earth station
	• horn antenna
	• low noise amplifier (LNA)
	• low noise block (LNB)
	• multiplexing equipment:
	  • network management system
	  • STM-1 multiplexer
	  • STM-16 multiplexer
	  • STM-192 multiplexer
	  • STM-4 multiplexer
	  • STM-64 multiplexer
	  • synchronous digital hierarchy (SDH)
	• optical fibre network:
	  • optical add-drop multiplexer (OADM) sites
	  • reconfigurable optical add-drop multiplexer (ROADM)
	  • terminal sites and optical add-drop multiplexer sites:
	  • battery backup

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	• dispersion compensation devices (DCD) • dense wavelength division multiplexing (DWDM) system • equipment racks • erbium doped fibre amplifier (EDFA) • optical amplifier • patch panel • power supplies • Raman amplifier • rectifier • regenerator • parabolic reflector • patch antenna • satellite antenna: • fixed • rotatable • satellite network • satellite receiver • satellite transmitter • satellite transponder • terrestrial microwave network: • circulators and isolators • coaxial cable • indoor unit • microwave transmitter and receiver • outdoor unit • parabolic reflector antennas • radio tower, mast, rooftop • waveguide.
Equipment type may include:	• asymmetrical • circuit switched • coarse wavelength division multiplexing (CWDM) • DWDM • digital • duplex • IP based • packet switched • simplex • symmetrical • time division multiplexing (TDM)

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	• wavelength division multiplexing (WDM).

Technologies may include:	• compression types:
	  • H.264
	  • MPEG-2
	  • MPEG-4
	• protocols and transport methods:
	  • asynchronous serial interface (ASI)
	  • DVB-ASI
	  • HD-SDI
	  • SD SDI
	  • optical transport network (OTN):
	  • IP/MPLS over OTN/DWDM
	  • optical Ethernet:
	  • fast Ethernet
	  • gigabit Ethernet
	  • 10 Gbps
	  • synchronous digital hierarchy (SDH)
	  • synchronous optical network (SONET).

Resources may include:	• equipment • hardware • installation platforms • ladders • manpower • materials • safety equipment • software • tools.
Enterprise procedures may include:	• asset registration • compliance • preferred suppliers • preferred vendors • procurement agreements • purchase requisition • service level agreements.
Link budget may include:	• actual received power level • allowance for splices due to fibre cuts • contingencies • fade margin • margin • path loss

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	• required receive level • transmitted signal power level • transmitter hardware losses.
Network management may include:	• administration • alarms • event history • maintenance • operation • provisioning.
Performance monitoring may include:	• alerting users that network degradation is underway • gauging the quality of payload signals • power level lower limit • power level upper limit • threshold crossing levels.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN7219A Manage alignment of systems with product and technology strategy

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop a technology roadmap and interface management system to align and integrate systems with a product and technology strategy. Strategic alignment involves the development and reconfiguration of system integration elements in a dynamic environment. The activity may be for new products in emerging technologies for convergence to Next Generation Networks (NGN) solutions. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff in a planning and product development role who align support systems with a product and technology strategy apply the skills and knowledge in this unit. They may make use of third party software test routines and testing hardware to measure network performance according to manufacturer's and design specifications.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Develop technology roadmap	1.1. Analyse market research information and determine customer needs within the product and technology strategy from a ***technology roadmap***
	1.2. Evaluate ***enterprise and technology issues*** which will affect the design of the system and translate them into system requirements
	1.3. Evaluate the programme, product and technology needs that affect the definition of the system

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ELEMENT	PERFORMANCE CRITERIA
	lifecycle 1.4. Develop systems ***integration***, ***verification and validation plans*** from the design requirements 1.5. Develop and communicate key aspects on the implementation of the technology roadmap to stakeholders and customers
2. Develop interface management of system elements	2.1. Determine ***system element*** interfaces and the ***sources of complexity*** for the interface management of the system 2.2. Develop a process and appropriate techniques to be adopted for the interface management of system elements 2.3. Produce a control process of the ***system element interfaces*** of the management system 2.4. Liaise and arbitrate where there are conflicts in the definition of interfaces
3. Implement systems integration	3.1. Evaluate suitability of ***system integration***, verification and validation plans for the product and technology strategy of the technology road map for a consumer product 3.2. Develop systems integration, verification and validation plans for complex systems, including the method and timing for each activity 3.3. Manage system integration plan and diagnose complex faults 3.4. Document fault conditions, report to appropriate person and follow up corrective actions 3.5. Prepare evidence for customer acceptance and certification of the system integration management plan for the consumer product 3.6. Plan and manage a transition to operational activity of the product

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE

Required skills

- analytical skills to evaluate product and technology needs
- communication skills to:
  - interact with enterprise personnel, customers and other contractors, while maintaining a customer focus and consideration of customer needs
  - liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - prepare reports given a specific format
  - read and interpret technical documentation, software and hardware manuals, specifications and relevant enterprise policy
- numeracy skills to take and analyse measurements
- PC skills to use a word processor to translate enterprise and technology issues into system requirements
- planning and organisational skills to:
  - break large projects into a series of small projects
  - manage and prioritise own work
  - organise testing
- problem solving skills to resolve software, hardware and logistics problems
- safety awareness skills to follow all related occupational health and safety (OHS) requirements and work practices
- task management skills to work systematically with required attention to detail and adherence to project requirements
- technical skills to:
  - develop systems integration, verification and validation plans for complex systems
  - document fault conditions
  - manage systems integration

Required knowledge

- enterprise and technology issues
- integration, verification and validation plans
- interface management systems
- legislation, codes of practice and other formal agreements that directly impact on system integration
- specific OHS requirements that impact on activity in terms of safety of self and public safety
- system element interfaces
- system integration solutions techniques
- system life cycles
- technology roadmaps

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan the implementation and testing of new system requirements, including system functionality and performance under load conditions • manage the interface elements of a new system • implement systems integration • recognise potential causes of problems and impact on service levels • analyse impact of integration of system changes on the network • prepare evidence for customer acceptance and certification of the system integration.
Context of and specific resources for assessment	Assessment must ensure: • site where the alignment of computer support systems with a product and technology strategy may be conducted • software tools currently used in industry • vendor products, specifications, equipment and enterprise policy required for the activity.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate implementing system integration • direct observation of the candidate performing a systematic approach to test and analysis of problems arising • review of test regime, test results with interpretation and improvement recommendations prepared by the candidate

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EVIDENCE GUIDE	
	• oral or written questioning of the candidate to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7220A Translate domain and solution architectures into platform requirements and designs. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

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RANGE STATEMENT	
regional contexts) may also be included.	
Technology roadmap refers to a plan that:	• applies to a new product or process, or an emerging technology • matches short term and long term goals with specific technology solutions to help meet those goals • provides a framework to help plan and coordinate technology developments • provides a mechanism to help forecast technology developments.
Enterprise and technology issues may include:	• communication and interoperability issues • distributed enterprise applications • technologies deployed • vendors selected as partners.
Integration, ***verification and validation plans*** may relate to:	• acceptance testing • specific testing methods • specific test schedules • taking multiple integrated systems that have passed system testing as input and tests their required interactions • testing process that exercises a software system's coexistence with others.
System element may include:	• contractual relationship • customer relationship • development relationship • hierarchical relationship.
Sources of complexity may include:	• different domains • multinational programmes • multiple suppliers • novel technology.
System element interfaces may include:	• requirements posed on the system element • services to be provided by the system element • specified connected devices/interfaces • system elements that can support several interfaces.
Systems integration may include:	• combining component subsystems into one system and ensuring that the subsystems function together as a system • process of linking together different computing systems and software applications physically

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RANGE STATEMENT	
	or functionally.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7220A Translate domain and solution architectures into platform requirements and designs

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to translate domain and solution architectures into platform requirements and designs. Translation involves the entire solution life cycle through development, deployment, management and optimisation. The brief may be for an existing support system or new infrastructure converging to Next Generation Technologies (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff whose work involves translating domain and solution architectures into platform requirements and designs apply the skills and knowledge in this unit. It may make use of design software, and simulation testing for performance to manufacturer's and design specifications.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Develop system design requirements	1.1. Produce a system requirements specification for a complex project involving ***enterprise and technology issues*** using the simplest possible technology and making the system modular 1.2. Resolve and negotiate requirement conflicts in order to establish a complete and consistent requirement set 1.3. Produce and develop acceptance criteria for requirements 1.4. Design a requirements management plan with categorisations, structures and ***sources of complexity***

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ELEMENT	PERFORMANCE CRITERIA
	1.5. Develop a process to manage the requirements enabling users to influence future improvements
2. Produce system design based on requirements	2.1. Evaluate the strengths and weaknesses of relevant technologies in the context of the design requirement and needs for ***systems integration***
	2.2. Create a range of alternative ***interdisciplinary concepts*** and assess their ***attributes***
	2.3. Plan for the incorporation of later ***life cycle design attributes*** in developing the design requirements
	2.4. Devise a system design strategy and approach and use the tools and techniques to conduct ***functional analysis***
	2.5. Produce a set of parameters to track critical aspects of the design
	2.6. Use documentation, modelling and simulation tools and techniques to represent a system or ***system element***
	2.7. Use complex simulations to evaluate design concepts for a system or system element
	2.8. Produce a report to evaluate and advise on the risks, suitability and limitations of models and simulations
	2.9. Identify the underlying domain specific issue, strategy and approach to be adopted for ensuring system robustness
	2.10. Produce a robust design using domain specific strategy and approach to platform requirements and designs
3. Verify solution design and traceability	3.1. Determine specific aspects of the design to the original intent
	3.2. Verify and track specific aspects of the current design back to the original intent throughout the supply chain
	3.3. Trace verification requirements back to system requirements and vice versa
	3.4. Use change control and configuration management to implement remedial actions and change control of inconsistencies

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- information technology skills for:
  - desktop research
  - enabling production of a system requirements specification for a complex project
  - word processing
- literacy skills to:
  - interpret technical documentation such as software and hardware manuals and specifications
  - interpret relevant enterprise policy and documentation
  - prepare reports given a specific format
  - read and comply with related occupational health and safety (OHS) requirements and work practices
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - break large projects into a series of small projects
  - organise testing and contingency plans
- problem solving skills to manage and trace technical margins both horizontally and vertically through the hierarchy
- task management skills to work systematically with required attention to detail and adherence to project requirements
- technical skills to:
  - conduct functional analysis
  - create design solutions
  - use simulation software

Required knowledge

- complex simulation techniques
- current enterprise platforms and designs
- design of management plans
- domain and solution architectures
- enterprise and technology issues
- information required to simulate computer system elements according to a test specification

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REQUIRED SKILLS AND KNOWLEDGE
• interdisciplinary concepts and attributes • life cycle design attributes • remedial actions and change control of inconsistencies • solution design and traceability • tools to conduct functional analysis

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop system design requirements • evaluate design concepts for system or system element using complex simulations • produce a system design using domain specific strategy to platform requirements and design • use functional analysis tools • use complex simulations • verify solution design and traceability.
Context of and specific resources for assessment	Assessment must ensure: • a site where development, deployment, management and optimisation of domain and solution architectures into platform requirements and designs can be undertaken • documentation, modelling and simulation tools currently used in industry • tests and equipment currently used in industry.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate translating domain and solution architectures into platform requirements

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EVIDENCE GUIDE	
	and designs • oral and written questioning of the candidate to assess required knowledge of platform requirements and designs • review of the candidate's documented simulation testing and change and improvement recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7222A Manage solution architecture and impacts in line with organisational processes. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT

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RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Enterprise and technology issues may include:	• communication and interoperability issues • distributed enterprise applications • technologies you deploy • vendors you select as partners.
Sources of complexity may include:	• different domains • multinational programmes • multiple suppliers • novel technology.
Systems integration may include:	• combining component subsystems into one system and ensuring that the subsystems function together as a system • process of linking together different computing systems and software applications physically or functionally.
Interdisciplinary concepts may include:	• behaviour • functionality • structure.
Attributes may include:	• availability • cost • feasibility • human factors • maintainability • reliability • risk • schedule • technology requirements • testability.
Life cycle design attributes may include:	• availability • maintainability • reliability • testability.
Functional Analysis component functions may include:	• accounting • manufacturing • marketing

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RANGE STATEMENT	
	• product design • sales.
System element may include:	• elements that can support several interfaces • requirements posed on the system element • services to be provided by the system element • specified connected devices and interfaces.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7221A Manage end to end architectural solutions across multiple domains

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse business options and design and implement end to end architectural solutions for a telecommunications service provider. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with project management roles and authority to direct the activities of installation staff apply the skills and knowledge in this unit. They also work in conjunction with manufacturers and vendors. This unit applies to network infrastructure service providers implementing new end to end architectural solutions.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Evaluate tools and techniques for architectural design	1.1. Apply the principles of architectural design within the lifecycle of application software 1.2. Develop a process to apply appropriate tools and techniques for architectural design of end to end solutions 1.3. Evaluate and select appropriate analysis and selection techniques to develop a partition between discipline technologies and derive discipline specific requirements
2. Analyse design options for optimal solutions	2.1. Analyse business options to support architectural design trade offs for an optimal design solution 2.2. Develop alternative architectural designs that are traceable to the requirements 2.3. Evaluate a range of architectural solutions and justify the selection of the optimum solution

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ELEMENT	PERFORMANCE CRITERIA
3. Develop interface requirements for effective solutions across multiple domains	3.1. Evaluate ***system element interfaces*** and the ***sources of complexity*** for the ***interface management*** of the system across multiple domains 3.2. Develop a process and appropriate techniques to be adopted for the interface management of ***system elements*** for end to end architectural solutions 3.3. Produce a control process for the system element interfaces of the management system 3.4. Liaise and arbitrate between stakeholders where there are conflicts in the definition of interfaces
4. Manage end to end systems integration	4.1. Evaluate suitability of ***system integration***, verification and validation plans for end to end architectural solutions across multiple domains 4.2. Develop systems integration, verification and ***validation plans*** for complex systems to ensure viable integration process 4.3. Manage system integration plan and diagnose complex faults 4.4. Document fault conditions, report to appropriate person and follow up corrective actions 4.5. Prepare evidence for customer acceptance and certification of the system integration management plan 4.6. Plan and manage a transition to operational activity for the end to end solution
5. Incorporate components of an architecture from a third party	5.1. Negotiate with vendor for acceptable ***vendor agreements*** and agreed ***roles and responsibilities*** of each party 5.2. Manage vendor within a clearly defined process for dealing with defects and scope changes 5.3. Plan beyond delivery of specific elements and establish requirements for ongoing maintenance and support from vendor
6. Manage requirements for the architecture solution	6.1. Negotiate minimum ***component costs*** with vendors and analyse vendor component costs as part of the assessment for the appropriateness of vendors quote 6.2. Manage the vendor selection process to provide high level of solution and support costs

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate product and technology needs
- communication skills to:
  - interact with enterprise personnel, customers and other contractors, while maintaining a customer focus and consideration of customer needs
  - liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - prepare reports given a specific format
  - read and interpret technical documentation, software and hardware manuals, specifications and relevant enterprise policy
- numeracy skills to take and analyse measurements
- PC skills to use a word processor to translate enterprise and technology issues into system requirements
- planning and organisational skills to:
  - break large projects into a series of small projects
  - manage and prioritise own work
  - organise testing and contingency plans
- problem solving skills to resolve software, hardware and logistics problems
- safety awareness skills to follow all related occupational health and safety (OHS) requirements and work practices
- task management skills to work systematically with required attention to detail and adherence to project requirements
- technical skills to:
  - develop systems integration, verification and validation plans for complex systems
  - document fault conditions
  - manage systems integration

Required knowledge

- architectural design tools
- interface management
- management of end to end system integration
- new end to end architecture design solutions
- solutions for business options across multiple domains
- system integration solutions techniques
- system interfaces

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REQUIRED SKILLS AND KNOWLEDGE
• validation plans • vendor agreements and negotiations

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate tools and techniques for architectural design • analyse design options for optimal solutions • develop interface requirements for effective solutions across multiple domains • manage end to end systems integration • incorporate components of an architecture from a third party • manage requirements for the architecture solution.
Context of and specific resources for assessment	Assessment must ensure: • site where architecture solutions across multiple domains can be managed • simulation software tools currently used in industry • vendor products, specifications, equipment and enterprise policy required for the activity.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate managing end to end architectural solutions across multiple domains • review of evaluations, documents and evidence for customer acceptance prepared by the candidate • oral or written questioning of the candidate to assess required knowledge.
Guidance information for	Holistic assessment with other units relevant to the

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EVIDENCE GUIDE	
assessment	industry sector, workplaces and job role is recommended, for example: • ICTTEN7222A Manage solution architecture and impacts in line with organisational processes. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
System element interfaces may	• requirements posed on the system element • services to be provided by the system element

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RANGE STATEMENT	
include:	• specified connected devices and interfaces • system elements that can support several interfaces.
Sources of complexity may include:	• different domains • multinational programmes • multiple suppliers • novel technology.
Interface management may include:	• integration with existing system • fine-tuning capabilities in multi-operating environments • links to legacy systems.

System elements may include:	• relationships:
	  • contractual
	  • customer
	  • development
	  • hierarchical.

Systems integration may include:	• bringing together of the component subsystems into one system and ensuring that the subsystems function together as a system • process of linking together different computing systems and software applications physically or functionally.
Validation plans may include:	• identification of method • interaction between the stakeholders • timing for each activity.
Vendor agreements may include:	• dealing with defects and scope changes • milestones • objectives and acceptance criteria • roles and responsibilities • scope.
Roles and responsibilities may include:	• accountabilities • dependencies • impact on delivery.
Component costs may refer to:	• appropriateness • completeness • correctness.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7222A Manage solution architecture and impacts in line with organisational processes

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse business options to plan, develop and manage solution architecture systems integration across multiple architectures for a telecommunications service provider. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with appropriate project management roles and authority to direct the activities of installation staff, manufacturers and vendors apply the skills and knowledge in this unit. This unit applies to service provider network infrastructure implementing solution architecture in line with organisational processes as a business solution.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Develop plan to support architectural design process	1.1. Prepare a plan with techniques to support the architectural design process and communicate the solution to different ***stakeholder groups***
	1.2. Analyse business options to support architectural design trade offs for optimal design solution
	1.3. Evaluate strengths and weaknesses of relevant technologies in the context of the requirement
	1.4. Assess a range of alternative ***interdisciplinary concepts*** and the effect of their ***attributes*** on the design requirements
	1.5. Prepare a solutions architecture plan with ***possible solutions*** and ***alternative solutions***

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ELEMENT	PERFORMANCE CRITERIA
2. Develop interface requirements for effective solutions across multiple architectures	2.1. Evaluate ***system element interfaces*** and the ***sources of complexity*** for the interface management of the system across multiple architectures 2.2. Develop a process and appropriate techniques to be adopted for the interface management of ***system elements*** for solution architecture 2.3. Produce a control process of the system element interfaces of the management system 2.4. Liaise and arbitrate between stakeholders where there are conflicts in the definition of interfaces
3. Manage solution architecture systems integration	3.1. Evaluate suitability of ***system integration***, verification and validation plans for solution architecture from requirements 3.2. Develop systems integration, verification and ***validation plans*** for complex systems to ensure viable integration process 3.3. Manage system integration plan and diagnose complex faults 3.4. Document fault conditions, report to appropriate person and follow up corrective actions 3.5. Prepare evidence for customer acceptance and certification of the system integration management plan 3.6. Plan and manage a transition to operational activity for the solution architecture
4. Manage solution implementation and notify stakeholder groups	4.1. Produce final ***project management requirements*** against solution architecture plan and notify the stakeholder groups of the impending implementation 4.2. Evaluate the impact of the proposed project solutions on customers and enterprise 4.3. Manage solution architecture activities as part of an overall project plan and monitor solution architecture risks 4.4. Manage the amendments to solution architecture processes to meet the needs of the project and apply necessary corrective actions

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate business options to support architectural design
- communication skills to:
  - interact with stakeholders while maintaining a customer focus and consideration of customer needs
  - liaise with internal and external personnel where there are conflicts in the definition of interfaces
  - present solutions at business meetings
  - work effectively within group
- literacy skills to:
  - prepare reports given a specific format
  - read and interpret requirements
- numeracy skills to analyse requirements
- PC skills to use a word processor to translate enterprise and technology issues into validation plans
- planning and organisational skills to:
  - break large projects into a series of small projects
  - manage and prioritise own work
  - manage solution elements
- problem solving skills to solve domain, technology and logistics problems
- safety awareness skills to follow all related occupational health and safety (OHS) requirements and work practices
- task management skills to work systematically with required attention to detail and adherence to project requirements
- technical skills to:
  - develop alternative solutions
  - diagnose interface requirements
  - manage solution architecture systems integration

Required knowledge

- features and operating requirements of complex systems, key performance indicators (KPIs) and service level agreements
- information required to define solution architecture and impacts in line with organisational processes
- interdisciplinary concepts across multiple architectures
- issues and challenges that occur with system changes
- legislation, codes of practice and other formal agreements that directly impact on

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REQUIRED SKILLS AND KNOWLEDGE
system integration • manufacturer's requirements for operation of systems equipment • organisational policy and procedures • performance and integration requirements • solutions architecture alternatives • specific OHS requirements that impact on activity in terms of safety of self and public safety • system element interfaces for solution architecture • system integration plans • validation plans

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • prepare an architecture plan with solutions and alternative solutions • develop interface requirements for effective solutions across multiple architectures • manage solution architecture systems integration • analyse impact of proposed project solutions on customers and enterprise • prepare evidence for customer acceptance and certification of the system integration management plan • produce final project management requirements.
Context of and specific resources for assessment	Assessment must ensure: • site where the development and management of solution architecture systems integration across multiple architectures may be conducted • software tools currently used in industry • vendor products, specifications, equipment and

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EVIDENCE GUIDE	
	enterprise policy required for the activity.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate implementing system integration • direct observation of the candidate performing a systematic approach to test and analysis of problems arising • review of evaluations, plans and evidence for customer acceptance, prepared by the candidate • oral or written questioning of the candidate to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTTEN7221A Manage end to end architectural solutions across multiple domains. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Stakeholder groups may include:	• construction • design • finance • planning • procurement.
Interdisciplinary concepts may include:	• behaviour • functionality • structure.
Attributes may include:	• availability • cost • feasibility • human factors • maintainability • reliability • risk • schedule • technology requirements • testability.
Possible solutions may include:	• better or more services • better technology option • credible solutions • easier to implement and manage • feasible solutions • more scalable.
Alternative solutions may include:	• availability of technology • cost • feasibility • human factors • risk

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RANGE STATEMENT	
	• schedule • technology requirements.
System element interfaces may include:	• requirements posed on the system element • services to be provided by the system element specified connected devices/interfaces • system elements that can support several interfaces.
Sources of complexity may include:	• different domains • multinational programs • multiple suppliers • novel technology.
System elements may include:	• contractual relationship • customer relationship • development relationship • hierarchical relationship.
System integration may include:	• combining the component subsystems into one system and ensuring that the subsystems function together as a system • process of linking together different computing systems and software applications physically or functionally.
Validation plans may include:	• identification of method • interaction between the stakeholders • timing for each activity.
Project management requirements may include:	• project specifications • risk assessment and management options • timelines, costs and deliverables.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7223A Manage application layer solutions

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop, evaluate, manage deployment and maintain currency of applications layer solutions for a telecommunications service provider. This involves integration of new solutions to an existing network and the management of change implementation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with appropriate project management roles and authority to direct the activities of installation staff, manufacturers and vendors apply the skills and knowledge in this unit. This unit applies to service provider network infrastructure implementing new applications layer solutions.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Develop application layer solutions	1.1. Produce the ***requirements for applications layer solutions*** for delivery of ***new applications layer solutions*** to customers using ***forecasting demand data*** 1.2. Prepare a plan for an organisational change control process and the ***integration of new solutions*** within a complete network infrastructure 1.3. Produce a ***test management schedule*** for the testing process of the application product 1.4. Translate complex design and architecture requirements to traceable application characteristics according to design requirements

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ELEMENT	PERFORMANCE CRITERIA
	1.5. Develop application architecture solution specifications using an ***industry process*** according to design requirements 1.6. Develop application software resource profiling and select suitable vendor for negotiations 1.7. Translate complex requirements into software packaging 1.8. Produce software deployment mapping and version control to ensure complete integration and compatibility of application solution to existing system 1.9. Complete configuration management and provide complex input network design requirements
2. Analyse test results of application layer solutions	2.1. Use design document and ***integration document software*** to replicate issues exhibited in test environment 2.2. Certify software solution compatibility and compliance to requirements using a web-based test management tool (quality centre) to conduct ***performance evaluation tests*** 2.3. Analyse test reports to evaluate load balancing and network security issues in test environment 2.4. Resolve complex issues in interface to isolate defects
3. Manage deployment of application layer solutions	3.1. Plan and prepare evidence for customer acceptance and certification 3.2. Plan and manage ***transition to operation activities*** required for transition to operation of integrated application layer solution 3.3. Prepare an installation failures procedure to make changes whilst maintaining service levels 3.4. Manage ***change implementation plan*** to maintain system stability
4. Maintain currency of application layer solutions	4.1. Manage ongoing ***monitoring activities*** to prolong new applications layer solution life cycle for cost-effective business reasons 4.2. Produce ***tuning activities*** to make efficient use of resources 4.3. Analyse the current demands for resources for deriving forecasts and future requirements 4.4. Produce a capacity plan predicting the infrastructure resources needed to achieve agreed service levels

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate test results of application layer solutions
- communication skills to:
  - interact with enterprise personnel, customers and other contractors, while maintaining a customer focus and consideration of customer needs
  - liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - prepare reports given a specific format
  - read and interpret technical documentation, software and hardware manuals, specifications and relevant enterprise policy
- numeracy skills to take and analyse measurements
- PC skills to use a word processor to translate enterprise and technology issues into system requirements
- planning and organisational skills to:
  - manage and prioritise own work
  - organise testing and deployment of application layer solutions
- problem solving skills to resolve logistics problems
- safety awareness skills to follow all related occupational health and safety (OHS) requirements and work practices
- task management skills to work systematically with required attention to detail and adherence to project requirements
- technical skills to:
  - develop application architecture solution specifications
  - manage deployment of application layer solutions
  - manage transition to operation activities
  - provide complex input network design requirements

Required knowledge

- installation failure procedures
- legislation, codes of practice and other formal agreements that directly impact on activity
- manage change
- new applications layer solutions

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REQUIRED SKILLS AND KNOWLEDGE
• software and hardware resources • specific OHS requirements that impact on activity in terms of safety of self and public safety • system integration techniques • test management scheduling • tuning activities to maintain currency • use of forecasting demand data • use of test management tools

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce a test management schedule for the testing process of the application product • develop application architecture solution specifications using an industry process • produce software deployment mapping and version control • analyse test results of application layer solutions • prepare evidence for customer acceptance and certification • prepare an installation failures procedure • manage ongoing monitoring activities • produce tuning activities • produce a capacity plan predicting the infrastructure resources needed.
Context of, and specific resources for assessment	Assessment must ensure: • site where the management of application layer solutions may be conducted • software tools currently used in industry • vendor products, specifications, equipment and

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EVIDENCE GUIDE	
	enterprise policy required for the activity.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate managing the deployment of application layer solutions • direct observation of the candidate performing a systematic approach to test and analysis of complex issues arising • review of performance evaluation tests, software deployment mapping, plans and evidence for customer acceptance, prepared by the candidate • oral or written questioning of the candidate to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7224A Manage voice, data and internet protocol network solutions. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Requirements for applications layer solutions may include:	• diagnostic software tools • hardware resources • management software tools • protocols • software resources.
New applications layer solutions may include:	• internet protocol (IP) games • internet protocol TV (IPTV) • mesh network applications • mobile voice over internet protocol (VoIP) • multicast mobile applications • multimedia products • web applications.

Forecasting demand data may be:	• collected from:
	  • customers:
	  • actual
	  • prospective
	  • economic planners
	  • internal organisational groups
	  • local
	  • marketing organisations
	  • real estate agents
	  • sales organisations
	  • state and federal governments
	  • statutory bodies
	  • traffic management systems
	• in relation to:
	  • access transport planning
	  • changing customer use patterns
	  • demographic changes

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RANGE STATEMENT	
	• economic forecasts • industry trends • influence of technology on traffic demand • land developments • local industry • market conditions • marketing programs • population trends • possible environmental impacts • power re-zoning • sales forecasts • shire planning • traffic patterns.
Integration of new solutions may include:	• no contentions • protocol compatibility • software compatibility • system interoperability.
Test management schedule may include:	• post-installation test procedures • pre-installation test procedures • produces test summary report • profiling of application solution • risk defects report • simulation testing • test process is testable for application built.
Industry process may include:	• complex architectural input • complex constructor table input • idea consultation.
Integration document software may include:	• fine-tuning capabilities in multi-operating environments • integration with existing system • links to legacy systems.

Performance evaluation tests may include:	• defects:
	  • defects detected are logged and mapped to failed cases
	• releases:
	  • manage software releases and iterations
	• requirements:
	  • traceability

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RANGE STATEMENT	

	• management
	• test lab:
	  • execute test cases from test plan
	• test plan:
	  • creating and updating test cases.

Transition to operation activities include:	• installation procedures • operations and maintenance (OM) expenses • OM • project scope • schedule and milestones • training procedures.
Change implementation plan may include:	• back out procedures • pre-validate changes prior to the change to assess environment stability • test process pre/post scheduled change to identify success.
Monitoring activities may include:	• current and future capacity • current and future performance • throughput of the infrastructure components.
Tuning activities may include:	• configuration settings • database performance tuning • network settings.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7224A Manage voice, data and internet protocol network solutions

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop, analyse test results, manage deployment and maintain currency of voice, data and IP network solutions for a telecommunications service provider. This involves integration of new solutions to an existing network and the management of change implementation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with appropriate project management roles and authority to direct the activities of installation staff, manufacturers and vendors apply the skills and knowledge in this unit. This unit applies to service provider network infrastructure implementing new applications layer solutions.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Develop voice, data and IP network solutions	1.1. Produce the ***requirements for voice***, ***data and IP network solutions*** for the delivery of ***new voice***, ***data and IP networks*** to customers using ***forecasting demand data*** 1.2. Prepare a plan for an organisational change control process and the ***integration of new solutions*** within a complete network infrastructure 1.3. Produce a ***test management schedule*** for the testing

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ELEMENT	PERFORMANCE CRITERIA
	process of the network product solution 1.4. Translate complex design and architecture requirements to traceable software application characteristics according to design requirements 1.5. Develop network architecture solution specifications using an ***industry process*** according to design requirements 1.6. Develop software and hardware resource profiling and select suitable vendor for negotiations 1.7. Translate complex requirements into software packaging 1.8. Produce software deployment mapping and version control to ensure complete integration and compatibility of network application solution to existing system 1.9. Complete configuration management and provide complex input network design requirements
2. Analyse test results of voice, data and IP network solutions	2.1. Use design document and ***integration document software*** to replicate issues exhibited in test environment 2.2. Certify software solution compatibility and compliance to requirements using web based test management tool (quality centre) to conduct ***performance evaluation tests*** 2.3. Analyse test reports to evaluate load balancing and network security issues in test environment 2.4. Resolve complex issues in interface to isolate defects
3. Manage deployment of voice, data and IP network solutions	3.1. Plan and prepare evidence for customer acceptance and certification 3.2. Plan and manage ***transition to operation activities*** required for transition to operation of integrated IP network solution 3.3. Prepare an installation failures procedure to make changes whilst maintaining service levels 3.4. Manage ***change implementation plan*** to maintain system stability
4. Maintain currency of voice, data and IP network solutions	4.1. Manage ongoing ***monitoring activities*** to prolong new IP network solution life cycle for cost-effective business reasons 4.2. Produce ***tuning activities*** to make efficient use of resources 4.3. Analyse the current demands for resources for

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ELEMENT	PERFORMANCE CRITERIA
	deriving forecasts and future requirements 4.4. Produce a capacity plan predicting the infrastructure resources needed to achieve agreed service levels

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to interrogate and evaluate complex information from multiple sources to manage and maintain network solutions
• communication skills to liaise with internal and external personnel on technical and operational matters
• literacy skills to:
  • interpret relevant enterprise policy and documentation
  • interpret technical documentation, such as software and hardware manuals and specifications
  • read and comply with related occupational health and safety (OHS) requirements and work practices
• numeracy skills to:
  • interpret technical data
  • take and analyse measurements
• PC skills for:
  • desktop research
  • word processing
• planning and organisational skills to:
  • manage change
  • schedule tests
  • tune activities to maintain currency
• problem solving skills to:
  • develop procedures such as for installation failure
  • produce new IP network solutions
• research skills to access technical information and sources to assist with planning and predicting infrastructure resources
• task management skills to work systematically with required attention to detail and adherence to project requirements

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REQUIRED SKILLS AND KNOWLEDGE

• technical skills to:
  • translate complex requirements design and architecture to traceable software application characteristics
  • use forecasting demand data
  • use test management tools

Required knowledge
• installation failure procedures • manage change • new IP network solutions • software and hardware resources • system integration techniques • test management scheduling • tuning activities to maintain currency • use of forecasting demand data • use of test management tools

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce a test management schedule • develop network architecture solution specifications • develop software and hardware resource profiling and select suitable vendor for negotiations • undertake configuration management of voice, data and IP network and provide complex input network design requirements • analyse test reports to evaluate load balancing and network security issues • plan and prepare evidence for customer acceptance • prepare installation failures procedure

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EVIDENCE GUIDE	
	• produce tuning activities to enable efficiencies • produce a capacity plan predicting the infrastructure resources needed.
Context of, and specific resources for assessment	Assessment must ensure: • a site where management of voice, data and IP network solutions can be undertaken • software and hardware resources suitable for developing, deploying and managing voice, data and IP network solutions • tests and equipment currently used in industry.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate using design document and integration document software to replicate issues exhibited in test environment • oral and written questioning of the candidate to assess required knowledge of requirements developing voice, data and IP network solutions • review of the candidate's plan for new voice, data and IP network solutions within a complete network infrastructure • review of the candidate's documented capacity plan predicting infrastructure resources needs.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7223A Manage application layer solutions. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.

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EVIDENCE GUIDE	
	In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Requirements for voice**, **data and IP network solutions may include:	• diagnostic software tools
	• hardware resources:
	  • data:
	  • routers
	  • servers
	  • switches
	  • optical
	  • wireless
	• management software tools
	• protocols
	• software resources.

New voice**, **data and IP networks may include:	• IP games • IP home networks • IP security • IP private branch exchange (PBX) • internet protocol TV (IPTV) • mesh network • mesh network applications

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RANGE STATEMENT	
	• mobile data • multiprotocol label switching (MPLS) network • multicast mobile applications • multimedia products • voice over internet protocol (VoIP) • web applications.

Forecasting demand data may be:	• collected from:
	  • customers:
	  • actual
	  • prospective
	  • economic planners
	  • internal organisational groups
	  • local
	  • marketing organisations
	  • real estate agents
	  • sales organisations
	  • state and federal governments
	  • statutory bodies
	  • traffic management systems
	• in relation to:
	  • access transport planning
	  • changing customer use patterns
	  • demographic changes
	  • economic forecasts
	  • industry trends
	  • influence of technology on traffic demand
	  • land developments
	  • local industry
	  • market conditions
	  • marketing programs
	  • population trends
	  • possible environmental impacts
	  • power re-zoning
	  • sales forecasts
	  • shire planning
	  • traffic patterns.

Integration of new solutions may include:	• hardware compatibility • platform compatibility

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RANGE STATEMENT	
	• protocol compatibility • software compatibility • technology compatibility • no contentions • signalling contention • system interoperability.
Test management schedule may include:	• post-installation test procedures • pre-installation test procedures • produces test summary report • profiling of software solution • risk defects report • simulation testing • test process is testable for network software built.
Industry process may include:	• complex architectural input • complex constructor table input • idea consultation.
Integration document software may include:	• fine-tuning capabilities in multi-operating environments • integration with existing system • links to legacy systems.

Performance evaluation tests may include:	• defects:
	  • defects detected are logged and mapped to failed cases
	• releases:
	  • manage software releases and iterations
	• requirements:
	  • traceability
	  • management
	• test lab:
	  • execute test cases from test plan
	• test plan:
	  • creating and updating test cases.

Transition to operation activities include:	• installation procedures • operations and maintenance (OM) expenses • OM • project scope • schedule and milestones • training procedures.
Change implementation plan may	• back out procedures

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RANGE STATEMENT	
include:	• pre-validate changes prior to the change to assess environment stability • test process pre and post scheduled change to identify success.
Monitoring activities may include:	• current and future capacity • current and future performance • throughput of the infrastructure components.
Tuning activities may include:	• configuration settings • database performance tuning • network settings.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7225A Manage network testing strategies

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan and manage a test regime for evaluation of application software for a telecommunications network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with appropriate project management roles and authority to direct the activities of software testing and evaluation apply the skills and knowledge in this unit. Mobile phones, wireless modems, set top boxes, media centres, web applications and content servers use application software to provide a telecommunications service.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan the test effort and develop test strategy for an application software	1.1. Analyse the functionalities of an ***application software*** from the system design document and create a ***test strategy*** for a new telecommunications product line 1.2. Produce the ***steps in developing the test strategy*** and the attributes of each step according to enterprise policy 1.3. Produce a test strategy for evaluating the suitability of the application software for integration into the telecommunications network 1.4. Analyse the test strategy and identify the ***types of risks*** that would hinder the test performance or reality

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ELEMENT	PERFORMANCE CRITERIA
2. Plan test strategy for the regime	2.1. Produce the ***phases of a test cycle*** for a test regime according to the system design document 2.2. Assess a ***range of tests*** required to evaluate the performance and functionality of the application software and determine the tests required to suit the test regime 2.3. Evaluate ***features of testing tool and debuggers*** and select an appropriate tool to test the software application and detect faults 2.4. Evaluate the ***elements of a test plan*** that would cover the testing functionality of the application software
3. Design a test plan and produce test reviews	3.1. Determine the forecast time, effort and cost for low and medium intensity projects to perform testing 3.2. Develop a test case or test scenario with prerequisite states based on requirements to generate expected test results for the test plan 3.3. Produce a ***test plan*** for specific phases based on the requirements of the project specifications for the application software 3.4. Produce test reporting associated with particular test phases within the test plan 3.5. Analyse test reports and evaluate the impact of the test plan on the testing environment 3.6. Manage the progress of the test plan to minimise the risks associated with testing and ensure test compliance with test requirements 3.7. Report any detected ***defects*** to the product evaluation personnel and prepare a strategy to manage the defects
4. Manage test traceability	4.1. Create a traceability matrix to correlate the relationship between marketing requirements and detailed requirements of the software product to the matching parts of design, test plan and test cases 4.2. Analyse the testing metrics produced by the test tool to manage the tracking of defects and plan process improvements based on the metrics 4.3. Produce an evaluation report from the traceability matrix to manage the defects or failures from the test plan

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate the functionalities of an application software
- communication skills to:
  - interact with enterprise personnel, customers and other contractors, while maintaining a customer focus and consideration of customer needs
  - liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - prepare reports given a specific format
  - read and interpret technical documentation, software and hardware manuals, specifications and relevant enterprise policy
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - manage and prioritise own work
  - organise testing
  - manage the progress of the test plan
- problem solving skills to resolve software, hardware and logistics problems
- safety awareness skills to follow all related occupational health and safety (OHS) requirements and work practices
- task management skills to work systematically with required attention to detail and adherence to project requirements
- technical skills to:
  - plan test strategy for the regime
  - manage test traceability

Required knowledge

- applications software features and functionalities
- configuration of software testing tools
- creation of traceability matrix
- elements of test plans
- features of testing tools and debuggers
- identification of types of risks
- legislation, codes of practice and other formal agreements that directly impact on testing
- manage software defects
- management of test traceability
- phases of test cycles

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REQUIRED SKILLS AND KNOWLEDGE
• production of test reviews • specific OHS requirements that impact on activity in terms of safety of self and public safety • steps in developing test strategy • testing procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce the steps in developing the test strategy • produce a test strategy for evaluating the suitability of the application software • design a test plan and produce test reviews • develop a test case or test scenario • produce a test plan for specific phases • produce test reporting associated with particular test phases within the test plan • create a traceability matrix • produce an evaluation report from the traceability matrix to manage the defects or failures from the test plan.
Context of, and specific resources for assessment	Assessment must ensure: • site where the planning and management of a test regime for evaluation of application software may be conducted • software tools currently used in industry • vendor products, specifications, equipment and enterprise policy required for the activity.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples

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EVIDENCE GUIDE	
	are appropriate for this unit: • direct observation of the candidate managing a test regime for evaluation of application software • direct observation of the candidate performing a systematic approach to test and analysis of problems arising • review of test regime, test results with interpretation and improvement recommendations prepared by the candidate • oral or written questioning of the candidate to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7226A Manage development and application of testing artefacts. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Application software may be for:	• firmware • games software • media centre • mobile phone • operating system • set top box • sever • web application • wireless modem.
Test strategy may relate to:	• communicating test plans to stakeholders and obtain buy-in from business clients • coordinating test environment and data requirements before starting phase • defining objectives, timelines, and approach for test effort • defining test activities with roles and responsibilities.

Steps in developing the test strategy may include:	• objective and scope of testing:
	  • business objectives
	  • extent of application to be tested
	  • goals to be met by testing effort
	  • what systems and components need to be tested
	• types of testing:
	  • different phases of testing required
	  • different types of testing
	  • test coverage
	• testing approach:
	  • methodology for test development and execution
	  • planning for test execution cycles
	  • specification of test environment set up
	  • testing process life cycle
	  • testing templates, checklist and guidelines
	• test environment specifications:
	  • configuration management, maintenance of test

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RANGE STATEMENT	
	bed and build management • hardware and software requirements • test data creation • test automation: • criteria for feasibility of test automation • defect management • test automation strategy • test tool identification • communication and status reporting • configuration management: • list of testing artefacts • tools and techniques for configuration management • change management: • models for assessing impact of changes on testing • plan for managing requirement changes • process for keeping test artefacts in sync with development artefacts • testing metrics: • metric to match strategic objectives • plan of process improvement based on metrics • techniques for collecting metrics • tools to gather and analyse metrics.
Types of risks may include:	• development: • complexity • defects in existing programme • inefficiently controlled project timelines • lack of reviews and configuration control • lack of specifications • less skilled human resources • problems in team coordination • production: • complexity of user interface • dynamic frequency of usage • high business impact of the function • testing lack of: • domain knowledge • sufficient time and resources

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RANGE STATEMENT	
	• test facilities and test data • testing and platform skills.
Phases of a test cycle may include:	• defect retesting • regression testing • requirements analysis • test closure • test development • test execution • test planning • test reporting • test result analysis.
Range of tests may include:	• compatibility • on demand testing • performance • process improvement • technical • test management • verification.

Features of testing tool and debuggers may include:	• automated functional graphical user interface (GUI) testing tool
	• benchmarks
	• formatted dump or symbolic debugging
	• performance analysis or profiling tool
	• program monitors:
	  • code coverage reports
	  • instruction set simulator
	  • program animation.

Elements of a test plan may include:	• test coverage • test methods • test responsibilities.
Test plan includes the following tests:	• acceptance or commissioning test • design verification or compliance test • manufacturing or production test • regression test.
Defects may be:	• deferred • fixed • rejected • treated.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7226A Manage development and application of testing artefacts

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan and manage a test regime by developing testing artefacts to evaluate application software for a telecommunications network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with project management roles and authority to direct the activities of software testing and evaluation apply the skills and knowledge in this unit. Mobile phones, wireless modems, set top boxes, media centres, web applications and content servers use application software to provide a telecommunications service.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan the test effort and develop test strategy for software testing	1.1. Analyse the functionalities of an ***application software*** from the system design document and create a ***test strategy*** for a new telecommunications product line 1.2. Produce the ***steps in developing the test strategy*** and the attributes of each step according to enterprise policy 1.3. Produce a test strategy to evaluate the suitability of the application software for integration into the telecommunications network 1.4. Assess a ***range of tests*** required to evaluate the performance and functionality of the application software and determine the tests required to suit the

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ELEMENT	PERFORMANCE CRITERIA
	test regime 1.5. Evaluate ***features of testing tool and debuggers*** and select an appropriate tool to test the software application and detect faults 1.6. Produce a ***test plan*** based on the requirements of the project specifications and identify ***testing artefacts*** required for model based software testing
2. Plan the development of testing artefacts	2.1. Develop ***software testing strategies*** for uncovering evidence of ***defects*** in software systems as part of the quality assurance process 2.2. Produce a test dependency model of the relationship between the test regime and the ***test levels*** in software testing for referencing and validation 2.3. Analyse the software testing requirements to determine the ***domain testing*** and ***application testing*** artefacts requirements to validate the software product
3. Develop and manage testing artefacts	3.1. Create reusable domain artefacts to detect early defects in domain testing 3.2. Modify domain test artefacts by binding the variability to create application test artefacts to detect defects in product line applications 3.3. Produce test reporting associated with ***phases of a test cycle*** within test plan 3.4. Analyse test reports and evaluate the impact of test plan with the testing artefacts on the testing environment 3.5. Manage the progress of test plan to minimise the risks associated with testing and ensure test complies with test requirements 3.6. Report detected defects to product evaluation personnel and prepare a strategy manage the defects 3.7. Analyse the testing metrics produced by the test tool to manage the tracking of defects and use metrics to plan process improvements 3.8. Produce an evaluation report from the traceability matrix to manage the defects or failures from the test plan

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate product and technology needs
- communication skills to:
  - interact with enterprise personnel, customers and other contractors, while maintaining a customer focus and consideration of customer needs
  - liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - prepare reports given a specific format
  - read and interpret technical documentation, software and hardware manuals, specifications and relevant enterprise policy
- numeracy skills to take and analyse measurements
- planning and organisational skills to:
  - break large projects into a series of small projects
  - manage and prioritise own work
  - organise testing
- problem solving skills to resolve software, hardware and logistics problems
- safety awareness skills to follow all related occupational health and safety (OHS) requirements and work practices
- task management skills to work systematically with required attention to detail and adherence to project requirements
- technical skills to:
  - configure software testing tools
  - create traceability matrix
  - develop software testing strategies

Required knowledge

- applications software features and functionalities
- configuration of software testing tools
- creation of testing artefacts
- creation of traceability matrix
- domain and application testing
- elements of test plans
- features of testing tools and debuggers
- identification of types of risks
- management of:
  - software defects

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REQUIRED SKILLS AND KNOWLEDGE
• test traceability • phases of test cycles • production of test reviews • steps in developing test strategy • testing procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • produce the steps in developing the test strategy • produce a test strategy to evaluate the suitability of the application software • develop software testing strategies for uncovering evidence of defects in software systems • create reusable domain artefacts to detect early defects in domain testing • produce test reporting associated with phases of a test cycle within test plan • produce an evaluation report from the traceability matrix .
Context of, and specific resources for assessment	Assessment must ensure: • site where testing artefacts can be developed and applied • software tools currently used in industry • vendor products, specifications, equipment and enterprise policy required for the activity.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate managing

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EVIDENCE GUIDE	
	development and application of testing artefacts • review of tests plans, reports and evaluation documents prepared by the candidate • oral or written questioning of the candidate to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7225A Manage network testing strategies. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with

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RANGE STATEMENT	
training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Application software may be for:	• firmware • games software • media centre • mobile phone • operating system • set-top box • sever • web application • wireless modem.
Test strategy may include:	• communicating test plans to stakeholders and obtain buy-in from business clients • coordinating test environment and data requirements before starting phase • defining objectives, timelines, and approach for test effort • defining test activities with roles and responsibilities.

Steps in developing the test strategy may include:	• change management:
	  • models for assessing impact of changes on testing
	  • plan for managing requirement changes
	  • process for keeping test artefacts in sync with development artefacts
	• configuration management:
	  • list of testing artefacts
	  • tools and techniques for configuration management
	• communication and status reporting
	• testing approach:
	  • methodology for test development and execution
	  • planning for test execution cycles
	  • specification of test environment set-up
	  • testing process life cycle
	  • testing templates, checklist and guidelines
	• test automation:
	  • criteria for feasibility of test automation
	  • defect management
	  • test automation strategy
	  • test tool identification

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RANGE STATEMENT	

	• test environment specifications:
	  • configuration management, maintenance of test bed and build management
	  • hardware and software requirements
	  • test data creation
	• testing metrics:
	  • metric to match strategic objectives
	  • plan of process improvement based on metrics
	  • techniques for collecting metrics
	  • tools to gather and analyse metrics
	• types of testing:
	  • different phases of testing required
	  • different types of testing
	  • test coverage
	• objective and scope of testing:
	  • business objectives
	  • extent of application to be tested
	  • goals to be met by testing effort
	  • what systems and components need to be tested.

Range of tests may include:	• compatibility • on demand testing • performance • process improvement • technical • test management • verification.

Features of testing tool and debuggers may include:	• automated functional graphical user interface (GUI) testing tool
	• benchmarks
	• formatted dump or symbolic debugging
	• performance analysis or profiling tool
	• program monitors;
	  • code coverage reports
	  • instruction set simulator
	  • program animation.

Test plan may include:	• acceptance or commissioning test • design verification or compliance test • manufacturing or production test • regression test.

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RANGE STATEMENT	
Testing artefacts produced by software testing may include:	• domain or application testing • test case • test data • test harness • test plan • test scripts • test suite • traceability matrix.
Software testing strategies may refer to:	• defects when software system does not behave as specified • test level requirements • variability of product line.
Defects may be:	• deferred • fixed • rejected • treated.
Test levels refer to:	• integration test of multiple element that form a configuration specified in architecture • system test that validates behaviour of whole system • unit test of single element.
Domain testing features may:	• aim at testing common parts and preparing test artefacts for variable parts • create reusable test artefacts for application testing • deal with variability of various domains • uncover evidence of defects in domain artefacts.
Application testing features may:	• aim at reusing test artefacts for common parts and reuse predefined variable domain test artefacts to test specific applications • reuse domain test artefacts to uncover evidence of defects in product line applications.
Phases of a test cycle may include:	• defect retesting • regression testing • requirements analysis • test closure • test development • test execution • test planning • test reporting • test result analysis.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7227B Analyse business specifications to produce technical solutions

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. Minor changes to performance criteria. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to model and analyse business specifications and produce a technical solution that satisfies customers' business needs.

Application of the Unit

Telecommunication officers in service and provision work who carry out design and implementation of technical solutions of ICT networks apply the skills and knowledge in this unit for a practical solution in network design.

They would be employed by telecommunications and IT networking provisioning companies specialising in integrating the converging and emerging technologies of ICT networks.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to analyse business specifications	1.1 Research the application of a suitable ***business model*** for telecommunication service provisioning that meets agreed customer requirements 1.2 Obtain ***business requirements*** and ***business specifications*** to provide data for the model 1.3 Determine the ***business drivers*** and key stakeholder/customer ***requirements*** with internal and external ***stakeholders*** 1.4 Evaluate business objectives and customer requirements for input into the model
2. Produce technical solutions to meet business imperatives	2.1 Research tools and templates for analysing business models and provide reports on technical design and specifications 2.2 Develop ***technical solutions*** for customer in response to drivers and business requirements 2.3 Evaluate costs involved to implement the IT/ICT technical solutions for customer 2.4 Produce a cost benefit analysis to assess the viability and optimum timing for deploying the technical solution for maximum return on investment (RoI)

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	2.5 Investigate a range of vendor products to determine the most suitable to meet technical requirements and customer needs 2.6 Produce a report document on the technical solutions addressing the business specifications and recommendations against customer requirements
3. Evaluate the impact of the technical requirements on the business	3.1 Review and assess business constraints, opportunities and objectives 3.2 Determine ***technical requirements*** according to input-output, interface, process flow or quality requirements 3.3 Analyse ***hardware, software*** and ***network*** requirements to suit the business plan 3.4 Build business platform based on IT/ICT technical solutions 3.5 Investigate processes to be changed by the business solution 3.6 Produce an evaluation document on the ***impact*** of the technical requirements on the business
4. Document and validate the agreed solutions	4.1 Submit technical requirements and solution overview to management for feedback 4.2 Analyse feedback and incorporate change as required 4.3 Document changes and distribute final business solution to internal and external stakeholders

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical, operational and business related matters
- literacy skills to:
  - design solutions and recommendations in required formats
  - interpret technical documentation and write reports
- numeracy skills to:
  - evaluate possible technical design scenarios for optimum solution

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    - interpret business requirements and specifications
- planning and organising skills to plan, prioritise and monitor own work
- problem-solving and contingency management skills to adapt varied business procedures to requirements
- research skills to interrogate vendor databases and websites to implement different solutions to meet client business specifications
- technical skills to:
    - produce optimum technical solutions
    - use software business tools.
    -

Required knowledge

- business models and tools
- business processes
- client business domain, business function and organisation
- compatibility issues and resolution procedures
- configuration of internet protocol (IP) networks
- customer and business liaison
- desktop applications and operating systems as required
- documenting technical specifications
- linkage between processes
- security protocols, standards and data encryption
- technologies:
    - access networks
    - core networks
    - ICT network topologies
    - mobile cellular networks
    - network protocols and operating systems
    - optical networks and principles
    - radio frequency (RF) networks and principles.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	

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Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate client specifications against accepted industry practices • produce technical solutions from business specifications • analyse feedback from client and make adjustment to the proposal • apply design concepts to business solutions • produce technical reports • make recommendations and offer optimum design solutions • produce an evaluation document on the impact of the technical requirements on the business.
Context of and specific resources for assessment	Assessment must ensure: • client functional requirements • business specifications • database software • simulation software • organisational guidelines • network and computer layout • site design software and hardware • information on a range of ICT business solutions.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of work processes and procedures and/or performance in a project context • oral or written questioning on required knowledge and skills • evaluation of research methodologies and the final proposal prepared by the candidate outlining solutions and recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7220A Translate domain and solution architectures into platform requirements and designs.

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	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Business model includes:	• customers:
	  • customer relationship
	  • distribution channel
	  • target customer
	• finances:
	  • cost structure
	  • revenue
	• infrastructure:
	  • business partnerships
	  • core capabilities

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	• value configurations
	• offering:
	  • customer preference
	  • value proposition.

Business requirements may include:	• business application • business plan • existing system • mission statement • nature of the business • network or people in the organisation.
Business specifications may include:	• budget allocation • budget costs estimate • future plan • growth forecast • technical requirements • timeline.
Business drivers may be in reference to:	• application solutions • business need or opportunity that needs to be addressed • business partnerships and associations • network or people in the organisation • system.
Requirements may be in reference to:	• application • business • database • network • people in the organisation • platform • system.
Stakeholders may include:	• development team • project team • sponsor • user.

Technical solutions may include:	• audit requirements
	• changes to:
	  • network infrastructure
	  • security or privacy provisions
	• e-business or e-commerce solution
	• hardware upgrades
	• implementing a new system
	• inventory management

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	• new hardware • new software • occupational health and safety (OHS) requirements • quality requirements • software upgrades • user training.
Technical requirements may be in reference to:	• bandwidth • hardware problems • network growth • network security • network traffic congestions • new technologies • power usage • software problems • transmission dropouts • upgrades.

Hardware may include:	• internet protocol TV (IPTV)
	• multimedia
	• network elements:
	  • gateways
	  • local area network (LAN) switches
	  • routers
	  • servers
	  • wireless networks
	• optical networks
	• radio networks
	• switching equipment
	• transmission equipment
	• voice and data equipment.

Software may include:	• commercial • customised software • in-house • packaged.
Network may include:	• broadband • data • ICT networks • internet and intranet • media • radio • security • switching

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	• telecommunications • transmission.
Impact may refer to:	• fewer downtimes • improved efficiency • improved response times • increased return on investment • lower operational costs • more ’user friendly‘ network.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN7228A Manage project requirements and process implementations

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse forecast data, develop specifications and resource requirements and plan implementation of the process solution for products and services. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with project management roles and authority to direct the activities of implementation staff apply the skills and knowledge in this unit. This unit is relevant when providing customers with products and services in new and emerging technologies.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Manage forecast service demand requirements	1.1. Develop a project plan to review ***forecasting data*** and generate planning forecasts using ***forecasting tools*** 1.2. Analyse and review forecasts according to enterprise policy and produce forecasts figures considering ***new developments*** in the area and technological changes where appropriate
2. Manage network development growth requirements	2.1. Analyse ***market intelligence*** on customer demand and ***demand data*** to plan for potential network traffic quantity and flow 2.2. Assess overall ***planning*** parameters, including approved business plan prior to commencing

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ELEMENT	PERFORMANCE CRITERIA
	planning process 2.3. Analyse gathered information and produce a project plan with ***specifications*** to meet network growth
3. Manage project resources requirements	3.1. Assess the ***resource requirements*** to manage the project from scoping phase through to project completion 3.2. Analyse the outcomes of the project deliverables to determine the effectiveness of the project process
4. Develop process solutions	4.1. Produce the ***requirements for process solutions*** for the delivery of ***product*** and ***services*** to customers using forecasting demand data 4.2. Prepare a plan for the organisational change control process and the ***integration of new solutions*** within a complete network infrastructure 4.3. Produce a ***test management schedule*** for the testing process of the product solution 4.4. Develop solution specifications using ***industry process*** according to design requirements 4.5. Develop software and hardware resource profiling and select suitable vendor for negotiations 4.6. Complete configuration management and provide complex input design requirements
5. Analyse test results for process solutions	5.1. Use design document and ***integration document software*** to replicate issues exhibited in test environment 5.2. Certify software solution compatibility and compliance with requirements using web based test management tool to conduct ***performance evaluation tests*** 5.3. Analyse test reports to evaluate compatibility and security issues in a test environment 5.4. Resolve complex issues in interface to isolate defects
6. Manage process implementation	6.1. Plan and prepare evidence for customer acceptance and certification 6.2. Plan and manage ***transition to operation activities*** required for transition to operation of integrated IP solution 6.3. Prepare an installation failures procedure to make changes whilst maintaining service levels 6.4. Manage ***change implementation plan*** to maintain

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ELEMENT	PERFORMANCE CRITERIA
	system stability

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to use information and data to manage network growth
• communication skills to discuss project brief with enterprise personnel, customers and other contractors
• literacy skills to read and write reports and project briefs
• numeracy skills to:
  • apply forecasting techniques
  • assess planning parameters
  • work with statistical data
• planning and organisational skills to consider current and new technology, facilities and features when developing options
• problem solving skills to account for unexpected changes in demand requirements
• research skills to:
  • obtain and study information relating to new technology or technology features
  • review forecasting data
• technical skills to:
  • use integration software
  • conduct performance evaluation tests

Required knowledge
• change management • customer applications and usage levels • forecasting techniques • industry processes • integration of new solutions • market intelligence • performance evaluation • planning procedures • product integration • products and services

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REQUIRED SKILLS AND KNOWLEDGE
• project management • sources of data to aid forecasting • test management

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • manage forecast service demand requirements • manage network development growth requirements • manage project resources requirements • develop process solutions.
Context of, and specific resources for assessment	Assessment must ensure: • forecast data and tools involved in planning • a range of software and hardware currently used in industry • relevant regulations, specifications that impact on forecasting activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate implementing process solutions • review of planning forecasts, specifications and evidence for customer acceptance completed by the candidate for different scenarios and situations • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
	for example: • ICTTEN7230A Scope project requirements and process solutions. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Forecasting data may be:	• collated by:
	  • directories
	  • examining plans

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RANGE STATEMENT	
	• historical usage data • interviews • maps • network management tools • reports • collected from: • customers: • actual • prospective • economic planners • internal organisational groups • marketing organisations • real estate agents • sales organisations • state/territory and federal governments • statutory bodies • traffic management systems • changing customer use patterns • customer access planning • demographic changes • economic forecasts • industry trends • influence of technology on traffic demand • land developments • local industry • marketing programs • population trends • possible environmental impacts • re-zoning • sales forecasts • shire planning • telecommunications history in the area • traffic patterns.
Forecasting tools may include:	• specialist forecasting software • spreadsheets • statistical tools: • graphical estimation • moving averages: • simple

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RANGE STATEMENT	
	• weighted • Poisson distribution • probability • queuing theory • regression analysis • trend analysis.
New developments may include:	• commercial • communications construction occurring directly or concurrently with primary activity • domestic • industrial.
Market intelligence may include:	• customer: • demand • feedback • projections • specific technology needs • impact of new technology • vendor forecasts.
Demand data may be:	• collected from: • customers: • actual • prospective • economic planners • internal organisational groups • marketing organisations • real estate agents • sales organisations • state/territory and federal governments • statutory bodies • traffic management systems • in relation to: • access transport planning • changing customer use patterns • demographic changes • economic forecasts • industry trends • influence of technology on traffic demand • land developments

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RANGE STATEMENT	
	• local industry • marketing programs • population trends • possible environmental impacts • re-zoning • sales forecasts • shire planning • traffic patterns.

Planning can relate to:	• buildings
	• network change
	• network growth and network reduction
	• priorities which are driven by:
	  • customer demand
	  • legislative requirements
	  • marketing initiatives
	  • revenue projections
	• sites
	• structures.

Specifications may include:	• availability of equipment and resources • costing • funding • infrastructure developments • priority • risk assessment • technology requirements • timeframe.
Resource requirements may refer to:	• communications strategies • contracting and procurement • cost • human resources • quality • risk assessment • time • validation processes.
Requirements for process solutions may include:	• diagnostic software tools • hardware resources • management software tools • protocol management • software resources.

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RANGE STATEMENT	
Product may include:	• broadband connections • business solutions • iPhone • mobile internet • optical network • phone conferencing • wireless services.
Services may include:	• assisting customer with new applications • assisting new product sourcing • business customer service • coverage • customer service • database hosting • international roaming • just-in-time deliveries • mobile service • quality of service (QoS) • service restoration.
Integration of new solutions may include:	• hardware compatibility • no contentions • platform compatibility • protocol compatibility • signalling contention • software compatibility • system interoperability • technology compatibility.
Test management schedule may include:	• post-installation test procedures • pre-installation test procedures • profiling of software solution • risk defects report • simulation testing • test process for testable network software built • test summary report.
Industry process may include:	• complex architectural input • complex constructor table input • idea consultation.
Integration document software may include:	• fine-tuning capabilities in multi-operating environments • integration with existing system

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RANGE STATEMENT	
	• links to legacy systems.
Performance evaluation tests may include:	• defects detected, logged and mapped to failed cases • releases to manage software releases and iterations • requirements for traceability and management • test lab to execute test cases from test plan • test plan to create and update test cases.
Transition to operation activities include:	• installation procedures • operations and maintenance (OM) expenses • OM • project scope • schedule and milestones • training procedures.
Change implementation plan may include:	• back out procedures • pre-validate changes prior to the change to assess environment stability • test process pre and post scheduled change to identify success.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN7230A Scope project requirements and process solutions

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse project needs, prepare project scoping requirements and manage the scoping process. This includes developing ***scope management strategies*** and plans in line with business requirements and organisational strategy for the delivery of products and services. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Network engineering staff or senior technical officers with project management roles and authority to direct the activities of implementation staff apply the skills and knowledge in this unit. This unit is relevant when planning to provide customers with products and services in new and emerging technologies.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Conduct project scope definition activities	1.1. Develop and confirm procedures for ***project authorisation*** with an ***appropriate authority*** for the commitment of resources and effort 1.2. Establish agreement of desired project outcomes with ***relevant stakeholders*** 1.3. Develop ***scope management plan*** to determine the scoping requirements
2. Define and plan	2.1. Analyse ***needs*** in consultation with client and

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ELEMENT	PERFORMANCE CRITERIA
scoping project requirements and process solutions	relevant stakeholders to verify project scope 2.2. Prepare project specifications with project objectives, ***deliverables***, constraints, exclusions, assumptions and principal work activities for the delivery of ***products*** and ***services*** 2.3. Determine and agree measurable project outcomes and benefits to enable quantified evaluation of program performance 2.4. Develop and communicate scope definition, ***scope management strategies*** and plans to stakeholders and seek agreement 2.5. Align program scope to business requirements and organisational strategy
3. Manage scoping process	3.1. Conduct regular program reviews to measure ***project performance*** and to ensure that stated program, business and strategic objectives are met 3.2. Establish and maintain ***change management system*** to form the basis of ongoing scope management 3.3. Conduct ***reviews of scope changes*** and take action to ensure that project and program objectives are achieved or modified 3.4. Measure project outcomes against defined program scope and aligned strategic objectives 3.5. Communicate results of program outcomes to appropriate authority 3.6. Manage the impact of scope changes within established time, cost and quality constraints according to ***change control procedures*** and to meet project objectives 3.7. Review project planning process and document recommendations for improvements to future projects

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

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REQUIRED SKILLS AND KNOWLEDGE

• analytical skills to analyse project needs
• communication skills to liaise with and communicate decisions to enterprise personnel and stakeholders
• literacy skills to:
  • review and amend project plans
  • write quality reports
• numeracy skills to:
  • assess project parameters
  • calculate budget requirements and limitations
• planning and organisational skills to
  • prioritise actions for successful outcomes
  • set out project requirements and priorities
• problem solving skills to:
  • account for unexpected variations to requirements
  • control proposed changes in scope
• research skills to gain and maintain relevant and current technical product knowledge

Required knowledge
• products and solutions • project life cycle and the significance of scope management • scope management plans, methodologies, techniques and tools • typical challenges and issues encountered in project scope management and options for addressing these • vendor products

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Evidence of the ability to: • prepare project specifications with project objectives

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EVIDENCE GUIDE	
competency in this unit	• develop scope management plan • develop scope management strategies • conduct regular program reviews • measure project outcomes • manage the impact of scope changes within established budget and timeline.
Context of, and specific resources for assessment	Assessment must ensure: • sites on which projects may be conducted • forecast data and tools involved in planning • range of software and hardware currently used in industry • relevant regulations, specifications that impact on forecasting activities.
Methods of assessment	A range of assessment methods should be used to assess practical skill and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate undertaking project scoping tasks • direct observation of the candidate managing the changes to scope of a project • review of plans and specifications prepared by the candidate • oral or written questioning to assess knowledge of strategies for managing project scope and their application to different situations • review of completed documentation outlining recommendations for improvements to scoping future projects.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN7228A Manage project requirements and process implementations. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Project authorisation may be:	• decided before involvement of the project manager
	• scope statement:
	  • aim of project
	  • explanation of project
	  • tools to measure success
	• required at a number of critical review points during the project.

Appropriate authority may relate to:	• authority to make decisions regarding the project • client • individual or group • owner

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RANGE STATEMENT	
	• senior executive • sponsor.
Relevant stakeholders may include:	• clients • decision makers • internal and external parties • sponsors • team members.

Scope management plan may relate to:	• determining that a scope change has occurred or is about to occur
	• identifying and reporting incremental increases to scope that were not part of the original project requirements
	• identifying factors which influence changes to scope
	• implementing agreed changes to scope
	• monitoring and reporting:
	  • achievement of project objectives
	  • effect of scope changes on other areas.

Needs may be:	• activity-oriented • computer systems or buildings • improvement-oriented • outcome-oriented • product-oriented.
Deliverables may include:	• implementation plans • integration plans with existing network • preferred vendors • products and services defined within the project scope • proposed timelines • risk assessment strategy.
Products may include:	• broadband connections • business solutions • iPhone • mobile internet • optical network • phone conferencing • wireless services.
Services may include:	• assisting customer with new applications • assisting new product sourcing • business customer service

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RANGE STATEMENT	
	• coverage • customer service • database hosting • international roaming • just-in-time deliveries • mobile service • quality of service (QoS) • service restoration.
Scope management strategies may relate to:	• controlling program scope creep • determining that a scope change has occurred or is about to occur • managing factors which influence changes to scope • managing scope changes when they occur • managing the effect of scope changes on other areas and on the achievement of multiple project objectives • progressive refinement of scope throughout multiple project life cycles.
Project performance may include:	• project's progress in terms of time and resources • time and resources spent on the projects, as compared to baseline data.
Change management system may include:	• change to control boards or committees • configuration management • documentation • impact analysis • risk analysis.

Reviews of scope changes may include:	• formal agreements:
	  • contracts
	  • subcontracts
	  • memoranda of understanding
	• major elements of the program liable to change:
	  • deletion of a line of business endeavour
	  • deletion of poorly performing projects
	  • new projects prioritising program
	• potential, perceived and actual changes
	• program documentation:
	  • integrated (program) risk analysis

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RANGE STATEMENT	
	• integrated budgets • integrated schedules • plans.

Change control procedures may include:	• assessing risk to project timeline:
	  • excess costs
	  • excess resources required to complete project on time
	• contingency plan
	• monitoring and reviewing progress.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN8194A Investigate the application of cloud networks in telecommunications switching

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to investigate the application of cloud networks (infrastructure-as-a-service) in telecommunications switching. Most infrastructure-based services are embedded in physical infrastructure. Cloud computing and infrastructure-as-a-service changes the focus from the physical infrastructure to the new world of virtual infrastructure. No longer are services built around floor space, servers or ports, but rather around virtual machine (VM) images, application instances, and virtualised storage and networks. Scalability, cost savings, security, flexibility of infrastructure and energy consumption are significant factors when business considers cloud networks. Applications involving cloud networks are developed to support business strategies. Cloud network solutions support the application of Next Generation Technologies (NGN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Application of the Unit

Application of the unit	Telecommunication planning engineers and senior technical staff apply the skills and knowledge in this unit to investigate the application of cloud networks (infrastructure-as-a-service) in telecommunications switching. Technical planners develop strategies to accommodate shortfalls in capacity and functionality for a switching network, and develop solutions for network growth using emerging technologies.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent

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	with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Evaluate current physical network infrastructure	1.1. Analyse the scalability, functionality, cost, security and energy consumption of existing physical network infrastructure 1.2. Report on the shortfalls and risks of existing physical infrastructure in accommodating network growth and increased functionality 1.3. Investigate capacity and functionality shortfalls of existing physical infrastructure to highlight the limitations of the existing switching network 1.4. Document estimated costs and issues associated with meeting capacity and functionality shortfalls using existing physical infrastructure
2. Investigate the application of cloud networks	2.1. Analyse trends in **cloud networks** (infrastructure-as-a-service) technologies and **multiprotocol label switching** (**MPLS**) architectures against the rapid changes in the landscape 2.2. Determine the applicability of cloud networks (infrastructure-as-a-service) to meet capacity and functionality requirements of the network 2.3. Assess the risks in using cloud networks to meet capacity and functionality requirements of the network 2.4. Evaluate a range of cloud network solutions and justify the selection of an optimum network switching solution 2.5. Develop solution elements using a series of small project elements 2.6. Produce a cloud network alternative solution to emulate the existing Core Network of a service provider
3. Analyse the impact of the cloud network solution for system integration and across business domains	3.1. Prepare a plan for organisational change control process and the ***integration of cloud network solutions*** within a complete network infrastructure 3.2. Prepare a test scenario and produce a ***test management schedule*** for the testing process of

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ELEMENT	PERFORMANCE CRITERIA
	system elements and interfaces using simulation 3.3. Use ***integration document software*** to replicate issues exhibited in test environment 3.4. Certify cloud network solution compatibility and compliance to requirements using web based test management tool (quality centre) to conduct ***performance evaluation tests*** 3.5. Analyse test reports to evaluate load balancing and network security issues in test environment 3.6. Document and resolve conflicts detected in simulation testing
4. Develop a business case for implementation of a cloud network	4.1. Prepare a cost-benefit analysis of the cloud network solution as a business case to evaluate the return on investment (RoI) 4.2. Investigate staging of the solution and timing implementation of the project elements as a scenario for real life implementation 4.3. Research and report on the ***key features*** of cloud network implementation in a business case study

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• analytical skills to evaluate the existing physical network infrastructure
• communication skills to:
  • interact with enterprise personnel, customers and other contractors, while maintaining a customer focus and consideration of customer needs
  • work effectively within a group
  • liaise with internal and external personnel on technical and business matters
• literacy skills to:
  • prepare reports given a specific format
  • read and interpret technical documentation, software and hardware manuals, specifications and relevant enterprise policy
• numeracy skills to analyse requirements
• PC skills to use a word processor to translate enterprise and technology issues into

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REQUIRED SKILLS AND KNOWLEDGE

a cloud network solution
• planning and organisational skills to:
  • manage and prioritise own work
  • manage solution elements
  • break up large project component into a series of smaller project components
• problem solving skills to solve domain, technology and logistics problems
• safety awareness skills to follow all related occupational health and safety (OHS) requirements and work practices
• task management skills to work systematically with required attention to detail and adherence to project requirements
• technical skills to:
  • prepare a test scenario and test regime for the simulation
  • resolve system conflict or defects following simulation testing
  • set up test management schedules and diagnose interface requirements

Required knowledge
• analysing infrastructure-as-a-service components • existing digital switching technology in service provider core network • information required to develop architectural solutions • integration document software • new cloud network technologies • overview knowledge of cloud networking transmission, transmitter and receiver architecture and their associated infrastructure • performance and integration requirements • prepare and/or interpret technical documentation • protocols as used on the MPLS and infrastructure-as-a-service • specific knowledge related to network components and their functions • specific organisational requirements relating to the computer systems • typical issues and challenges that occur with system changes

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • evaluate the current physical network infrastructure's capacity and functionality shortfalls • investigate the application of cloud networks and plan the architectural design • develop components of cloud networking solution for meeting capacity and functionality requirements of the network • assess the risks in using cloud networks to meet capacity and functionality requirements of the network • analyse impact of integration of cloud network solution on the network • prepare a test plan with test scenario and produce a test management schedule • use integration document and software test management tools to replicate issues exhibited in test environment • certify cloud network solution compatibility and compliance • prepare a cost-benefit analysis of the cloud network solution • develop a business case for implementation of a cloud network.
Context of and specific resources for assessment	Assessment must ensure: • site where the application of cloud networks in telecommunications switching may be investigated • software tools currently used in industry • vendor products, specifications, equipment and enterprise policy required for the activity.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate investigating the application of cloud networks and planning the architectural design • review of reports, plans and business case for a cloud network solution prepared by the candidate • oral or written questioning of the candidate to assess

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EVIDENCE GUIDE	
	knowledge of cloud networks.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN8197A Produce engineering solutions using numerical computations and simulation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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RANGE STATEMENT	
Cloud networks refers to:	• delivery of internet protocol (IP) infrastructure (typically a platform virtualisation environment) as a service • overlays the IP network using MPLS.
multiprotocol label switching (***MPLS***) refers to:	• encapsulating packets of various network protocols • use in creating virtual links between distant nodes • use in high-performance telecommunications networks which direct and carry data from one network node to the next • using layered protocols using the OSI 7 layer model.

Infrastructure-as-a-service may include:	• computer hardware (typically set up as a grid for massive horizontal scalability)
	• computer network:
	  • firewalls
	  • gateways
	  • load balancing
	  • MPLS switch
	  • servers
	• internet connectivity
	• platform virtualisation environment for running client specified virtual machines
	• service level agreements
	• utility computing billing:
	  • per instance hour.

Integration of cloud network solutions may include:	• hardware compatibility • no contentions • platform compatibility • protocol compatibility • signalling contention • software compatibility • system interoperability • technology compatibility.
Test management schedule may include:	• post-installation test procedures • pre-installation test procedures • produces test summary report • profiling of software solution • risk defects report

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RANGE STATEMENT	
	• simulation testing • test process is testable for network software built.
Integration document software may include:	• fine-tuning capabilities in multi-operating environments • integration with existing system • links to legacy systems.
Performance evaluation tests may include:	• defects (defects detected are logged and mapped to failed cases) • releases (manage software releases and iterations) • requirements (traceability and management) • test lab (execute test cases from test plan) • test plan (creating and updating test cases).
Key features may include:	• bandwidth on demand • distribution • enhanced rate • transmission.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN8195B Evaluate and apply network security

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. References to other units updated. Outcomes deemed equivalent.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 1.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to analyse the security features of an internet protocol (IP) based telecommunications network.

This applies to IT networking and telecommunications networking topologies.

Application of the Unit

Telecommunication engineers apply the skills and knowledge in this unit to analyse and report on the security of an ICT network, particularly Internet security.

They are responsible for the evaluation of security of ICT networks using converging switching and transmission technologies in local area networks (LAN) and wide area networks (WAN), broadband networks, internet protocol TV (IPTV) and virtual networks.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

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Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Analyse the operation of the Internet	1.1 Evaluate the interrelationship of IP to open systems interconnect (OSI) seven layer model and the impact on network topologies and ***network elements***
	1.2 Assess media access control (MAC) and IP addressing and their application in security
	1.3 Report on transmission control protocol/internet protocol (TCP/IP) operations and the use of ***transport protocols*** for transmitting data over the network
	1.4 Examine the various types of ***routing protocols*** and implication on security
	1.5 Analyse forms of ***label switching*** as applied to data packets
	1.6 Use software to simulate the ***least cost algorithms***
2. Analyse internetwork protocols	2.1 Compare connection-oriented and connection-less networks in internetworking applications
	2.2 Research the ***design parameters*** used in networks
	2.3 Produce a report on IP multi-casting protocols and systems including IP ***frame fields*** of the data frames
3. Research and report internetwork operations	3.1 Analyse protocol considerations of voice over internet protocol (VoIP)

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	3.2 Research the protocols G723.1, G729 and G729A standards and evaluate their application in internetworking 3.3 Determine the format of JPEG and GIF files as applied to still pictures 3.4 Determine the format of MPEG-2 and H.32x series multimedia protocols for motion pictures 3.5 Evaluate the features of different of ***multi-service protocols*** and of different ***email system protocols*** in networking operations 3.6 Produce a report on the features the different ***web-based protocols*** used in internetworking operations
4. Analyse features and types of network security	4.1 Analyse procedures and processes used for security attacks and use of protection mechanisms 4.2 Research conventional ***encryption algorithms*** and determine possible locations of encryption devices 4.3 Produce a report on conventional encryption key distribution problems and how message authentication and verification is achieved 4.4 Research one-way hashing and secure ***hashing functions*** 4.5 Produce a report on digital signature standard (DSS) principles including ***public key cryptography algorithms*** for network security
5. Research features of public key authentication and email network security protocols	5.1 Research public key authentication using Kerberos 5.2 Analyse how electronic mail security is achieved using pretty good privacy (PGP) 5.3 Research and report on ***IPSec*** protocol security 5.4 Produce a report on encapsulating security payload (ESP) including Internet ***key management processes***
6. Research features of web, network management and system security	6.1 Analyse how web threats and attacks occur in an IP network and determine system intruders and threats 6.2 Research the operation of ***transaction protocols*** 6.3 Evaluate the processes used for selection and protection of system passwords 6.4 Evaluate ***system threats*** and methods used to counter act the threats 6.5 Produce a report on anti-virus protection strategies, including firewall design principles, types and configurations
7. Document evaluation	7.1 Present a final report to include research and evaluation of

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report	network security management principles and the application to the network in the workplace with enhancement recommendations

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate a range of complex technical data
- communication skills to work effectively within a group and present information
- information technology skills to use:
  - software for desktop research
  - statistical data
  - word processing software
- literacy skills to prepare reports given a specific format and read and interpret technical standards
- planning and organisational skills to manage own work in specific time frames
- research skills to gather and record data from measurements
- technical skills to:
  - operate test equipment
  - use telecommunications management networks.
  -

Required knowledge

- administrative network management systems
- algorithms
- cryptography
- encapsulation
- encryption
- enterprise solutions
- firewalls
- network topologies
- operations network management systems
- organisational policy and procedures
- protocols
- routing theory
- system threats

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- transaction protocols
- workplace and industry environment.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse the operation of the Internet • implement Internet technology • select Internetwork protocols • research and report various internetwork operations • analyse features and types of network security methods and their weaknesses • analyse features of various cryptography systems • research and report the features of public key authentication and email network security protocols • research and report the features of web, network management and system security.
Context of and specific resources for assessment	Assessment must ensure: • a telecommunications operations site with a mentor or supervisor appropriately experienced in relevant telecommunications technology and infrastructure • networked computers and relevant software.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning to assess required knowledge • direct observation of the candidate carrying out relevant security checks within a networked communication system • review of reports completed by the candidate for different security breached scenarios.

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Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTPMG8143B Manage a telecommunications project • ICTPMG8149B Evaluate and use telecommunications management networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Network elements may include:	• bridges • gateways

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	• routers • servers • switches.
Transport protocols may include:	• Ethernet • point-to-point protocol (PPP) • synchronous data link control (SDLC) • synchronous optical network (SONET).
Routing protocols may include:	• adaptive • enhanced interior gateway routing protocol (EIGRP) • fixed • flooding • interior gateway routing protocol (IGRP) • open shortest path first (OSPF) • random • routing information protocol (RIP).
Label switching may include:	• cell switching routers (CSR) • IP • tag.
Least cost algorithms may include:	• Bellman-Ford's • Dijkstra's.
Design parameters may include:	• datagram lifetime • error and flow control techniques • fragmentation • reassembly • routing.
Frame fields may include:	• datagram format • internet control message protocol (ICMP) • IPv6 header and addressing • protocol data unit (PDU).
Multi-service protocols may include:	• border gateway protocol (BGP) • OSPF • resource reservation protocol (RSVP) • real time control protocol (RTCP) • real time protocol (RTP).

Email system protocols may include:	• data transparency:
	  • ASCII
	  • binary
	  • EBCDIC
	  • radix64 coding
	  • Unicode

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	• multipurpose mail extensions (MIME) • simple mail transfer protocol (SMTP).
Web-based protocols may include:	• common gateway interface (CGI) • file transfer protocol (FTP) • hyper-text mark-up language protocol (HTML) • hyper-text transfer protocol (HTTP) • Java applets and application programmers interface (API).
Encryption algorithms may include:	• Blowfish • Data Encryption Standard (DES) • Feistel Cipher • International Data Encryption Algorithm (IDEA).
Hashing functions may include:	• hash message authentication checksum (HMAC) • Secure HAsh (SHA-1).
Public key cryptography algorithms may include:	• Dieffie-Hellman key exchange • Rivest Shamir Adleman (RSA).
IPSec may include:	• authentication header • internet protocol (IP) security • transport and tunnel modes of operation.
Key management processes may include:	• internet security association and key management protocol (ISAKMP) • Oakley key determination protocol (OKDP).
Transaction protocols may include:	• secure electronic transaction (SECT) • simple network management protocol (SNMP) • SNMPv1 (community facility and proxies) • SNMPv3 (message processing and the user security model) • secure socket layer (SSL).
System threats may include:	• logic bombs • trap doors • Trojans • viruses • worms.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering

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ICTTEN8196A Evaluate and apply digital signal processing to communications system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse, apply and simulate the operation of digital signal processing (DSP) to signals in a telecommunications system. Digital signal processing is essential in digital communications systems including signal conditioning and processing functions such as modulation and multiplexing. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers responsible for the management and maintenance of digital communication systems apply the skills and knowledge in this unit. They combine the technical skills of this unit with design skills to develop solutions in modern applications, such as internet protocol TV (IPTV), digital TV, fast broadband and internet applications.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Apply DSP design criteria to telecommunications system	1.1. Review ***DSP criteria*** applied to signal processing 1.2. Perform ***frequency domain analysis*** on telecommunications signals 1.3. Apply digital processing techniques to ***DSP baseband communications signals*** used in digital systems 1.4. Generate the output of a comb filter in ***digital filtering*** application using convolution theorem and

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ELEMENT	PERFORMANCE CRITERIA
	autocorrelation
2. Determine linear time invariant (LTI) system properties	2.1. Simulate ***telecommunication entities*** using ***simulation software functions*** 2.2. Perform calculations to find numerical approximations of the continuous-time convolution process 2.3. Simulate echo cancellation by applying simulation software using ***adaptive DSP algorithms*** and an inverse filtering method
3. Analyse digital telecommunication signals processing	3.1. Analyse the result of digitally passing a signal through a first-order recursive discrete-time filter 3.2. Determine frequency response of a simple continuous-time system using Fourier transform 3.3. Analyse amplitude modulated signals using Fourier transform
4. Analyse time and frequency forms of signals by applying simulation of signal processing	4.1. Program a simulated software application to represent a comb filter with a signal applied from a ***telecommunication system*** 4.2. Produce a report analysing the simulated output results and relevance of a DSP filter to a telecommunications system

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to evaluate a range of complex technical data
- communication skills to work effectively within group
- information technology skills for word processing, using statistical data and desktop research
- literacy skills to:
  - read and interpret technical documentation
  - write reports including recommendations
- numeracy skills to perform mathematical calculations
- research skills to:

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REQUIRED SKILLS AND KNOWLEDGE

• gather and record data from measurements
• gather data, observe and analyse signal issues
• technical skills to :
  • apply simulation software
  • operate telecommunication test equipment
  • use telecommunications management networks

Required knowledge
• digital communications systems • Fourier transforms • LTI • modulation methods, amplitude (AM), frequency (FM) and phase (PM) and digital formats • organisational policy and procedures • responses to non-compliance • radio frequency (RF) awareness • workplace and industry environment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • apply DSP criteria to a telecommunications system • evaluate LTI system properties • analyse DSP, time and frequency forms of signals by applying signal processing.
Context of and specific resources for assessment	Assessment must ensure: • a telecommunications operations site • digital communication systems, simulation software and telecommunications test equipment currently used in industry.

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EVIDENCE GUIDE	
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or written questioning to assess required knowledge • direct observation of the candidate carrying out analysis and fault solution development within a digital communication system.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN8197A Produce engineering solutions using numerical computations and simulation. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

DSP criteria include:	• anti-alias and reconstructive filters
	• distortion
	• Nyquist sampling rate
	• quantisation error and noise
	• sampling theory
	• signal conditioning
	• signal converters:
	  • ADC
	  • DAC
	• Z-domain representation and transforms.

Frequency domain analysis may include:	• discrete Fourier transform (DFT)
	• fast Fourier transform (FFT)
	• modern spectral analysis
	• power spectra
	• signals:
	  • aperiodic
	  • periodic
	  • random
	• time and frequency representation.

DSP baseband communications signals may include:	• bandpass sigma delta systems
	• data equalisation
	• error control and coding
	• matched filtering
	• modulation:
	  • AM
	  • FM
	  • PM
	• pulse shaping
	• quaternary phase shift keying (QPSK) - quadrature amplitude modulation (QAM) digital communications
	• root raised cosine

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	• signalling:
	  • amplitude shift keying (ASK)
	  • frequency shift keying (FSK)
	  • phase shift keying (PSK).

Digital filtering refers to:	• comb and ARMA filters • digital filter design parameters and methods • FIR and IIR Filters • poles and zeroes and z-domain.
Telecommunication entities may include:	• discrete-time Fourier transform (DTFT) based filter of given design parameters • DTFT operation • generation of dual tone multi frequency signals • telephone touch tone system.
Simulation software functions may include:	• conv • filter • isim.
Adaptive DSP algorithms include:	• acoustic echo control and noise control • channel equalisation • echo control for feedback suppression • inverse system identification • Kalman • least squares • least mean squares • QR algorithms • recursive least squares (RLS).
Telecommunication system may include:	• AM with carrier • FM • PSK • single-sideband AM.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN8197A Produce engineering solutions using numerical computations and simulation

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to analyse, calculate and solve complex mathematical engineering problems that provide underpinning knowledge and skills for advanced telecommunication mathematical systems requiring numerical simulation No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Telecommunication network engineers apply the skills and knowledge in this unit. It involves the application of complex mathematical analysis to technical problems. It involves the design and evaluation of systems and networks, system enhancement, and interaction with design engineering sections from manufacturers to resolve telecommunications network problems that are not common. Relevant job roles may include: • digital signal processing • antenna performance and propagation evaluation • queuing systems • forecasting

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	• data analysis • capacity predictions • traffic engineering • radio networks.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**

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ELEMENT	PERFORMANCE CRITERIA
1. Use advanced engineering mathematics for a range of complex engineering solutions	1.1. Solve mathematical ***functions*** using ***complex trigonometric ratios*** 1.2. Solve mathematical functions using manipulation of ***matrices and determinants*** to perform ***standard calculations*** 1.3. Solve ***trigonometric functions*** using ***operations on complex numbers*** 1.4. Solve complex functions using ***integral and differential calculus*** 1.5. Solve mathematical functions using ***ordinary differential equations*** (***ODE***) 1.6. Solve mathematical equations using ***Laplace transforms*** 1.7. Solve mathematical problems using ***algorithmic control structures*** 1.8. Use software simulations where possible to produce ***simulated calculations*** for a range of ***engineering solutions*** 1.9. Analyse the results from the simulated solution and compare to the derived solutions to adjust any variables in the calculation process
2. Design a simulation control system with queues	2.1. Design a ***simple control system*** using simulation software 2.2. Design a ***queuing system*** using simulation software 2.3. Design a ***stochastic system*** using simulation software 2.4. Document and present all numerical software simulations for the engineering problems

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• advanced mathematical skills to perform a range of complex engineering solutions • communication skills to work effectively within group • information technology skills for word processing and desktop research

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REQUIRED SKILLS AND KNOWLEDGE
• literacy skills to read and interpret technical documentation • numeracy skills to gather and record data from measurements • research skills to gather data and information • technical skills to operate test equipment
Required knowledge
• integration and differentiation processes • mathematical simulations • mathematical theories • numerical analysis of signals • queuing theories • software programming and debugging • software simulation

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • analyse and manipulate functions using symbolic and numerical software, including the operations of entering and manipulating polynomials in suitable software and then substitution of values and graphing • analyse and manipulate matrices and determinants, numerically with and without symbolic and numerical software • design and debug programs using algorithmic control structures and output the results to the screen, a graph and a file • analyse and manipulate complex numbers numerically and with symbolic software • determine and manipulate equations using the advanced calculus operations of differentiation and integration numerically and with symbolic software

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EVIDENCE GUIDE	
	• determine and manipulate equations of the type called ODE met in telecommunications engineering applications numerically and with symbolic software • determine and manipulate Laplace transforms met in telecommunications engineering applications numerically and with symbolic software • design a simulation control system and simulate queues using software.
Context of and specific resources for assessment	Assessment must ensure: • networked computers • simulation software • relevant documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral questioning or written questioning to assess required knowledge • direct observation of the candidate carrying out mathematical simulations • review of simulation control system prepared by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplaces and job role is recommended, for example: • ICTRFN8180A Analyse a mobile network system • ICTRFN8181A Analyse a satellite communications system • ICTTEN8194A Analyse a telecommunications switching network • ICTTEN8195A Evaluate and apply network security • ICTTEN8196A Evaluate and apply digital signal processing to communications system. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Functions may include:	• cos(x) • exponential(x) • ln(1+x) • sin(x).

Complex trigonometric ratios refer to:	• analysing the elements of a vector 'term by term' with the operations of division, multiplication and exponentiation
	• analysing the series expansion of functions commonly used in telecommunications engineering problems
	• applying series expansion using Taylor and Maclaurins forms to simple formulae:
	  • polynomials
	  • exponentials
	  • logarithmic functions
	  • trigonometric functions
	• calculating a best fit polynomial of up to degree five for a set of

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	at least ten data points using a least square method in software
	• calculating a line of best fit and plot the result given a set of at least ten data points using a least square method in software
	• complex trigonometric ratios:
	  • cosh functions
	  • sinh functions
	  • tanh functions
	• interpolating data for a curve of best fit
	• performing calculations with a simulation package.

Matrices and determinants refer to:	• analysing row and column vectors as a special case of a general matrix • applying symbolic software to perform standard calculations on a matrix • calculating the co-factor of a determinant given the desired row and column • calculating the eigen values and eigen vectors of a square matrix of three dimensions • calculating the numerical and symbolic addition and/or subtraction of commensurable matrices • calculating the numerical and symbolic inner product of commensurable row and column vectors • calculating the numerical and symbolic product of a matrix by a scalar • calculating the numerical product of a pair of commensurable matrices • calculating the numerical value for the inverse of a square matrix • converting a set of linear equations to Matrix form.
Standard calculations may include:	• determinant of a square matrix with up to 4x4 dimension • eigen values and eigen vectors of a square matrix with up to 4x4 dimension • solution of up to four simultaneous equations • symbolic product of a pair of commensurable matrices with outer dimensions not exceeding four.
Trigonometric functions include:	• cos • cosh • sin • sinh • tan • tanh.
Operations on complex	• analysing the polar and rectangular forms of complex numbers • calculating complex variables with basic arithmetic operations

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RANGE STATEMENT	

numbers refer to:	• calculating the complex roots of polynomials with real coefficients up to third order
	• calculating the results of operations on complex numbers using complex forms of trigonometric functions
	• deriving the results for the complex operations of square root and multiple roots for up to sixth order
	• operations on complex numbers:
	  • multiple roots
	  • powers
	  • square roots
	• solving an engineering problem using euler equation.

Integral and differential calculus refer to:	• calculating derivatives and integrals of a single variable using standard forms and with symbolic software • calculating maximum and minimum values of a differential function • calculating partial derivatives using standard forms of differentiation • calculating the numerical differential of an equation from the sample interval • calculating the numerical integration of an equation given the sample interval • differentiating implicitly defined functions by applying the chain rule and software solution • integrating and evaluating double integrals that use standard forms and substitution methods • integrating equations by applying integration methods.

Ordinary differential equations (***ODE***) refer to:	• solving first order ODE using standard methods
	• solving first and second order ODE equations using various ODE solutions methods:
	  • applying software
	  • numerical plot with constant coefficients
	  • numerical solutions
	  • trial exponential solutions determining the unknown constants.

Laplace transforms refer to:	• calculating Laplace transforms of relevant equations using standard forms:
	  • exponential equations
	  • telecommunications related equations with polynomials up to degree two
	  • trigonometric equations
	• calculating partial fraction expansion of linear equations of one

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RANGE STATEMENT	
	variable with constant coefficients of second order degree or less • calculating the inverse Laplace transform by arrangement, into standard forms • solving a telecommunications related first order ODE using Laplace transforms numerically and with symbolic software.
Algorithmic control structures may include:	• multi-way selection (switch) • post-test repetition (repeat until) • pre-test repetition (Do While) • program fragments that use algorithmic control structures • program to output calculated results • program to request data by command line prompting • sequence • solution expressed in an acceptable algorithmic form • two-way selection (IF then Else) • well structured program to obtain the solution to a given engineering problem.

Simulated calculations
may include:
	• manipulation of diary files
	• plotting the results of calculations with equations:
	  • exponential
	  • logarithmic
	  • trigonometric functions
	• script to repeat previous calculations
	• simplification and expansion of symbolic equations and arithmetical expressions
	• symbolic variables, constants and equations
	• variable browsers window and command history screen
	• variables to store appropriate data for problem solving.

Engineering solutions may include:	• antenna performance and propagation evaluation • capacity predictions • data analysis • digital signal processing • forecasting • queuing systems • radio networks • traffic engineering.
Simple control system is based on:	• delay elements • feedback loop.
Queuing system includes:	• fixed arrival times • fixed processing delay

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RANGE STATEMENT	
	• single queue • single server.
Stochastic system includes:	• random arrival times • random processing delay • single queue • single server.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTWHS2081A Work safely in a radio frequency electromagnetic radiation environment

Modification History

Release	Comments
Release 1	This unit of competency first released with *ICT10 Integrated Telecommunications Training Package version 2.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to use organisational risk-control procedures when working with a risk of exposure to radio frequency (RF) electromagnetic radiation (EMR) hazards.

Note: In certain environments EMR may be referred to as electromagnetic emissions (EME). Users should confirm EMR regulatory requirements with the relevant federal, state or territory authority.

Application of the Unit

The unit applies to site maintenance staff, technicians and installers who install or maintain equipment at installations that are sources of RF EMR.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Prepare to work in an RF EMR environment	1.1 Identify ***characteristics of RF EMR*** and situations that can lead to exposure to ***RF EMR hazards***
	1.2 Identify ***potential effects*** of RF EMR on the human body and contributing factors that affect it
	1.3 Identify ***relevant regulations and standards*** that apply to working with and controlling RF EMR hazards
	1.4 Obtain and review RF EMR information required for work environment
2. Assess RF EMR risks	2.1 Assess potential RF EMR hazards in the telecommunications work environment
	2.2 Estimate the likely field strength pattern of a potential RF EMR hazard
3. Control RF EMR risks	3.1 Identify ***typical organisational controls*** to manage and control identified RF EMR hazards
	3.2 Choose and apply appropriate RF EMR controls
	3.3 Report EMR exposure that exceeds acceptable levels according to ***organisational work health and safety (WHS) requirements***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

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- communication skills to:
  - access information on organisational control measures for RF EMR hazards
  - determine response requirements
  - enable clear and direct communication to identify and confirm requirements and share information
  - follow instructions
  - report EMR exposure over acceptable levels
  - use language and concepts appropriate to cultural differences
- literacy skills to:
  - complete workplace documentation
  - document scope of work and work practices
  - read and interpret:
    - documentation from a variety of sources
    - drawings and specifications relating to the work to be done
- numeracy skills to estimate and calculate measurements of ambient RF signals
- planning and organising skills to plan and set out work
- technical skills to:
  - access and understand site-specific instructions in a variety of media
  - use communications equipment.

Required knowledge

- characteristics of RF EMR and sources of RF EMR
- nature of work undertaken close to sources of RF EMR
- relevant statutory and regulatory requirements relating to working safely with RF EMR
- control processes for managing safe exposure to RF EMR.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this	Evidence of the ability to: • apply knowledge of the effect of RF EMR on the body • locate, interpret and apply relevant information, standards

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unit	and specifications for working safely with RF EMR
	• identify organisational controls for exposure to RF EMR, including lock-out procedures and the use of personal protective equipment
	• carry out two risk assessments demonstrating:
	  • correct identification of risks and safety requirements recorded in a job safety analysis (JSA) sheet or safe work method statement (SWMS) or similar record sheet
	  • correct selection and use of appropriate processes, tools and equipment to minimise RF EMR risk
	  • compliance with regulations, standards and organisational procedures and processes
	  • communicating and working effectively and safely with others.

Context of and specific resources for assessment	Assessment must ensure access to: • induction procedures and requirements • relevant specifications and work instructions • tools and equipment appropriate to applying safe work practices • support materials appropriate to activity • workplace instructions relating to safe work practices and addressing hazards and emergencies • relevant regulations, standards, specifications and manuals, including industry-related systems information.
Method of assessment	A range of assessment methods should be used to assess awareness of RF EMR hazards. The following examples are appropriate for this unit: • direct observation of the candidate preparing and carrying out work close to sources of RF EMR • oral or written questioning of the candidate to assess awareness of RF EMR hazards • review of JSAs and documentation prepared by the candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. This assessment may be carried out in a simulated environment to minimise risks of injury or loss.

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	Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Characteristics of RF EMR include:	• electrical fields • electromagnetic spectrum • energy • frequency • magnetic fields • non-ionising radiation • radiation • wavelength.
RF EMR hazards include:	• air navigation aids • amateur and ham radio • broadcast radio and television • business services for voice and data

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	• cordless phones • emergency services • marine safety and operations • mobile phones and associated towers • radar.
Potential effects relate to:	• brain cancer • dysaesthesia (abnormal sensation) • eye damage • infertility • risk to pregnancy • tissue heating.
Relevant regulations and standards may include:	• appropriate Australian Communications and Media Authority (ACMA) technical standard requirements relating to RF EMR and sources of RF EMR • Australian Communications Industry Forum (ACIF) standards and codes • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Radiation Protection Standard - Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz.
Typical organisational controls may include:	• appropriate signage • commitment to the exposure limits set out in the ARPANSA Standard • controlled access and sign-in at each site for employees, contractors and visitors • creation of locked out procedures and areas • identification of areas where equipment generates RF EMR • identification of the boundaries of RF EMR hazard areas • induction processes • placement assessments • prohibition of workers from any site where RF EMR hazard exceeds the limit for occupational exposure • provision of appropriate testing equipment, such as personal monitor or radiation meter • restricted access to the general public • secure barrier around the RF EMR hazard areas • training for staff and contractors.
Organisational WHS requirements relate to:	• Australian standards • construction industry WHS standards and guidelines • duty of care • health and safety representatives, committees and supervisors • industry WHS standards and guidelines

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	• licences, tickets and certificates of competency • National Code of Practice for Induction Training for Construction Work • national safety standards • person conducting a business or undertaking (PCBU) or officer of the PCBU safety codes of practice • WHS and Welfare Acts and regulations.

Unit Sector(s)

Work health and safety - Telecommunications

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ICTWHS2170B Follow work health and safety and environmental policies and procedures

Modification History

Release	Comments
Release 2	This version first released with *ICT10 Integrated Telecommunications Training Package Version 3.0*. It is based on the superseded equivalent ICTWHS2170A.
Release 1	This version first released with *ICT10 Integrated Telecommunications Training Package Version 2.0*.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to follow safe work practices and environmental policy in managing telecommunications workplace tasks. It involves awareness of the safe handling of active optical fibre, cabling, laser sources and equipment.

The unit requires the ability to apply work health and safety (WHS) requirements, the basic principles of risk management, and prevention of injury and illness on construction sites involving the NBN in particular, and all other locations where telecommunications work is performed.

This unit includes the ability to recognise asbestos hazards and take steps to minimise associated risks. Removal of asbestos is a licensed activity covered by the units of competency CPCCDE3014A Remove non-friable asbestos.

Some cabling and installation work may fall within the definition of construction work. People entering the construction site are required to complete the general induction training program specified by the National Code of Practice for Induction Training for Construction Work (Australian Safety Compensation Council, May 2007), sometimes referred to as the ‘White Card’.

The unit CPCCOHS1001A Work safely in the construction industry from the CPC08 Construction, Plumbing and Services Training Package fulfils this requirement.

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Application of the Unit

The unit applies to field officers deploying broadband access networks using optical technologies. They combine technical skills with specific WHS skills to work safely on live systems.

The unit also applies to telecommunications staff working under supervision in a technical environment. This includes school-based workers, entry-level workers, trainees and apprentices.

Licensing/Regulatory Information

Licensing requirements will apply to this unit of competency depending on the regulatory requirements of each jurisdiction. Users should confirm requirements with the relevant federal, state or territory authority.

Note: The terms occupational health and safety (OHS) and WHS are equivalent and generally either can be used. Western Australian and Victorian legislation uses OHS. Commonwealth, NSW, Queensland, Northern Territory, Tasmania and South Australia legislation uses WHS.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

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Elements and Performance Criteria

1. Apply WHS regulatory requirements	1.1 Identify ***WHS requirements*** relevant to own work, role and responsibilities and comply with ***safe work practices*** 1.2 Apply ***duty of care requirements***
2. Follow workplace procedures for identifying hazards and using control measures to control risk	2.1 Identify and report ***common construction hazards*** in the work area to ***designated personnel*** according to ***workplace procedures*** 2.2 Identify and follow WHS requirements, workplace procedures and work instructions to ***control hazards and risks*** 2.3 Comply with safe work practices and ***principles of risk management*** 2.4 Implement duty of care requirements 2.5 Complete ***job safety analysis*** (JSA) ***sheet or safe work method statement*** (SWMS) according to work requirements, including ***hazard identification*** and ***risk assessment*** 2.6 Use and complete checks to ***personal protective equipment*** according to work requirements 2.7 ***Assess and test for harmful gases*** associated with the workplace
3. Identify safety requirements for work with optical fibre equipment	3.1 Identify safe work practices when handling optical fibre, lasers and optical connectors according to relevant ***Australian standards*** 3.2 Identify safe work practices when handling and disposing of chemical waste
4. Identify WHS communication and reporting processes	4.1 Identify ***WHS communication processes, information and documentation*** 4.2 Identify the role of ***designated WHS personnel*** and ***safety signs and symbols*** 4.3 Identify procedures and ***relevant authorities*** for reporting hazards, ***incidents*** and injuries
5. Identify WHS incident response procedures	5.1 Identify ***general procedures for responding to incidents and emergencies*** 5.2 Identify procedures for accessing first aid 5.3 Identify and demonstrate requirements for selecting and using relevant personal protective equipment 5.4 Identify ***fire safety equipment***
6. Contribute to WHS	6.1 Discuss WHS and environmental issues with designated

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and environmental issues in the workplace	personnel according to workplace procedures, and relevant WHS policies and ***environmental requirements*** 6.2 Contribute to ***participative arrangements*** for WHS and environmental management in the workplace within organisational procedures, scope of responsibilities and own competencies 6.3 Record and report WHS issues, risks and hazards to designated personnel
7. Identify and respond to minor traffic management	7.1 Assess ***traffic safety*** requirements of the general location with respect to regulatory and organisational requirements 7.2 Identify a safe work zone around vehicle and work space using traffic cones and signs according to regulatory requirements 7.3 Identify and respond to changed traffic conditions
8. Identify and respond appropriately to a confined space	8.1 Identify a ***confined space*** in line with regulatory or organisational guidelines 8.2 Refer the telecommunications work in the identified confined space to appropriate trained personnel
9. Identify and respond appropriately to asbestos hazards	9.1 Identify ***asbestos hazards*** or their likelihood 9.2 ***Respond to asbestos hazards*** or their likelihood 9.3 Report identified or suspected asbestos hazards to designated personnel according to workplace procedures

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - ask effective questions and clarify requirements
  - listen to, and liaise with, relevant personnel on technical and operational matters
  - raise and report WHS matters, discuss and relay WHS information to others
  - explain legislative requirements and principles of risk management, safety signs and symbols and common hazards in relation to own work
- literacy skills to:
  - interpret technical documentation and standards

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    - incorporate technical language into written tasks, such as reporting on recommendations to minimise hazards and injury
- numeracy skills to interpret technical data, such as specifications of laser operations
- problem-solving skills to use methodology that minimises risk
- research skills to access technical information and sources to understand and report on safety requirements
- safety awareness skills to:
    - apply required precautions and action to minimise, control or eliminate hazards associated with work activities
    - recognise asbestos and the likelihood of asbestos in work area
    - select and use required personal protective equipment that conforms to industry and WHS standards
    - work systematically with required attention to detail without injury to self and others, and damage to goods or equipment
    - select and use appropriate methods for laser handling.
    -

Required knowledge

- applicable federal, state and territory WHS procedures, regulations, standards, codes of practice and industry standards and guidance notes relevant to own workplace, role and responsibilities
- differences between federal, state and territory WHS legislation and regulations
- common construction hazards
- asbestos hazards and their potential risk for workers and the community
- common construction hazards and common hazards in relation to own work
- general construction work activities that require licences, tickets or certificates of competency
- environmental control processes:
    - air quality management
    - disposal and handling of hazardous and dangerous substances
    - noise pollution
    - safe disposal of fibre offcuts
    - stormwater and materials spillage
    - waste disposal
- WHS responsibilities and rights of duty holders/workplace parties under environmental and WHS regulations and codes of practice, including:
    - persons in control of construction work or projects
    - employers and self-employed persons
    - persons conducting a business or undertaking (PCBUs) and their officers
    - supervisors
    - employees

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    - designers
    - inspectors
    - manufacturers and suppliers
- optical fibres and equipment:
    - hazards relating to handling of optical fibre and laser light source in the workplace
    - injuries:
        - damage to retina from lasers
        - damage to lungs from inhalation of fibre offcuts and particles
        - needle stick injury from fibres and offcuts
    - laser warning signs and labels relating to optical fibre components and equipment
    - safety requirements when handling and working with:
        - devices
        - laser light sources
        - optical fibre connectors
        - optical fibres
        - patch cords
- own responsibilities to comply with safe work practices including those relating to:
    - asbestos hazards
    - confined spaces
    - housekeeping
    - identification of hazards
    - preventing bullying or harassment
    - smoking
    - use of amenities
    - use of drugs and alcohol
- principles of risk management for construction work, including:
    - hazard identification
    - risk assessment and control
- ways in which WHS is managed in the workplace, and activities required under WHS legislation, including:
    - hazard identification
    - hazards that exist in the workplace
    - WHS instruction
    - preferred order of ways to control risks (hierarchy of control)
    - risk assessment and controls
    - role of WHS committees and representatives
    - training and provision of WHS information
    - types of common personal protective equipment and fire safety equipment
    - types of WHS information and documentation

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- workplace environmental and WHS procedures relevant to the work being undertaken, including procedures for:
  - designated personnel responsible for WHS
  - employee/worker participation in WHS management
  - general first aid response requirements
  - general workers' compensation and injury management requirements
  - meaning of WHS symbols found on signs and labels in the workplace
  - raising WHS issues
  - recognising and reporting on:
    - accidents
    - asbestos hazards
    - dangerous occurrences
    - emergencies
    - hazards
    - incidents
    - injuries
    - near misses
  - responding to:
    - accidents
    - emergencies
    - evacuation procedures
    - fires
    - hazards
    - incidents
    - injuries
- work operations to control risks
- traffic control for a single vehicle
- risks associated with confined spaces and appropriate responses.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to	Evidence of the ability to:

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demonstrate competency in this unit	• recognise and report hazards to designated personnel • follow workplace procedures necessary to control risks in the workplace • identify and apply safe handling procedures for optical fibres and laser sources • identify and respond appropriately to asbestos, traffic and confined spaces hazards in the workplace.
Context of and specific resources for assessment	Assessment must ensure access to: • relevant WHS Acts, regulations and codes of practice • WHS implementation resources, such as sample forms, signs and procedures • personal protective equipment • first aid equipment • fire safety equipment • organisational WHS policies and procedures • relevant work areas for identification of hazards and control measures. • optic fibre cabling and equipment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate applying safety aspects to the handling of optical fibres and lasers • direct observation of the candidate following or participating in common WHS workplace procedures • oral or written questioning to assess knowledge of WHS concepts and applications • evaluation of written reports on hazards and safety recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

WHS requirements include:	• applicable and relevant national safety standards • construction industry WHS standards and guidelines • federal, state and territory WHS legislation, regulations, standards and codes of practice • industry standards, guidance notes, guidelines, Australian standards and other documents applicable to own workplace, work, role and responsibilities • National Code of Practice for Induction Training for Construction Work • requirements for licences, tickets and certificates of competency • responsibilities, duties and rights of duty holders and workplace parties (including health and safety representatives, committees and supervisors) under environmental and WHS Acts and regulations.

Safe work practices may relate to:	• access to site amenities, including:
	  • drinking water
	  • toilets

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	• appropriate warning labels on cabinets and enclosures
	• avoiding contact with hazardous chemicals, including not inhaling or swallowing such materials
	• avoiding drugs and alcohol at work
	• being aware of how to respond to potential accidents
	• ensuring manufacturer's warnings and instruction labels in relation to the laser product are not damaged or obscured during installation
	• general requirements for:
	  • safe use of plant and equipment
	  • use of personal protective equipment and clothing
	• housekeeping to ensure a clean, tidy and safe work area
	• no hazardous chemicals, including fibre particles and solvents, left on site at the completion of the work
	• preventing bullying and harassment
	• relevant Australian standards relating to WHS
	• specific organisational safety requirements
	• smoking in designated areas only
	• storing and removing debris
	• using a wet cleaning process and making sure all solvent residues are disposed of according to environmental policy
	• warning labels used in conjunction with laser and optical fibre systems.

Duty of care requirements relate to:	• legal responsibilities, duties and rights of duty holders and workplace parties as specified in WHS Acts, regulations and codes of practice
	• own duties to comply with safe work practices:
	  • activities that require licences
	  • tickets
	  • certificates of competency
	• specific and general duties and responsibilities of particular individuals, workplace parties and others (as prescribed in applicable federal, state and territory WHS legislation and regulations), including:
	  • construction and other supervisors
	  • construction and other workers
	  • designers
	  • employers and self-employed persons
	  • PCBUs and officers
	  • WHS inspectors
	  • manufacturers, importers, suppliers, installers and commissioners

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	• persons in control of the work site • subcontractors.
Common construction hazards may include:	• confined spaces • electricity • excavations, including trenches • falling objects • hazardous chemicals and dangerous goods • hot and cold working environments • manual handling • noise • operation of plant and equipment • traffic and mobile plant • unplanned collapse • ultraviolet (UV) radiation • working at heights.

Designated personnel may include:	• managers
	• PCBUs and officers
	• WHS personnel
	• worker health and safety representatives
	• other persons authorised or nominated by the organisation or industry to:
	  • approve specified work
	  • direct specified work
	  • inspect specified work
	  • perform specified work
	• supervisors
	• team leaders.

Workplace procedures may include:	• risk assessment
	• worker consultation and participation
	• hazard control
	• emergency responses to:
	  • accidents
	  • fires
	  • other emergency incidents and events
	• identifying hazards
	• reporting WHS issues
	• resolving WHS issues
	• using personal protective equipment.

Measures for controlling hazards and	• administrative controls • elimination

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risk may include:	• engineering controls • isolation • personal protective equipment • substitution.

Hazards may include:	• activating equipment without notifying other staff who may be working remotely on the network
	• hazardous chemicals, including:
	  • cleaning alcohol and other solvents
	  • epoxy resins and chemicals that cause cancer, allergies or that can damage health in any way
	• environmental hazards:
	  • air pollution
	  • damage to natural or heritage precincts
	  • dangerous gases, heavy or noxious metals pollution, release of hydrochlorofluorocarbons (HCFC)
	  • ground water contamination
	  • noise
	  • petrochemical spillage
	• flammable cleaning chemicals fluids and solvents
	• fibre offcut damage to eyes and skin
	• health hazards, including:
	  • hazardous chemicals and dangerous goods
	  • handling of optic fibres and lasers
	  • infective agents, including viruses and bacteria
	  • risk of sustained injury from repetitive tasks
	• inhalation of fibre offcuts and particles from vacuum cleaning of work site
	• laser damage to eyes
	• safety hazards:
	  • manual handling (lifting, biomechanical)
	  • tasks such as welding
	  • working at heights
	• radio frequency (RF) radiation.

Principles of risk management include:	• identifying hazards • assessing the risks involved • worker participating in, and consulting on, all risk management activities • consulting and reporting to ensure involvement of relevant workers • controlling risks • monitoring the effectiveness of controls.

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Job safety analysis sheet or safe work method statement may include:	• sheets to record the steps in the risk management process:
	  • identification
	  • assessment
	  • control
	  • monitoring
	• primary application of assessment
	• as specified in workplace procedures, policies and processes.

Hazard identification includes:	• checking equipment and work area:
	  • before work commences
	  • during work
	• housekeeping
	• reviewing accident or incident records
	• workplace inspections
	• as specified in workplace procedures, policies and processes

Risk assessment includes:	• a scale:
	  • low
	  • medium
	  • high
	• awareness of likelihood and consequence factors
	• JSA
	• as specified in workplace procedures, policies and processes.

Personal protective equipment may include:	• breathing apparatus:
	  • dust masks
	  • respirators
	• clothing:
	  • boots and other safety footwear
	  • gloves
	  • high visibility retro reflective vests
	  • overalls
	  • protective jackets or pants for preparing, cutting or jointing optical fibres
	  • aprons
	  • arm guards
	• eye protection:
	  • protective eyewear designed specifically for laser
	  • goggles
	• face and head protection:

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	• face masks • helmets and hard hats • hearing protection • protective, well-fitting clothing • UV protective clothing and sunscreen • radiation detectors.
Assessing and testing for harmful gases include:	• using gas detection equipment • reporting and responding to a positive test for gases in line with organisational guidelines • following workplace procedures and complying with legislative and regulatory requirements.
Australian standards may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) standards TS 14 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • cabling security codes and regulations • Communications Cabling Manual (CCM) Volume 1 • Environmental Protection Acts • International Standards ISO 9000 and 9001 • International Telecommunications Union (ITU) recommendations • WHS Acts and relevant codes and standards • road and traffic control legislation and codes • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006 • Telecommunications Act and relevant codes.
WHS communication processes may include:	• discussions with worker health and safety representatives • processes for raising WHS issues • toolbox talks • WHS meetings • WHS notices, newsletters, bulletins and correspondence • WHS participative arrangements • workplace consultation relating to WHS issues and

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	changes.
WHS information and documentation may include:	• accident and incident reports • Australian standards • construction documentation and plans • emergency information contact • evacuation plans • guidance notes • job safety analyses • labels • proformas for reporting hazards, incidents and injuries • reports of near misses and dangerous occurrences • risk assessments • safe work method statements • safety data sheets (SDS) • safety meeting minutes • site safety inspection reports • WHS Acts, regulations and other codes of practice.
Designated WHS personnel may include:	• first aid officers • WHS committee members • WHS representatives • supervisors.

Safety signs and symbols may include:	• emergency information signs:
	  • equipment
	  • exits
	  • first aid
	• fire signs and location of fire alarms and fire fighting equipment
	• hazard, danger and warning signs
	• regulatory signs:
	  • mandatory
	  • limitation or restriction
	  • prohibition
	• safety tags and lockout:
	  • danger tags
	  • out of service tags.

Relevant authorities may include:	• emergency services:
	  • ambulance
	  • emergency rescue
	  • fire brigade
	  • police

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	• supervisor • WHS regulatory authority.

Incidents may include:	• accidents resulting in personal injury or damage to property
	• near misses or dangerous occurrences which do not cause injury but may pose an immediate and significant risk to persons or property, and need to be reported so that action can be taken to prevent recurrence, for example:
	  • breathing apparatus malfunctioning to the extent that the user's health is in danger
	  • collapse of the floor, wall or ceiling of a building being used as a workplace
	  • collapse or failure of an excavation more than 1.5 metres deep, including any shoring
	  • collapse or partial collapse of a building or structure
	  • collapse, overturning or failure of the load bearing of any scaffolding, lift, crane, hoist or mine-winding equipment
	  • damage to or malfunction of any other major plant
	  • electric shock
	  • electrical short circuit, malfunction or explosion
	  • fire or escape of gas, hazardous substance or steam
	  • any other unintended or uncontrolled incident or event arising from operations carried on at a workplace.

General procedures for responding to incidents and emergencies may include:	• basic emergency response:
	  • keep calm
	  • raise alarm
	  • obtain help
	• evacuation
	• notification of designated WHS personnel and authorities
	• referring to site emergency plans and documentation
	• when and how to notify emergency services.

Emergencies may include:	• chemical spill • fire • injury to personnel • structural collapse • toxic and flammable vapours emission • vehicle and mobile plant accident.
Fire safety equipment may include:	• breathing apparatus • fire blankets • fire fighting equipment.
Environmental	• clean-up management

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requirements must include:	• dust management • noise management • waste management.
Participative arrangements may include:	• arrangements for documenting, communicating and following up requests and suggestions relating to WHS issues • arrangements or processes for raising and communicating WHS concerns • electing worker health and safety representatives • informal WHS meetings • planning committees • purchasing committees • WHS committees • WHS reports and other processes for advising workers on WHS issues and matters.
Traffic safety applies to safety of:	• pedestrians passing an area where work is being conducted • vehicles passing an area where work is being conducted • workers working adjacent to traffic.
Confined spaces applies to:	• spaces clearly labelled as confined spaces • spaces that meet the general specifications for a confined space.
Asbestos hazards may be found in:	• corrugated asbestos roofing • eaves of houses • meter boxes • pit and pipe infrastructure • wall cladding.
Respond to asbestos hazards may include:	• notifying designated personnel and authorities • closing the worksite to further activity • barricading the work area • avoiding any disturbance of the work area • exercising a duty of care to self, fellow workers and the public.

Unit Sector(s)

Telecommunications - Work health and safety

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ICTWOR2141A Work effectively in a telecommunications technology team

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to perform individual work and work with others in a telecommunications technology. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who work in telecommunications technology teams apply the skills and knowledge in this unit. They use enterprise information and work schedules for personal development and team work.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan skills development	1.1. Seek advice on future career directions with ***appropriate people*** 1.2. Identify possible career directions in industry or organisation for personal advancement 1.3. Conduct self assessment of skills to identify skills gap and plan for further skills development 1.4. Determine appropriate ***methods to acquire additional skills*** 1.5. Prepare ***portfolio of evidence*** to support the skills development plan
2. Organise personal work priorities	2.1. Ensure that ***work goals and objectives*** are understood, negotiated and agreed according to ***organisational requirements*** 2.2. Assess and ***prioritise workload*** to ensure tasks are completed within identified timeframes 2.3. Monitor and adjust personal work performance to ensure achievement of tasks
3. Participate in a team	3.1. Consult team members to identify ***team purpose***, ***roles***, ***responsibilities***, ***goals***, ***plans and objectives***

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ELEMENT	PERFORMANCE CRITERIA
	3.2. Develop strategies to support the team and seek assistance from team members when necessary to prevent conflict within the team 3.3. Give and receive feedback to assist in meeting team and organisation goals 3.4. Communicate ***unresolved issues*** to appropriate personnel to ensure action is taken in response to these matters

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - participate in open and constructive discussions
  - work collaboratively as part of a team
- learning skills to stretch boundaries of own knowledge and skills
- literacy skills to:
  - access information to draft a portfolio of evidence
  - identify career options and personal work goals
- planning and organisational skills to organise and prioritise work
- problem solving skills to solve routine problems related to the workplace, under direct supervision
- task management skills to work systematically with required attention to detail and adherence to all safety requirements

Required knowledge

- different roles that people may play within a team, how this impacts on the way a team works and what it might achieve
- legislation, codes of practice and other formal agreements that impact on the work activity
- organisational policies, plans and procedures
- skills development in career planning terms
- sources of advice on career planning and skill development
- specific occupational health and safety (OHS) requirements relating to the activity and site conditions

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REQUIRED SKILLS AND KNOWLEDGE
• types of evidence and ways of creating portfolios of evidence • typical issues and challenges that occur when working in teams

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop a career portfolio or similar information • prepare work schedule, prioritising urgent requests • actively participate in a team.
Context of, and specific resources for assessment	Assessment must ensure: • telecommunications technology team • examples of resumes and career planning resources • relevant documentation that impact on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate actively participating in telecommunications team • review of career portfolio prepared by the candidate • review of documentation outlining further skills development needs • oral or written questioning to assess required knowledge.
Guidance information for assessment	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required.

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EVIDENCE GUIDE	
	Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Appropriate people may include:	• assessors • colleagues • mentors • supervisors.
Methods to acquire additional skills may include:	• attendance at workshop or demonstration • formal course participation • on-the-job coaching or mentoring • work experience.

Portfolio of evidence may relate to:	• types of evidence:
	  • academic results including informal studies
	  • personal interests and experiences
	  • previous employment

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RANGE STATEMENT	

	• recreational experiences
	• volunteer work
	• work experience
	• purpose of evidence:
	  • assessment of current competencies
	  • building a picture of personal attributes
	  • documentation of competencies relevant to the workplace
	  • identification of areas for further skill development
	  • identification of strengths and weaknesses.

Work goals and objectives may include:	• budgetary targets • production targets • reporting deadlines • sales targets • team and individual learning goals • team participation.
Organisational requirements may include:	• access and equity principles and practice • business and performance plans • defined resource parameters • ethical standards • goals and objectives • plans, systems and processes • legal and organisational policies, guidelines and requirements • OHS policies, procedures and programs • quality and continuous improvement processes and standards • quality assurance and procedures manuals.
Prioritise workload may include:	• logical sequencing of sub-tasks within a single task • sequencing of work over periods from several hours to several days • urgent requests acted on promptly.
Team purpose, ***roles***, ***responsibilities***, ***goals***, ***plans and objectives*** may include:	• action plans, business plans and operational plans linked to strategic plans • expected outcomes and outputs • goals for individuals and the work team • individual and team performance • OHS responsibilities.

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RANGE STATEMENT	
Unresolved issues may include:	• grievances and complaints • issues, concerns and tensions • matters affecting workplace relationships and team cohesion • problems related to work roles and responsibilities.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Workplace effectiveness

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ICTWOR3028A Organise resources

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to organise resources for a telecommunications project in a customer environment. It involves preparing and evaluating tenders, organising equipment and labour resources and customer training. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who organise resources supply apply the skills and knowledge in this unit. This unit may be applied to domestic, commercial or industrial installations for indoor and outdoor installation within a customer premises for customer cabling and equipment. Telecommunications applications include digital telephony, data, video, digital broadcasting, computer networks with local area networks (LAN) and multimedia. Relevant job roles include team leader, planner and scheduler of new installations and maintenance teams.

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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Organise for third party supply	1.1. Develop specifications and company criteria for material supply and purchasing and include in appropriate ***tender*** documents 1.2. Prepare tender documents according to company policy 1.3. Identify likely ***material suppliers*** and invite to tender and supply 1.4. ***Evaluate and accept tenders*** as appropriate to

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ELEMENT	PERFORMANCE CRITERIA
	company policy 1.5. Negotiate price and conditions of purchase to company guidelines and satisfaction
2. Organise supply of equipment and material	2.1. Develop specifications detailing types and quantities of equipment and material 2.2. Notify supplier to deliver ***equipment*** and material to the designated location within the specified timeframe
3. Organise customer training	3.1. Ascertain detail of training required from the customer and establish timeframe for ***customer training*** 3.2. Determine and organise resources to undertake the level of training required
4. Assess and organise labour resources	4.1. Produce an estimate of total labour resources required using standard installation times and allowing for contingencies 4.2. Determine required ***labour skills*** to meet resource allocation for planned activities 4.3. Establish a workforce with required numbers and skills of staff to meet demand 4.4. Notify workforce of job requirements and organise priorities to ensure agreed timeframe with the customer is met

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to:
  • work in teams
  • convey information, including technical and operational matters to others
  • liaise with internal and external personnel on technical and operational matters
• literacy skills to:
  • interpret technical documentation such as equipment manuals and specifications

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REQUIRED SKILLS AND KNOWLEDGE

• prepare and interpret work procedures
• numeracy skills to estimate materials and resource requirements
• planning and organisational skills to:
  • apply inventory analysis techniques and tools
  • organise, coordinate and sequence material supply requirements
• problem solving skills to:
  • analyse supply logistics
  • develop and implement a supply plan
  • solve civil and logistics problems
• project management skills to:
  • review job progress against agreed goals
  • set team goals
  • manage tasks
  • work systematically with required attention to detail and adhere to all safety requirements
• technical skills to:
  • assess requirements
  • interpret drawings related to supply of materials

Required knowledge
• appropriate engineering and design practices and procedures • appropriate tools, equipment and materials required to do the work • enterprise permit procedures • enterprise recording procedures • occupational health and safety (OHS) practices • overview knowledge of work planning and organisation theory • relevant plant and equipment operations • relevant statutory requirements • time management techniques

Evidence Guide

EVIDENCE GUIDE
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • develop tenders for customer premises equipment (CPE) products, equipment, peripherals and associated equipment • assess tenders and provide a clear report outlining all options, including recommendations with supporting reasons • organise supply of equipment and material to designated location to meet specified timeframe • identify labour needs and organise labour to meet installation schedules • determine customer training needs.
Context of, and specific resources for assessment	Assessment must ensure: • site for organising resources for a telecommunications project • enterprise and site related documentation • regulatory, supplier and equipment documentation that impact on activities.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3035A Organise material supply • ICTWOR3041A Schedule resources. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those

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EVIDENCE GUIDE	
	required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Tender may be invited by:	• letter and in the press • price and conditions of purchase according to company guidelines • procedures that are enterprise specific • supplier agreements.
Material suppliers may be:	• partner companies • preferred or approved suppliers • tenderers.
Evaluate and accept tenders may involve consideration of:	• ability to meet planned timeframe • capacity • company performance • delivery times • performance and quality • price • product type • quality assurance processes • reputation.
Equipment may include:	• asymmetrical digital subscriber line (ADSL) modem • data switch • network equipment • optical multiplexer

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RANGE STATEMENT	
	• private automatic branch exchange (PABX) switch • peripherals • router • set top box • telephone systems.

Customer training may be undertaken by:	• a third party:
	  • communications consultant
	  • contractor to a major supplier
	• installation staff
	• specialist trainers.

Labour skills may include:	• construction • consultancy • design • human resources • marketing • planning • project management • sales • technical.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Workplace effectiveness

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ICTWOR3035A Organise material supply

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to organise material supplies for a telecommunications project. It involves preparing and evaluating tenders from third party suppliers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who organise material supply for a telecommunications project apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Determine material needs	1.1. ***Assess material needs*** from design plans and comply with ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Check availability of required materials within existing stock 1.3. Assess the availability of material from ***preferred suppliers***
2. Prepare and evaluate tenders	2.1. Develop specifications and criteria for material supply and purchasing 2.2. Prepare ***tender*** documents and invite quotes from material suppliers according to enterprise policy 2.3. Evaluate tenders and accept according to enterprise procedures
3. Organise delivery of equipment and material to site	3.1. Select types and quantities of equipment available from existing stocks and pack for distribution 3.2. Arrange delivery of equipment and material within the specified timeframe 3.3. Organise third party supply according to agreed timeframe and supply agreements
4. Undertake	4.1. Record ***warranty details*** and distribute to relevant

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ELEMENT	PERFORMANCE CRITERIA
administrative tasks	parties as required 4.2. Issue relevant ***financial documents*** according to enterprise policy 4.3. Record materials received in asset register according to enterprise procedures 4.4. Complete administrative requirements according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - communicate in a team
  - convey technical and operational information to others
  - liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - interpret technical documentation, such as equipment manuals and specifications
  - read and interpret drawings related to supply of materials
  - prepare and interpret work procedures
- numeracy skills to estimate materials and resource requirements
- planning and organisational skills to:
  - organise, coordinate and sequence material supply requirements
  - apply inventory analysis techniques and tools
- problem solving skills to:
  - solve civil and logistics problems
  - develop and implement a supply plan
  - analyse supply logistics
- project management skills to:
  - manage tasks
  - review job progress
  - work systematically with required attention to detail
- technical skills to assess requirements

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REQUIRED SKILLS AND KNOWLEDGE
Required knowledge
• appropriate engineering and design practices and procedures • enterprise permit and recording procedures • occupational health and safety (OHS) practices • overview knowledge of work planning and organisation theory • relevant plant and equipment operations • relevant statutory requirements • time management techniques • tools, equipment and materials required to do the work

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• apply the tender process according to both enterprise and legislative requirements
	• comply with all related OHS requirements and work practices
	• determine material needs:
	  • from design plans
	  • from relevant databases
	  • beyond current holdings
	• organise supply of equipment and material to site
	• record materials received on asset register.

Context of, and specific resources for assessment	Assessment must ensure: • site for ordering materials for a telecommunications project • relevant regulatory, enterprise, supplier and equipment documentation that impact on work activities.

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EVIDENCE GUIDE	
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate preparing and evaluating tenders received from third party suppliers • direct observation of the candidate organising resources for a telecommunications project • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3093A Manage spare parts • ICTWOR4041A Schedule resources. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Assess material needs may relate to:	• analysis of needs against existing stocks and gaps determined
	• determining the timeframe for material supply from project management briefs and associated time charts
	• materials:
	  • network switching
	  • transmission
	  • radio(fixed and mobile) systems and equipment including infrastructure
	  • relevant installation and maintenance tools and test equipment.

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) standards • International Standards ISO 9000 and ISO 9001 • International Telecommunications Union (ITU) recommendations • OHS Act • heritage legislation • industrial awards and conditions • Taxation Act and legislation • Customs Act.
Preferred suppliers may be:	• based on service agreement • existing suppliers • recommended.
Tender may include:	• invitations by letter and in the press • price and conditions of purchase according to company guidelines • procedures that are enterprise specific • supplier agreements • tender evaluation criteria: • ability to meet planned timeframe

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RANGE STATEMENT	
	• capacity • company performance • delivery times • performance and quality • price • product type • quality assurance processes • spares availability.

Warranty details may be:	• distributed to:
	  • finance groups
	  • installers
	  • maintainers
	  • purchasing groups
	  • sales and marketing staff
	• stored manually or electronically in enterprise databases.

Financial documents may include:	• bills • costing documents • internal financial information sheets • invoices.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Workplace effectiveness

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ICTWOR3041A Schedule resources

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake scheduling of resources for a new installation or upgrade of an existing system, for all telecommunications applications including telephony, data, video and multimedia. It involves assessing human resources, plant, equipment and material needs and negotiating with external suppliers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who schedule resources apply the skills and knowledge in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope project resources	1.1. Collate and analyse ***design and estimation documents*** from ***appropriate personnel*** for resource needs, deadlines and comply with ***relevant legislation***, ***codes***, ***regulations and standards*** 1.2. Consult ***interested parties*** for input to schedule
2. Schedule resources for a project	2.1. Coordinate ***resource requirements*** for project to match available labour to quantity and type of work required 2.2. Schedule availability of resources to suit relevant interested parties and according to ***works schedules*** including start and finish dates 2.3. Document and clearly communicate resources schedule to appropriate personnel for approval
3. Monitor and coordinate resources	3.1. Monitor and coordinate quantity, quality and timing of supply of each input and service according to the

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ELEMENT	PERFORMANCE CRITERIA
schedule according to project progress	progress of projects being undertaken 3.2. Reschedule resources based on priorities and report to the appropriate person according to enterprise guidelines 3.3. Complete administrative tasks

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - prepare and interpret work procedures
  - interpret technical documentation, equipment manuals and specifications
- numeracy skills to estimate resource requirements
- planning and organisational skills to organise, coordinate, sequence and monitor resources schedules
- problem solving skills to solve logistics and scheduling problems
- project management skills to:
  - develop and implement work plan
  - coordinate and sequence work requirements reviewing job progress against agreed goals
  - apply resource management techniques and tools
- technical skills to assess resource requirements

Required knowledge

- appropriate engineering and design practices and procedures
- enterprise permit procedures
- enterprise recording procedures
- industrial awards
- occupational health and safety (OHS) practices
- relevant plant and equipment operations
- relevant statutory requirements
- team communication processes and goal setting

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REQUIRED SKILLS AND KNOWLEDGE
• time management techniques • tools, equipment and materials required to do the work • work planning and organisation theory

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to:
	• identify resource requirements from plans, equipment and system manuals, specifications and relevant enterprise policy
	• plan and provision to meet key dates and milestones for:
	  • appropriately skilled labour
	  • volume and type of material
	• monitor work progress, coordinate and adjust resource requirements to meet both customer's needs and cost parameters.

Context of and specific resources for assessment	Assessment must ensure: • telecommunications operations site suitable for scheduling projects • equipment currently used in industry • relevant enterprise and site related documentation • relevant regulatory, supplier and equipment documentation that impact on scheduling activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • review of activities involving the scheduling of resources for a telecommunications project completed by the candidate • review of an oral and written report with completed

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EVIDENCE GUIDE	
	documentation • direct observation of the candidate scheduling resources for a telecommunications project • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3028A Organise resources • ICTWOR3035A Organise material supply • ICTWOR3093A Manage spare parts • ICTWOR3127A Supervise worksite activities. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT

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RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Design and estimation documents may include:	• budget estimates • design plans • estimators list • material list • preferred supplier list • project plans • tender document • works schedule.
Appropriate personnel may include:	• estimator • project administrator • project manager.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• AS Communications Cabling Manual (CCM) Volume 1 • Australian Communications Industry Forum (ACIF) standards and codes • ACMA technical standards • Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • fire regulations • heritage legislation • industrial relations agreements including awards and enterprise • local government • manufacturer's enterprise operating policy and procedures • national code • OHS Act • power company requirements • Privacy Act • services and utilities codes of practice and standards: • electricity

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RANGE STATEMENT	
	• gas • water • spectrum management regulations • statutory requirements • Trade Practices Act • traditional land owners.
Interested parties may include:	• local • managers • property owners • stakeholders • state and federal agencies • tenants • utilities.

Resource requirements may include:	• equipment:
	  • installation
	  • monitoring
	  • test
	• labour
	• material
	• plant:
	  • barriers
	  • diggers
	  • excavators
	  • work platforms
	• safety equipment:
	  • for hazardous chemicals
	  • gas monitors
	  • personal protective equipment
	  • radiation detectors.

Works schedules may include:	• labour requirements and availability • plant, equipment and materials availability • variations in work environment likely to affect the planned completion of the project.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Workplace effectiveness

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ICTWOR3093A Manage spare parts

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to manage spare parts in all areas of telecommunications and includes maintenance of a database, stock control and dispatch. Licensing is applicable to this unit in instances where it is necessary to operate a forklift. Each state and territory has a different licensing body and different legislative, regulatory or certification requirements may also apply. Users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Support staff with store and warehouse duties who are required to manage spare parts from all areas of telecommunications, including switching and transmission exchange equipment, customer equipment, radio and cellular equipment apply the knowledge and skills in this unit.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Manage the receipt and dispatch of spare parts	1.1. Obtain ***relevant legislation***, ***codes***, ***regulations and standards*** and follow occupational health and safety (***OHS***) ***and environmental requirements*** for the given work 1.2. Identify ***hazards*** and make worksite safe according to relevant safety legislation and company work practices and use ***personal protective equipment*** 1.3. Unload, unpack and store incoming ***spare parts*** using ***appropriate methods*** and enterprise procedures, and check off delivered items on documentation 1.4. Package, label and relocate outgoing spare parts ready for dispatch using enterprise procedures 1.5. Update parts database to reflect current spare parts movements and holdings, following each dispatch or

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ELEMENT	PERFORMANCE CRITERIA
	delivery and complete any other administrative task required by the enterprise
2. Store spare parts	2.1. Label spare parts using appropriate ***identification scheme*** and place in predefined ***storage locations*** 2.2. Observe ***anti-static precautions*** when handling equipment susceptible to damage by electrostatic discharge 2.3. Display, maintain and update material safety data sheets (MSDS) on site
3. Manage stock flow	3.1. Action spare parts requests by checking the database for availability and location and organise the dispatch 3.2. Monitor the levels of spare parts stock by examining database reports against enterprise usage and replenishing stock when necessary 3.3. Investigate and keep records of alternative suppliers of spare parts to minimise the impact of availability and cost issues with regular suppliers 3.4. Monitor spare ***parts with limited shelf life*** and dispose of and replace when necessary 3.5. ***Audit*** spare parts holdings for a ready supply of items to minimise disruptions to job completions 3.6. Update database from appropriate ***documentation*** each time a store's transaction occurs to maintain the validity of the data

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communications skills to efficiently deal with employees, customers, contractors and suppliers • learning skills to pro-actively keep up to date with materials handling and storage identification techniques • literacy skills read basic technical data and maintain electronic data base • numeracy skills to estimate costs, depreciation, and undertake stocktake • organisational skills to efficiently lay out a spare parts store

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REQUIRED SKILLS AND KNOWLEDGE

• planning and organisational skills to:
  • improve systems and procedures
  • prioritise and organise own work
• research skills to source alternate parts supplies

Required knowledge

• computer and database operation
• handling of:
  • chemicals and dangerous materials
  • sensitive electronic equipment using anti static procedures and safeguards
• modern storage practices and identification of parts location
• OHS procedures
• service level agreements
• stocktake and audit of spare parts holdings
• telecommunications components and assemblies

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • apply spare parts management procedures • arrange for efficient storage of spare parts • order spare parts • research alternative parts replacements • update spare parts management database.
Context of, and specific resources for assessment	Assessment must ensure: • site where work may be conducted • use of equipment currently used in industry • database, relevant regulatory, organisational procedures, documentation and equipment documentation that impact on work.

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EVIDENCE GUIDE	
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate receiving, storing and dispatching parts • review of an oral and written report with completed documentation • direct observation of the candidate managing spare parts database.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3028A Organise resources • ICTWOR3035A Organise material supply. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• appropriate licensing • AS/ACIF standards and codes • AS/NZ standards • Australian building codes and regulations • compliance with appropriate Australian Communications and Media Authority (ACMA) technical standard requirements for underground, aerial, Category 5 or Category 6, 6A, 7 or 7A and unshielded twisted pair (UTP) • Environmental Protection Acts • fire regulations • heritage legislation • noise abatement • OHS • WorkSafe Australia standards and codes of practice • Trade Practices Act.

OHS and environmental requirements may include:	• disposal of hazardous liquids
	• earmuffs
	• flashing lights
	• gas and other hazard detection equipment
	• gloves:
	  • leather
	  • plastic
	  • rubber
	• head protection
	• kneepads
	• masks
	• MSDS
	• materials
	• oil spills
	• personal protective clothing:
	  • protective suits

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RANGE STATEMENT	

	• safe working practices such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • dangerous goods
	  • hazardous substances
	• safety barriers
	• safety boots
	• safety equipment
	• safety glasses for laser work
	• special access requirements
	• suitable light and ventilation
	• tools and equipment
	• trench guards
	• warning signs and tapes
	• witches hats
	• work platforms.

Hazards may include:	• glass fibres • high voltages (HV) at electrical distribution substation • manual handling • natural gas and other gas build up • needle stick injury • optical fibre cables may contain hazardous light • radio frequency equipment emitting electromagnetic radiation.

Personal protective equipment may include:	• earmuffs
	• electrical isolators
	• gas detectors
	• gloves :
	  • leather
	  • plastic
	  • rubber
	• head protection
	• kneepads
	• masks
	• personal protective clothing:
	  • protective suits
	  • safety boots

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RANGE STATEMENT	
	• safety glasses.
Spare parts may include:	• antennas • assemblies • batteries • cable • circuit cards • components • connectors • filters • module • panels • power equipment • software • sub racks • systems • tools • unit • wiring harnesses.
Appropriate methods may include:	• forklift • hoists • lifts • manual lifting and carrying • other mechanical lifting aids.
Identification scheme may include:	• adhesive labels • bar code • enterprise part numbers • radio frequency identification (RFID) tagging.
Storage locations may include:	• bins • carousels • floor area • racks • shelves.
Antistatic precautions may include:	• anti static bags • anti static heel strap • anti static work mat • anti static wrist strap • controlled climate.
Parts with limited shelf life may include:	• batteries • cleaning fluids

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RANGE STATEMENT	
	• magnetic disks • magnetic tapes.
Audit may include:	• full stocktake • spot check.
Documentation may include:	• insurance details • invoice • purchase order • spare parts database • stock take records • supplier database • warranty details.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Workplace effectiveness

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ICTWOR3127A Supervise worksite activities

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to supervise small scale projects with a limited range of technical skills. It involves accounting for staff, activities and resource usage. This unit does not cover general management of people and processes. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who supervise small scale worksite activities relating to telecommunications applications apply the skills and knowledge of this unit. This unit applies to all telecommunications applications including telephony, data, video and multimedia.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for worksite activities	1.1. Clarify requirements of job with customer and ***project*** personnel and arrange access to site 1.2. Confirm ***resource requirements*** and allocate time and schedule activities with project manager following ***relevant legislation***, ***codes***, ***regulations and standards*** and site specific safety requirements and enterprise procedures 1.3. Document or articulate worksite activities plan and verify with project manager 1.4. Source materials and equipment and place orders according to enterprise policy 1.5. Confirm ***external agency licences and approvals***

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ELEMENT	PERFORMANCE CRITERIA
	1.6. Notify ***affected parties*** of works to be undertaken 1.7. Inform staff of their ***responsibilities*** on site
2. Supervise and monitor worksite activities	2.1. Direct and supervise staff in work activities following plan 2.2. Account for staff, activities and resource usage 2.3. Recognise contingency situations and take corrective actions in consultation with project manager
3. Perform administrative tasks	3.1. Undertake administrative tasks 3.2. Prepare simple ***report*** and present to project manager

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - prepare and interpret work procedures
  - read and interpret technical documentation, equipment manuals and specifications
- numeracy skills to estimate variations in resource requirements
- problem solving skills to:
  - organise and monitor worksite activities
  - deal with contingencies
  - arrange training
- project management skills to:
  - implement work plan
  - coordinate and sequence work activities
  - review job progress against agreed schedule
  - apply resource management techniques and tools
- technical skills to use materials and equipment

Required knowledge

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REQUIRED SKILLS AND KNOWLEDGE
• appropriate tools, equipment and materials required for the work • enterprise permit procedures and recording procedures • occupational health and safety (OHS) practices • relevant plant and equipment operations • relevant statutory requirements and industrial awards • team communication processes • typical worksite issues • work planning and organisation theory

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan work activities • liaise with customer or project manager • prioritise and allocate tasks • monitor work progress and reallocate resources to meet completion requirements • supervise staff ensuring compliance with OHS and regulations • comply with all related OHS requirements and work practices.
Context of, and specific resources for assessment	Assessment must ensure: • telecommunications operations site suitable for supervision activities • equipment currently used in industry • enterprise and site related documentation • agency licenses • relevant regulatory, supplier and equipment documentation that impact on worksite activities.

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EVIDENCE GUIDE	
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate supervising worksite activities • direct observation of the candidate liaising with project manager regarding resources and schedules for a telecommunications project • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3041A Schedule resources • ICTWOR3093A Manage spare parts. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Project may include:	• part of a larger project • small or short term job.

Resource requirements may include:	• equipment:
	  • installation
	  • monitoring
	  • test
	• labour
	• material
	• plant:
	  • barriers
	  • diggers
	  • excavators
	  • work platforms
	• safety equipment:
	  • for hazardous chemicals
	  • gas monitors
	  • personal protective equipment
	  • radiation detectors.

Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • AS Communications Cabling Manual (CCM) Volume 1 • Australian building codes and regulations • Australian standards • enterprise standards • environmental protection • fire regulations • heritage legislation • industrial relations agreements including awards and enterprise

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	• international standards
	• local government
	• manufacturer's enterprise operating policy and procedures
	• national code
	• OHS Act
	• other services and utilities codes of practice and standards:
	  • electricity
	  • gas
	  • water
	• power company requirements
	• Privacy Act
	• spectrum management regulations
	• statutory requirements
	• Trade Practices Act
	• traditional land owners.

External agency licences and approvals may include:	• environmental protection • noise pollution • site permits • waste production and removal.
Affected parties may include:	• customer • neighbour • occupants • other property owners • utility providers.
Responsibilities may relate to:	• basic coordination and direction of small groups working on a site remote from the enterprise headquarters • parts of projects • small projects.
Report may be:	• associated manual • completion of enterprise procedures • computer-based documentation • electronic communication.

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Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Workplace effectiveness

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ICTWOR3231A Resolve technical enquiries using multiple information systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to remotely support the resolution of complex technical enquiries related to a product or service. The enquiry may be the result of an escalation. The resolution of the enquiry requires the use of multiple information systems to both obtain and record customer information. The informant may be the customer or another party to the enquiry, such as a field technician. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who deal with customers and field technicians apply the skills and knowledge in this unit. This unit assumes a background in telecommunications with experience in customer access networks and customer infrastructure including equipment and cabling.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Initiate contact with the customer	1.1. Apply all relevant ***legislation***, ***codes***, ***regulations and standards*** in the resolution process 1.2. Receive and analyse ***enquiry*** to efficiently select an initial course of action 1.3. Engage effectively with the ***customer*** to confirm initial referral details and propose an initial course of action
2. Obtain information from multiple information system	2.1. Identify information needs and the sources of this information 2.2. ***Log on*** to and navigate relevant ***information systems*** efficiently 2.3. Record details of the ***informant*** and the enquiry in

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ELEMENT	PERFORMANCE CRITERIA
	information systems according to enterprise requirements 2.4. Identify and verify information relevant to the enquiry and its resolution with the informant
3. Develop a plan to resolve the enquiry	3.1. Review critical information with the informant and apply technical expertise to develop options for resolving the enquiry 3.2. Consider all inputs and recommend a course of action including ***escalation*** 3.3. Negotiate a suitable course of action with the informant 3.4. Record details of course of action as required by enterprise information systems
4. Implement a plan to resolve the enquiry	4.1. Confirm the negotiated course of action with the informant prior to initiating actions and seek agreement on a schedule of actions for longer term resolutions 4.2. Identify and initiate actions to be taken by the technical support operator, the informant or other parties 4.3. Contact informant to confirm the success of the planned actions 4.4. Record outcomes of resolution as required by information systems

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to provide advice and guidance to customers and technical field staff or to seek assistance • literacy skills to read and interpret manuals, specifications, relevant enterprise policy and documentation • negotiation skills to enable interaction with customer • numeracy skills to interpret and evaluate different types of technical data • planning and organisational skills to organise and prepare the resolution process

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REQUIRED SKILLS AND KNOWLEDGE
• problem solving skills to respond to complex customer challenges • task management skills to work systematically with required attention to detail and adherence to all safety requirements • technical skills to advise on a range of customer equipment and environments and to perform diagnostic procedures
Required knowledge
• computer keyboard usage • computer literacy • conflict resolution skills • database and spreadsheet concepts • enterprise escalation policy and procedures • enterprise information systems • interpersonal skills • legislation, codes of practice and other formal agreements that directly impact on resolution processes • typical issues and challenges that occur when dealing with customers in a telecommunications environment

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • navigate relevant systems for the required information • develop a plan of action to deal with the enquiry • develop agreement to resolve enquiry • document all dealings for future reference • follow up resolution effectively.
Context of and specific resources for assessment	Assessment must ensure: • operational customer contact centre

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EVIDENCE GUIDE	
	• customer contact technologies currently used in industry • relevant regulatory and equipment documentation that impact on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate developing a plan of action to deal with the enquiry • direct observation of the candidate negotiating with informant to resolve the enquiry • review of documented reports completed by the candidate for two different resolution issues • oral or written questioning of the candidate to assess knowledge of resolution practices.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3232A Collect and analyse technical information. Aboriginal people and other people from a non-English speaking background may have second language issues Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include

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EVIDENCE GUIDE	
	equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) electromagnetic radiation (EMR) standard • Australian building codes and regulations • Australian standards • equal employment opportunity (EEO) and anti-discrimination legislation • enterprise standards • Privacy Act • Telecommunications Act • Telecommunications Industry Ombudsman • Trade Practices Act.

Enquiry may include:	• a request for help in using, a service, product or process from a:
	  • customer
	  • other party with an interest in the service, product or process
	  • retail sales person
	  • technician
	• complaints.

Customer may include:	• beneficiary of a service, product or process • parties external to the organisation

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RANGE STATEMENT	
	• parties internal to the organisation • purchaser of a service, product or process • user of a service, product or process.
Log on may include use of:	• hardware • password • software features • user name.
Information systems may include:	• database application • spreadsheet application.
Informant may include:	• a buyer • current user • party external to the organisation • party internal to the organisation • technician maintaining a service • technician repairing a product.
Information may include:	• details required from core business systems • details required to complete a transaction or process • specific details requested by a customer • specific details requested by others.
Escalation may relate to:	• failure to resolve a complaint • further circumstances that need to be explored • lack of response to a complaint in given timeframe • previous investigation failed to bring resolution satisfactory to all parties.

Unit Sector(s)

Unit sector	Telecommunication

Co-requisite units

Co-requisite units	

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Co-requisite units		

Competency field

Competency field	Workplace effectiveness

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ICTWOR3232A Collect and analyse technical information

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to investigate a technical situation involving the collection and analysis of information from a variety of sources, including interviews and database systems. The technical situation under investigation may be the result of a fault or failure of a product, service or process. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who deal with customers and field technicians apply the skills and knowledge in this unit. This unit assumes a background in telecommunications with experience in customer access networks and customer infrastructure, including equipment and cabling.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Obtain recorded information	1.1. Apply all relevant ***legislation***, ***codes***, ***regulations and standards*** in the analysis process 1.2. Verify the situation to be investigated and identify appropriate ***sources of information*** for this situation 1.3. Obtain relevant information from computer systems and analyse and ***record information***
2. Conduct a simple interview	2.1. Select interviewees with correct information about the matter being investigated and select an ***interview process*** to suit the circumstances of the interviewee 2.2. Prepare for an interview by performing preliminary research 2.3. Develop interview questions to identify key points for an effective interview

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ELEMENT	PERFORMANCE CRITERIA
	2.4. Conduct an interview using effective listening and questioning techniques and focus the interviewee on information relevant to the matter being investigated 2.5. Record information obtained in the interview
3. Analyse information	3.1. ***Analyse*** critical information by reviewing the situation being investigated 3.2. Assess between factual information and assumptions and make deductions based on factual critical information 3.3. Incorporate assumptions into the ***reasoning process*** where it assists in forming valid ***inferences*** 3.4. Analyse inferences from those deductions and assumptions and produce a resolution of the situation being investigated
4. Implement the outcomes of analysis	4.1. Identify practical actions based on inferences arising from the analysis process 4.2. Implement practical actions to resolve the situation 4.3. Review outcomes of practical action by assessing their impact on the situation

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- literacy skills to:
  - read and interpret manuals, specifications, relevant enterprise policy and documentation
  - accurately record interviews
  - write notes and text files
- negotiation skills to enable interaction with customer
- numeracy skills to interpret and evaluate different types of technical data
- planning and organisational skills to organise and prepare the resolution process
- problem solving skills to respond to complex customer challenges
- task management skills to work systematically with required attention to detail and adherence to all safety requirements

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REQUIRED SKILLS AND KNOWLEDGE
• technical skills to advise on a range of customer equipment and environments and to perform diagnostic procedures
Required knowledge
• analytical techniques appropriate for information analysis, especially deductive reasoning • computer keyboard usage • computer literacy • conflict resolution skills • database and spreadsheet concepts • enterprise information systems • information types and their sources • interpersonal skills • legislation, codes of practice and other formal agreements that directly impact on resolution processes • listening, questioning and interviewing • privacy issues • the influence of human factors on information analysis, e.g. prejudice, biases and fallacies in reasoning • typical issues and challenges that occur when dealing with customers

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • use a database • demonstrate listening, questioning and interviewing techniques • develop an accurate record of interview • integrate information from varied sources • draw logical inferences from information gathered • make sound recommendations for action based on

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EVIDENCE GUIDE	
	inferences.
Context of and specific resources for assessment	Assessment must ensure: • operational customer contact centre • customer contact technologies currently used in industry • interview and evidence recording equipment • relevant regulatory and equipment documentation that impact on work activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate using a database to record information • direct observation of the candidate's questioning and interviewing techniques • review of records of interview completed by the candidate • oral or written questioning of the candidate to assess knowledge of information gathering practices.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTWOR3231A Resolve technical enquiries using multiple information systems. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require

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EVIDENCE GUIDE	
	language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications Industry Forum (ACIF) standards and codes • Australian Communications and Media Authority (ACMA) technical standards • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) electromagnetic radiation (EMR) standard • Australian building codes and regulations • Australian Standards • equal employment opportunity (EEO) and anti-discrimination legislation • enterprise standards • Privacy Act • Telecommunications Act • Telecommunications Industry Ombudsman • Trade Practices Act.
Sources of information may include:	• customers or clients • fellow employees • field staff • information databases • other effected individuals.
Record information may include:	• electronically based proformas

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RANGE STATEMENT	
	• electronically based reports • hand written notes.
Interview process may include:	• face to face interview • informal discussion • telephone interview • text based information gathering.
Analyse may include:	• biographical analysis • comparative analysis • developing a hypothesis • geographical analysis • historical analysis • scenario generation.
Reasoning process may include:	• decision-making • deduction • problem solving techniques.
Inferences may include:	• estimates • explanations • probable interpretations • probable predictions.

Unit Sector(s)

Unit sector	Telecommunication

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Workplace effectiveness

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ICTWOR4032A Undertake a civil site survey

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to assess a site for a telecommunications project. It involves gathering information about the site and the project, surveying the site and evaluating the suitability of the site for the work. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff whose work involves undertaking a civil site survey apply the skills and knowledge in this unit. The site surveys may be undertaken for an upgrade or a new installation.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for survey	1.1. Discuss detailed requirements and arrange access to site with ***key stakeholders*** 1.2. Examine regulatory and statutory requirements associated with the telecommunications project 1.3. Determine need for ***specialist studies*** for the site
2. Survey land, buildings and facilities	2.1. ***Survey existing buildings*** to assess capability of meeting changes required for the project 2.2. Collect information through ***site survey*** 2.3. Determine ***environmental impact*** of development 2.4. Estimate impact of prevailing ***weather conditions*** on planned changes 2.5. Assess and document ***building options*** should a new structure be necessary 2.6. Assess geographical nature of land and determine ***barriers to signalling***
3. Report survey findings and recommendations	3.1. Outline survey findings and recommendations to accommodate project requirements on the site 3.2. Develop options to meet planned changes along

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ELEMENT	PERFORMANCE CRITERIA
	with cost-benefit data 3.3. Complete report and forward to relevant stakeholders following relevant procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with internal and external personnel on technical and operational matters
- literacy skills to:
  - interpret technical telecommunications specifications
  - read and interpret drawings related to layouts, design, construction and project management
  - write reports
- numeracy skills to take and analyse measurements
- planning and organisational skills to organise and coordinate surveys
- problem solving skills to solve site problems for telecommunications projects
- task management skills to work systematically with required attention to detail and adherence to safety requirements
- technical skills to assess technical requirements compared to survey data

Required knowledge

- background information required to undertake a civil site survey
- meteorology and weather conditions
- features and operating requirements of construction equipment
- geographical barriers to signalling
- legislation, codes of practice and other formal agreements that impact on the work activity
- licensing and regulatory issues applying to a civil site survey on telecommunications sites
- soil testing methods and requirements
- specific knowledge of:
  - civil site safety practices
  - personal protective equipment for civil survey projects

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REQUIRED SKILLS AND KNOWLEDGE
• occupational health and safety (OHS) requirements relating to surveys and site conditions • typical issues and challenges that occur on-site

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • negotiate with key stakeholders, enterprise personnel, customers, community representatives, specialists and other contractors on environmental and network needs • undertake a survey of environmental conditions, land, buildings and facilities for a telecommunications project • apply legislative impacts on the project including relevant operational codes, OHS requirements and work practices • report survey findings outlining options and including recommendations with supporting reasons, coverage of existing and proposed needs.
Context of, and specific resources for assessment	Assessment must ensure: • site for civil site survey • use of equipment currently used in industry • relevant regulatory and enterprise documentation that impacts on survey work.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing a civil site survey • review of reports completed by the candidate

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EVIDENCE GUIDE	
	outlining survey findings, recommendations and options • oral or written questioning to assess knowledge of regulatory and enterprise requirements and survey methods.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTPMG5031A Prepare a project brief. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating

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RANGE STATEMENT	
conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Key stakeholders may include:	• community representatives • contractors • customers • enterprise personnel • survey specialists.
Regulatory and statutory requirements may include:	• Australian Communications and Media Authority (ACMA) technical standards • Australian building codes and regulations • International Standards ISO 9000 and ISO 9001 • environmental protection • fire regulations • heritage legislation • industrial relations awards and agreements • International Telecommunications Union (ITU) recommendations • local government • Telecommunications Act and telecommunications national code • OHS Act • Privacy Act • Trade Practices Act • spectrum management regulation.
Specialist studies relate to:	• archaeologists • environmental experts • geologists • heritage experts • surveyors.
Survey existing buildings may include:	• access • building design • ceiling heights • communications options • earthing arrangements • existing environmental conditions • floor loading • floor space • security arrangements.

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RANGE STATEMENT	

Site survey may include:	• building availability capacity
	• earthing requirements environmental impact
	• geological and land surveys
	• land:
	  • Crown
	  • private
	• line of sight data
	• power availability
	• regulatory and statutory requirements
	• site availability
	• site ownership and acquisition data
	• soil
	• weather conditions.

Environmental impact may involve:	• disturbance of flora and fauna
	• features:
	  • access
	  • dams
	  • fences
	  • hazards
	  • survey marks
	• issues:
	  • environment
	  • habitats
	  • heritage values
	  • legislation
	  • seasonal changes
	  • traditional landowners
	• pollution:
	  • air
	  • noise
	  • water
	• radio frequency hazards
	• visual impact:
	  • location of other services and plant
	  • potential hazards
	  • potential soil erosion areas.

Weather conditions may include impact of:	• cyclone • earthquake

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RANGE STATEMENT	
	• fire risk • flooding • fog • rainfall • snow • wind.
Building options may include:	• container • hut • new building • portable housing • underground housing.
Barriers to signalling may include:	• distance • land or water • line of sight • local features • weather conditions.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Workplace effectiveness

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ICTWOR4079A Schedule equipment maintenance

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to schedule maintenance of telecommunications equipment and networks on customer premises and service provider networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Technical staff who undertake preventative maintenance of telecommunications systems apply the skills and knowledge in this unit. This unit applies to indoor and outdoor installation and may be applied to domestic, commercial or industrial installations. Relevant jobs roles include a supervisor in charge of maintenance teams responsible for the upkeep of telecommunications equipment to ensure reliable performance of legacy equipment.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify preventative maintenance program for customers	1.1. Verify details of ***customer*** system and equipment type to assess level of maintenance required 1.2. Determine type and extent of maintenance agreed against the existing ***service level agreement*** with the customer 1.3. Contact customer and agree on suitable time to carry out maintenance program
2. Plan maintenance and fault clearance activity	2.1. Verify details of warranties and service agreements for customer equipment and advise customer of ***charging details*** where warranty or agreement does not exist 2.2. Negotiate and agree on commitments and

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ELEMENT	PERFORMANCE CRITERIA
	responsibility with the customer 2.3. Organise work priorities so that maintenance staff are available to meet scheduled commitments
3. Arrange allocation of labour resources	3.1. Evaluate the expertise and competencies of staff to meet skills required to maintain the equipment noted in the service level agreement 3.2. Allocate staff member with the appropriate skills and competency to the task to minimise risk of failure 3.3. Advise the designated repair officer of responsibilities, warranties and service agreements in conducting maintenance and fault repair 3.4. Prepare a ***schedule*** of the maintenance program and confirm with customer
4. Organise assistance to fault staff	4.1. Provide additional resources if required 4.2. Arrange delivery of additional materials and parts 4.3. Escalate fault to appropriate level when it cannot be rectified in specified timeframe 4.4. Organise product manufacturer support as appropriate

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to liaise with customers, vendors, internal and external personnel on technical and operational matters • literacy skills to interpret technical documentation, equipment manuals and specifications • planning and organisational skills to schedule maintenance • problem solving skills to solve resources and logistics problems • task management skills to work systematically with required attention to detail and adherence to all safety requirements
Required knowledge
• electronic databases, spreadsheets and schedulers • equipment to be maintained

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REQUIRED SKILLS AND KNOWLEDGE
• legislation, codes of practice and other formal agreements that impact on the work activity • procurement of spare parts • service level agreements • specific occupational health and safety (OHS) requirements relating to the activity and site conditions • typical issues and challenges that occur on site • vendor procedures

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and organise preventive maintenance schedule according to vendor specified requirements and customer agreements • negotiate fault clearance arrangements with customers applying related OHS requirements and work practices • plan and schedule fault clearance activity allocating appropriately skilled repair officer to rectify faults.
Context of, and specific resources for assessment	Assessment must ensure: • site where equipment maintenance may be conducted • enterprise and site related documentation • regulatory, enterprise, supplier and equipment documentation that impact on work activities.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate scheduling equipment maintenance

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EVIDENCE GUIDE	
	• review of schedule prepared by the candidate outlining maintenance and repairs required • oral or written questioning assessing required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4080A Undertake preventative maintenance of systems and equipment • ICTTEN4081A Locate, diagnose and rectify faults. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised

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RANGE STATEMENT	
wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Customer may include:	• government department • private individual • service provider • small business.
Service level agreement may refer to:	• after hours call outs • agreements reached between a customer and a communications company • cost details • details of frequency and type of maintenance • roles and responsibility of customer and maintenance contractor • warranty issues.
Charging details may include:	• cap on maintenance schedule • hourly rate for casual attendances for fault clearance • set number of maintenance attendances per month in contract agreement within contract charges.
Schedule may include:	• contingencies • frequency of maintenance attendances • level of support required • nature and type of maintenance • repair activities.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units	

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Co-requisite units		

Competency field

Competency field	Workplace effectiveness

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BSBCUS201B Deliver a service to customers

Modification History

Release	Comments
Release 1	This version first released with *BSB07 Business Training Package version 6.0.* Revised unit. Required skills updated to focus on learning and development practices and compliance with policy and procedures. Replaces BSBCUS201A Deliver a service to customers

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to deliver all aspects of customer service at an introductory level. It includes creating a relationship with customers, identifying their needs, delivering services or products and processing customer feedback.

Application of the Unit

This unit applies to individuals who perform a range of routine tasks in the workplace using a limited range of practical skills and fundamental knowledge of customer service in a defined context under direct supervision or with limited individual responsibility.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Establish contact with customers	1.1 Acknowledge and greet ***customer*** in a professional, courteous and concise manner according to ***organisational requirements***
	1.2 Maintain personal dress and presentation in line with organisational requirements
	1.3 Communicate using appropriate ***interpersonal skills*** to facilitate accurate and relevant exchange of information
	1.4 Maintain sensitivity to customer specific needs and any cultural, family and individual differences
	1.5 Establish rapport/relationship with customer and express a genuine interest in customer needs/requirements
2. Identify customer needs	2.1 Use appropriate questioning and active listening to determine customer needs
	2.2 Assess customer needs for urgency to identify priorities for service delivery
	2.3 Provide customer with information about available options for meeting customer needs and assist customer to identify preferred option/s
	2.4 Identify personal limitations in addressing customer needs and seek assistance from ***designated persons*** where required
3. Deliver service to customers	3.1 Provide prompt customer service to meet identified needs according to organisational requirements
	3.2 Provide information regarding problems and delays, and follow-up within appropriate timeframes as necessary
	3.3 Communicate with customers in a clear, concise and courteous manner
	3.4 Identify ***opportunities*** to enhance the quality of service and products, and take action to improve the service whenever

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	possible
4. Process customer feedback	4.1 Promptly recognise ***customer feedback*** and handle sensitively according to organisational requirements 4.2 Accurately record any feedback and communication between customers and the organisation according to organisational standards, policies and procedures 4.3 Identify any unmet customer needs and discuss suitability of other products/services 4.4 Support customers to make contact with other services according to organisational policies and procedures

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to convey meaning clearly, concisely and coherently
- literacy skills to communicate with customers and to develop required product knowledge
- numeracy skills to interpret customer requirements and to meet customer needs
- problem-solving skills to deal with customer enquiries or complaints
- self-management skills to:
  - comply with policies and procedures
  - seek learning and development opportunities.

Required knowledge

- key provisions of relevant legislation from all forms of government that may affect aspects of business operations, such as:
  - anti-discrimination legislation
  - ethical principles
  - codes of practice
  - privacy laws
  - occupational health and safety (OHS)
- organisational policies and procedures relating to customer service and the customer service process.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • demonstrating all stages of customer service interactions • responding to customer feedback • demonstrating a range of interpersonal skills • knowledge of relevant legislation.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • access to office equipment and resources • examples of customer complaints and policies relating to customer service.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • analysis of responses to case studies and scenarios • demonstration of techniques • observation of presentations • oral or written questioning to assess knowledge of customer service and communication techniques • review of information provided to customers about problems and delays, and customer follow-up • review of documentation recording feedback and communication between customers and the organisation.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Customers may include:	• contacts from other organisations • external customers • internal customers • members of the public • patients • service users.
Organisational requirements may include:	• access and equity principles and practice • anti-discrimination and related policy • following OHS procedures for dealing with customers • legal and organisational policies, guidelines and requirements • quality and continuous improvement processes and standards • quality assurance and/or procedures manual.
Interpersonal skills may include:	• listening actively to what the customer is communicating • providing an opportunity for the customer to confirm their request • questioning to clarify and confirm customer needs • seeking feedback from the customer to confirm understanding of needs • summarising and paraphrasing to check understanding of customer's message • using appropriate body language.
Designated persons may include:	• manager, supervisor or team leader • more experienced personnel with specific knowledge or information • staff from other work areas with particular product or service knowledge.
Opportunities may include:	• advice about warranties, guarantees or support services • packaging options • pricing options • procedures for delivery of goods or service • provision of product knowledge • systems for recording complaints.

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Customer feedback may be about:	• damaged goods or delivery problems • delays • invoicing errors • quality of customer service • quality of service provision.

Unit Sector(s)

Stakeholder Relations – Customer Service

Custom Content Section

Not applicable.

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BSBFIM501A Manage budgets and financial plans

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to undertake financial management within a work team in an organisation. This includes planning and implementing financial management approaches, supporting team members whose role involves aspects of financial operations, monitoring and controlling finances, and reviewing and evaluating effectiveness of financial management processes in line with the financial objectives of the work team and the organisation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit addresses the requirement for managers to ensure that financial resources are used effectively. This is done by ensuring access to budget/s and ongoing monitoring expenditure against the budget/s. The unit applies to managers working in small and large business environments and not for profit organisations.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan financial management approaches	1.1. Access ***budget/financial plans*** for the work team 1.2. Clarify budget/financial plans with ***relevant personnel*** within the organisation to ensure that documented outcomes are achievable, accurate and comprehensible 1.3. Negotiate any changes required to be made to budget/financial plans with relevant personnel within the organisation 1.4. Prepare ***contingency plans*** in the event that initial plans need to be varied
2. Implement financial management approaches	2.1. Disseminate relevant details of the agreed budget/financial plans to team members 2.2. Provide ***support*** to ensure that team members can competently perform ***required roles*** associated with the management of finances 2.3. Determine and access ***resources and systems*** to manage financial management processes within the

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ELEMENT	PERFORMANCE CRITERIA
	work team
3. Monitor and control finances	3.1. Implement ***processes*** to monitor actual expenditure and to control costs across the work team 3.2. Monitor expenditure and costs on an agreed cyclical basis to identify cost variations and expenditure overruns 3.3. Implement, monitor and modify contingency plans as required to maintain financial objectives 3.4. ***Report*** on budget and expenditure in accordance with organisational protocols
4. Review and evaluate financial management processes	4.1. Collect and collate for analysis, ***data and information on the effectiveness of financial management processes*** within the work team 4.2. Analyse data and information on the effectiveness of financial management processes within the work team and identify, document and recommend any improvements to existing processes 4.3. Implement and monitor agreed improvements in line with financial objectives of the work team and the organisation

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- numeracy skills to read and understand a budget and to update a budget
- technology skills to use software associated with financial record keeping.

Required knowledge

- basic accounting principles
- organisational requirements related to financial management
- relevant legislation and current requirements of the Australian Taxation Office, including GST
- requirements for organisational record keeping and auditing
- principles and techniques involved in:
  - budgeting

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REQUIRED SKILLS AND KNOWLEDGE
• cash flows • electronic spreadsheets • GST • ledgers and financial statements • profit and loss statements.

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • financial skills required to work with and interpret budgets, ageing summaries, cash flow, petty cash, GST, and profit and loss statements • knowledge of the record keeping requirements for the ATO and for auditing purposes.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • assessment of written reports indicating broad knowledge of managing budgets and managing financial resources in the organisation • demonstration of techniques using financial record keeping software • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • oral or written questioning to assess knowledge of requirements for organisational record keeping and auditing

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EVIDENCE GUIDE	
	• review of contingency plans • review of identification of cost variations and expenditure overruns • evaluation of documentation reportingon budget and expenditure • review of documentation identifying and recommending improvements to financial management processes.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Diploma of Management.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Budget/financial plans may include:	• cash flow projections • long-term budgets/plans • operational plans • short-term budgets/plans • spreadsheet-based financial projections • targets or key performance indicators for production, productivity, wastage, sales, income and expenditure
Relevant personnel may include:	• financial managers, accountants or financial controllers • supervisors, other frontline managers
Contingency plans may include:	• contracting out or outsourcing human resources and other functions or tasks • diversification of outcomes • finding cheaper or lower quality raw materials and consumables

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RANGE STATEMENT	
	• increasing sales or production • recycling and re-using • rental, hire purchase or alternative means of procurement of required materials, equipment and stock • restructuring of organisation to reduce labour costs • risk identification, assessment and management processes • seeking further funding • strategies for reducing costs, wastage, stock or consumables • succession planning
Support may include:	• access to specialist advice • documentation of procedures • help desk or identified experts within the organisation • information briefings or sessions • intranet-based information • training including mentoring, coaching and shadowing
Required roles may include:	• arranging for use of corporate credit cards • banking • debt collection • ensuring security, accuracy and currency of financial operations • invoicing clients, customers and consumers • maintaining journals, ledgers and other record keeping systems • maintaining petty cash system • purchasing and procurement • wages and salaries payments and record keeping
Resources and systems may include:	• hardware and software • human, physical or financial resources • record keeping systems (electronic and paper-based) • specialist advice or support

Processes to monitor actual expenditure and to control costs across the work team include:	• reporting of:
	  • assets
	  • consumables

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RANGE STATEMENT	
	• equipment • expenditure • income • stock • wastage
Reporting may include data from:	• bank statements • credit card statements • financial reports • invoices and receipts • ledgers and journals • logs • petty cash records • spreadsheet-based records
Data and information on the effectiveness of financial management processes may include records (paper-based and electronic) related to:	• bank account records • cash flow data • contracts • credit card receipts • employee timesheets • files of paid purchase and service invoices • income and expenditure • insurance reports • invoices • job costings • petty cash receipts • quotations • taxation records • wages/salaries books

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Management

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Co-requisite units

Co-requisite units		

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BSBINM302A Utilise a knowledge management system

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to access and use a knowledge management system, to input into a knowledge management system, and to contribute to monitoring, reviewing and improving a knowledge management system and work practices. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to individuals who apply a broad range of competencies in various work contexts. They may exercise discretion and judgement using appropriate theoretical knowledge of knowledge management to assist in increasing productivity, to improve quality or to recognise the benefits to the organisation through the improved use of knowledge. For the purpose of this unit, knowledge management is defined as the whole range of strategies, methods, activities and techniques used formally and informally by individuals and the organisation (as formalised in a knowledge management system) to identify, collect, organise, store, retrieve, analyse, share and apply knowledge to the work of the organisation.

Licensing/Regulatory Information

Not applicable.

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Access and use knowledge management system	1.1. Access ***knowledge management system*** to assist with specific tasks, in line with system ***procedures*** 1.2. Administer system, in line with procedures
2. Input to knowledge management system	2.1. Gather, analyse and prepare ***inputs*** for contribution to the system, in line with procedures 2.2. Check inputs for clarity, accuracy, currency and relevance 2.3. Make inputs to system, in line with procedures 2.4. Analyse requirements of the system and ensure suggestions for improvements are provided to ***relevant personnel***
3. Review and improve work practices	3.1. Provide feedback about the clarity, accuracy, currency and relevance of the system's output to

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ELEMENT	PERFORMANCE CRITERIA
	relevant personnel 3.2. Document learning resulting from the use of the system 3.3. Improve work practices as a result of learning from the use of the system

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to classify and report information • literacy skills to read and understand a variety of texts; and to write, edit and proofread documents to ensure clarity of meaning, accuracy and consistency of information • problem-solving skills to deal with information which is contradictory, ambiguous, inconsistent or inadequate • technology skills to display information in a format suitable to the target audience.
Required knowledge

• key provisions of relevant legislation from all forms of government that may affect aspects of business operations, such as:
  • anti-discrimination
  • ethical principles
  • codes of practice
  • privacy laws
  • occupational health and safety (OHS)
• organisational policies and procedures for knowledge management
• other relevant organisational policies and procedures, for example:
  • commercial confidentiality.
  • customer service
  • information management
• records management.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • making contributions to knowledge management system • records of outcomes resulting from the use of the system • knowledge of organisational policies and procedures for knowledge management.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • access to office equipment and resources • examples of information documents found in the workplace • access to system (within privacy and confidentiality provisions).
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • review of documentation outlining learning resulting from the use of the system • analysis of responses to case studies and scenarios • demonstration of techniques.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • general administration units • other information management units.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Knowledge management system may include:	• planned and implemented system • policies • procedures and practices to manage knowledge within the organisation and among relevant stakeholders • protocols

Procedures may include:	• accessible operating instructions
	• accessible user manuals
	• criteria established for selecting and filtering input to the system
	• related policies and procedures covering:
	  • consultation, participation, communication, and written and verbal reporting
	  • documentation
	  • data collection, storage and retrieval
	  • privacy and confidentiality
	  • quality
	  • staff, professional development, training, and coaching and mentoring
	  • work organisation
	• templates for the collection of input to the system

Inputs may be:	• electronic • paper-based • verbal
Relevant personnel may include:	• managers, leaders, supervisors and coordinators • owners • staff, team members and colleagues

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Unit Sector(s)

Unit sector	

Competency field

Competency field	Knowledge Management - Information Management

Co-requisite units

Co-requisite units		

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BSBMGT401A Show leadership in the workplace

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to work with teams and individuals, their standard of conduct and the initiative they take in influencing others. At this level, work will normally be carried out within routine and non routine methods and procedures which require the exercise of some discretion and judgement. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	Frontline management provides the first level of leadership within the organisation. This unit applies to people who are making the transition from being a team member, to taking responsibility for the work and performance of others. Frontline managers have a strong influence on the work culture, values and ethics of the teams they supervise. As such it is important that frontline mangers model good practice, professionalism and confidently represent their organisation.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Model high standards of management performance and behaviour	1.1. Ensure management performance and behaviour meets the organisation's requirements 1.2. Ensure management performance and behaviour serves as a positive role model for others 1.3. Develop and implement performance plans in accordance with organisation's goals and objectives 1.4. Establish and use key performance indicators to meet organisation's goals and objectives
2. Enhance organisation's image	2.1. Use ***organisation's standards and values*** in conducting business 2.2. Question, through established communication channels, standards and values considered to be damaging to the organisation 2.3. Ensure personal performance contributes to developing an organisation which has integrity and

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ELEMENT	PERFORMANCE CRITERIA
	credibility
3. Make informed decisions	3.1. Gather and organise information relevant to the issue/s under consideration 3.2. Facilitate individuals and teams active participation in decision making processes 3.3. Examine options and assess associated risks to determine preferred course/s of action 3.4. Ensure decisions are timely and communicate them clearly to individuals and teams 3.5. Prepare plans to implement decisions and ensure they are agreed by relevant individuals and teams 3.6. Use ***feedback processes*** effectively to monitor the implementation and impact of decisions

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication and presentation skills to represent the organisation, to explain its work to others and to model professionalism • decision making skills to demonstrate good judgement and follow through.
Required knowledge
• basic theory of group behaviour • leadership styles and concepts.

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • articulation of organisational values and expectations of behaviour • instances where leadership and decision making have been demonstrated and which have led to positive changes in the workplace • knowledge of leadership styles and concepts.
Context of and specific resources for assessment	Assessment must ensure: • access to workplace documents.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • analysis of responses to case studies and scenarios • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of performance in role plays • observation of presentations • review of performance plans • oral or written questioning to assess knowledge of leadership styles • evaluation of communication of expectations, roles and responsibilities • review of documentation examining options and assessing associated risks to determine preferred course/s of action.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Certificate IV in Frontline Management.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised

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RANGE STATEMENT	
wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Organisation's standards and values will be:	• stated or implied by the way the organisation conducts its business
Feedback processes may be:	• formal or informal • from internal or external sources

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to outline the regulatory, taxation and insurance compliance requirements of a micro business; and to source advice and specialist services to assist business owners/managers in satisfying these requirements and needs. Specific legal requirements apply to the management of a micro business.

Application of the Unit

Application of the unit	This work will be undertaken by individuals who are establishing or operating a micro business providing for self employment.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify the regulatory, taxation and insurance requirements of the business	1.1. Identify ***regulatory***, ***taxation and insurance requirements*** that might be relevant to the operation of the business 1.2. Gather ***information*** that assists in interpreting and explaining the regulatory, taxation and insurance requirements 1.3. Investigate the relationships between legislation, regulations, codes of practice, associated standards and written material to determine compliance requirements of the business
2. Develop procedures to ensure compliance and risk minimisation	2.1. Identify business advisers and other sources of assistance relevant to compliance requirements and type of business 2.2. Explain to advisers business type and operations, covering the full scope of the business 2.3. Clarify and confirm compliance requirements and risk minimisation needs with advisers 2.4. Establish ***sources of advice and specialist services*** for regulatory, taxation and insurance compliance 2.5. Review advice and procedures against the compliance requirements and their appropriateness for the business
3. Implement compliance	3.1. Implement procedures within the guidelines

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ELEMENT	PERFORMANCE CRITERIA
procedures	provided 3.2. Take action to ensure that the business complies with the relevant taxation and business registration requirements, legislation, regulations, codes of practice and associated standards 3.3. Arrange appropriate insurance cover for the business

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to question and seek clarification from advisers on regulatory, taxation or insurance matters • literacy skills to interpret relevant regulatory, taxation and insurance information • research skills to investigate compliance requirements.
Required knowledge
• business registration and licensing requirements • commonwealth, state/territory and local government legislative requirements relating to business operation, especially in regard to occupational health and safety (OHS) and environmental issues, equal employment opportunity, industrial relations and anti-discrimination • nature of legal responsibility • relevant industry codes of practice • relevant OHS responsibilities and procedures • sources of advice and specialist services • sources of information about regulatory, taxation and insurance requirements and issues • taxation requirements.

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • identification of regulatory, taxation and insurance compliance requirements and risk minimisation needs of the business • identification of sources of advice on compliance and risk minimisation procedures for the business • development and review of procedures for compliance and risk minimisation (with assistance from advisers) • knowledge of legislative requirements affecting business operation.
Context of and specific resources for assessment	Assessment must ensure: • access to relevant documentation • candidate's individual circumstances and work in the context of establishing or running a micro business, are the basis for assessment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • oral or audio-visual presentation of a case study of a micro business in similar field and location as candidate's proposal • portfolio of evidence including identification of relevant compliance and risk minimisation needs for the micro business, and development of risk minimisation and compliance procedures (with assistance from advisers) • review of implementation of procedures • review of insurance cover arranged for the business.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBSMB302A Develop a micro business proposal.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Regulatory, taxation and insurance requirements may include:	• local, state/territory, commonwealth and international legislation, regulations and codes of practice affecting business operations such as: • Acts and regulations • industry and OHS codes of practice • business registrations and licences • planning and other permissions • environmental legislation • industrial law, agency law, property law, consumer legislation and standards, Torts Law and duty of care • equal employment opportunity (EEO) and anti-discrimination legislation • anti-competition regulations
Information gathered may include:	• government agencies • industry associations • internet • written material
Taxation requirements may include:	• Australian Business Number • Business Activity Statement and goods and services tax (GST) returns • GST registration • PAYG and withholding arrangements • tax file number
Insurance requirements may include:	• comprehensive insurance for vehicles/property • professional indemnity insurance • public liability insurance • third party insurance on motor vehicles • workers compensation • other insurance cover as required by state/territory or commonwealth legislation, contractual obligations or as recommended for

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RANGE STATEMENT	
	the industry/type of business

Sources of advice and specialist services may include:	• accountants
	  • business advisers
	  • financial planners and insurance brokers
	  • funding bodies
	  • government agencies (for example, Indigenous Business Australia, Office of Aboriginal Economic Development)
	  • industry/trade associations
	  • insurance brokers
	• lawyers

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Small and Micro Business

Co-requisite units

Co-requisite units		

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BSBSMB306A Plan a home based business

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to examine the issues around establishing a business in a home and to plan the workplace within a home environment. Specific legal requirements apply to the management of a small or micro business.

Application of the Unit

Application of the unit	This work will be undertaken by individuals who are establishing or operating a micro business providing for self employment.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Determine the viability of basing a business in a home environment	1.1. Identify ***activities*** that will be undertaken by the business and what facilities and workspace are needed 1.2. Identify what ***licences***, ***permits***, ***regulations or restrictions*** apply to operating a home-based business 1.3. Identify the availability of ***services and infrastructure*** to support the business 1.4. Calculate the costs of suitable ***fittings and equipment*** for the business and any modifications required to existing facilities and infrastructure in the home 1.5. Determine access requirements of clients or delivery vehicles to the business premises 1.6. Identify insurance requirements for operation of the business in the home
2. Plan the workplace in a home environment	2.1. Prepare a floor plan or layout that meets the needs of the business and the home occupants 2.2. Prepare any concept plans for modifications to buildings or structures in accordance with local government requirements 2.3. Obtain ***approvals*** from relevant authorities 2.4. Identify occupational health and safety (OHS) issues and develop ***procedures*** to eliminate or minimise

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ELEMENT	PERFORMANCE CRITERIA
	any risks 2.5. Design the workplace to provide appropriate ***client access and facilities*** while retaining privacy for home occupants 2.6. Allocate adequate and secure space for business machinery, equipment and storage of materials
3. Minimise potential sources of conflict	3.1. Identify possible ***sources of conflict*** with neighbours or home occupants 3.2. Develop ***protocols*** for home occupants, visitors and clients to enable the business to successfully operate in the home environment 3.3. Prepare a work schedule that identifies ***business and personal activities*** 3.4. Establish contingency plans for ***unanticipated events***

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to clarify restrictions and approvals; to negotiate with neighbours, home occupants, trades people and suppliers; to formulate questions to obtain quotes
- literacy skills to understand and complete any relevant forms relating to a home-based business
- research skills to locate and access sources of information relating to restrictions/approvals for a home-based business.

Required knowledge

- aspects of the business being proposed
- commonwealth, state/territory and local government legislative requirements relating to business operation, especially in regard to occupational health and safety (OHS) and environmental issues
- constraints of home-based businesses
- relevant services and infrastructure available.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • identification of why the particular business is best established in the home • identification and selection of useful strategies in planning the set up of a home-based business • knowledge of constraints of home-based businesses.
Context of and specific resources for assessment	Assessment must ensure: • access to relevant documentation • candidate's individual circumstances and work in the context of establishing or running a home-based business, are the basis for assessment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • portfolio of evidence including floor layout and quotes for work • oral or written questioning to assess knowledge of relevant legislation • review of access requirements determined for clients or delivery vehicles to the business premises • review of protocols developed for home occupants, visitors and clients • analysis of contingency plans established for unanticipated events.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBSMB302A Develop a micro business proposal • BSBSMB304A Determine resource requirements for the micro business.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Activities may include:	• any products produced by the business • if the business includes only one aspect of a process • if the business is an adjunct to something else
Licences, ***permits***, ***regulations or restrictions*** may include:	• funding agency restrictions • local government regulations • state/territory government environmental regulations/restrictions
Services and infrastructure may include:	• disability access • gas • mobile phone coverage • phone/internet access • postal services • power • supply of materials and packaging • vehicle access • water
Fittings and equipment may include:	• furniture desk, chairs, work benches • hardware/software • storage for example shelving, cabinets/freezers/machinery, shed
Approvals may be needed from:	• body corporate (if rented unit) or owner (if the house is rented) • public liability/WorkCover
Procedures may include:	• verbal instructions • visual images • written signs
Client access and facilities may include:	• dedicated area for consultation with clients/staff and /or display area • entry • parking • signage

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RANGE STATEMENT	
	• toilets
Sources of conflict may include:	• changes in home occupants' needs for space • noise • parking • waste
Protocols may include:	• informal understandings • verbal instructions
Business and personal activities may include:	• community and family responsibilities • personal networking/mentoring
Unanticipated events may include:	• attendance at events (community, family conferences, training) • personal and/or family illness

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Small and Micro Business

Co-requisite units

Co-requisite units		

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BSBSMB401A Establish legal and risk management requirements of small business

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to identify and comply with the regulatory, legal, taxation and insurance requirements, and risk management needs of small business. Specific legal requirements apply to the management of a small business.

Application of the Unit

Application of the unit	This work is undertaken by individuals who operate a small business. The unit is suitable for existing micro and small businesses or setting up a new business or a department in a larger organisation.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify and implement business legal requirements	1.1. Identify and research possible ***options for the business legal structure*** using ***appropriate sources*** 1.2. Determine ***legislation and regulatory requirements*** affecting the operations of the business under its chosen structure 1.3. Develop and implement procedures to ensure full compliance with relevant legislation and regulatory requirements
2. Comply with legislation, codes and regulatory requirements	2.1. Establish systems to ensure the ***legal rights and responsibilities*** of the business are identified and the business is adequately protected, specifically in relation to ***occupational health and safety*** (***OHS***), business registration and environmental requirements 2.2. Identify ***taxation principles and requirements*** relative to the business and follow procedures to ensure compliance 2.3. Identify and carefully maintain ***legal documents*** and maintain and update relevant ***records*** to ensure their ongoing security and accessibility 2.4. Monitor the provision of products and services of the business to protect legal rights and to comply with legal responsibilities 2.5. Conduct investigations to identify areas of

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ELEMENT	PERFORMANCE CRITERIA
	non-compliance with legal and regulatory requirements and take corrective action where necessary
3. Negotiate and arrange contracts	3.1. Seek legal advice on contractual rights and obligations, if required, to clarify business liabilities 3.2. Investigate and assess potential products/services to determine ***procurement rights*** and to ensure protection of business interests where applicable 3.3. Negotiate and secure contractual procurement rights for goods and services including ***contracts with relevant people***, as required, in accordance with the business plan 3.4. Identify ***insurance requirements*** and acquire adequate cover 3.5. Identify options for leasing/ownership of business premises and complete contractual arrangements in accordance with the business plan

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication, reporting, record keeping and consultation skills to operate the business • literacy skills to interpret legal requirements, to develop policies and procedures and to analyse compliance information • research skills to investigate legal structures, and taxation and insurance requirements • time management skills to prioritise tasks and to meet key dates.
Required knowledge
• business registration and licensing requirements • commonwealth, state/territory and local government legislative requirements relating to business operation, especially in regard to OHS and environmental issues, equal employment opportunity, industrial relations, anti-discrimination, taxation • creation and termination of relevant legal contracts

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REQUIRED SKILLS AND KNOWLEDGE
• cultural differences and legal implications • duty of care imposed by Law of Torts • legal rights and obligations of alternative ownership structures • record keeping to meet minimum legal and taxation requirements • relevant consumer legislation • relevant industry codes of practice • relevant insurance requirements and products.

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • implementation of a systematic approach to identifying, managing and meeting legal and business requirements within culturally appropriate contexts • interpreting compliance data and formulating appropriate action • knowledge of relevant legislation.
Context of and specific resources for assessment	Assessment must ensure: • access to relevant documentation • candidate's individual circumstances and work in the context of establishing or running a small business, are the basis for assessment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • portfolio of evidence including contracts negotiated and arranged • oral or written questioning to assess knowledge of relevant consumer legislation • review of procedures developed and implemented to ensure full compliance with relevant legislation and regulatory requirements

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EVIDENCE GUIDE	
	• review of insurance cover acquired.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBSMB402A Plan small business finances • BSBSMB404A Undertake small business planning.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Options for the business legal structure may include:	• company • cooperative • corporation • government owned enterprise • partnership • profit or not-for-profit legal structure • sole trader • trust
Options for the business legal structure may be influenced by:	• confidentiality • contractual requirements • family/community/cultural expectations • ownership transfer • partnership considerations • preferences of owners/stakeholders • protection of stakeholders and assets • requirements of financial backers • superannuation • taxation
Appropriate sources may include:	• business advisers • financial planners • government agencies

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RANGE STATEMENT	
	• industry/trade associations • mentors • professional advisers (e.g. solicitors, accountants)

Legislation and regulatory requirements may include:	• local, state/territory, commonwealth and international legislation, regulations and codes of practice affecting business operations such as:
	  • relevant Acts and regulations
	  • industry and OHS codes of practice
	  • business registrations and licences
	  • planning and other permissions
	  • environmental legislation
	  • industrial law, agency law, property law, consumer legislation and standards, Torts Law and duty of care
	  • equal employment opportunity (EEO) and anti-discrimination legislation, anti-competition regulations

Legal rights and responsibilities may include:	• culturally appropriate processes and protocols • marketing the business in accordance with consumer legislation • obligations imposed by choice of business structure • operating the business with a duty of care (Law of Torts)
Occupational health and safety and requirements must include:	• complying with relevant OHS codes of practice • establishing and maintaining a system for managing OHS • establishing hazard management arrangements to assess and control the risks associated with workplace hazards including development of written safe operating procedures • establishing OHS record keeping arrangements in accordance with regulatory requirements • OHS duty of care responsibilities • registering with state/territory workers compensation authority if applicable
Taxation principles and requirements may include:	• relevant taxation requirements/obligations for business • tax file number, Australian Business number, goods and services tax registration, PAYG and

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RANGE STATEMENT	
	withholding arrangements
Legal documents may include:	• appropriate software for financial records • certificate of incorporation • constitution documents • franchise agreements and financial documentation • partnership agreements • statutory books for companies (register of members, register of directors and minute books)
Records may include:	• environmental • financial • OHS • personnel • taxation
OHS records may include:	• accident reports and investigations • first aid and medical • hazardous substances register • instruction and training • manufacturers' and suppliers' information • material safety data sheets • OHS audits and inspections • plant maintenance and testing • workers compensation and rehabilitation
Procurement rights to products and services may include:	• any form of licensing • royalties, copyright, patents, trademarks, registered design and applications, intellectual property, software licenses, franchises, agencies
Contracts with relevant people may include:	• any person with whom the business has, or seeks to have, a performance-based relationship • owners, suppliers, employees, landlords, agents, distributors, customers
Insurance requirements may include:	• comprehensive insurance for vehicles/property • professional indemnity insurance • public liability insurance • third party insurance on motor vehicles • workers compensation • other insurance cover as required by state/territory or commonwealth legislation,

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RANGE STATEMENT	
	contractual obligations or as recommended for the industry/type of business

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Small and Micro Business

Co-requisite units

Co-requisite units		

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BSBSMB407A Manage a small team

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan for the management of and to manage staff. It involves industrial relations, staff selection, staff records, induction, training, team development and career planning to enhance business operations through retaining a competent, committed and motivated team in the workplace. Specific legal requirements apply to the management of a small business.

Application of the Unit

Application of the unit	This work is undertaken by individuals who operate a small business. The unit is suitable for existing micro and small businesses or a department in a larger organisation.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Develop staffing plan	1.1. Determine ***staffing requirements*** to allow the business to run effectively, in accordance with the business requirements as outlined in the business plan 1.2. Identify and compare the existing skills/competencies of owner/s and staff with business requirements to identify any gaps 1.3. Develop ***policies and procedures*** for owner/s and staff, in accordance with the business plan
2. Recruit, induct, train and retain the team	2.1. Develop job/position descriptions, competencies required and selection criteria to meet the needs of the business 2.2. Judge information obtained from each candidate against specified selection criteria and decide selection in accordance with business needs and legal requirements 2.3. Induct new staff members in accordance with the policies and procedures of the business 2.4. Make team members aware of their responsibilities and performance requirements as soon as practicable and take opportunities to coach team members who

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ELEMENT	PERFORMANCE CRITERIA
	are unfamiliar with the procedures of the business 2.5. Develop and implement a ***staff development program and career paths*** based on the requirements of business and staff competencies 2.6. ***Advertise staff vacancies*** appropriately in accordance with staffing plan
3. Comply with INDUSTRIAL RELATIONS obligations	3.1. Clarify workplace rights and obligations of employers and employees, in accordance with ***legal requirements and codes of practice*** 3.2. Counsel staff, if required, in a positive and constructive manner and record outcomes accurately
4. Maintain staff records	4.1. Develop ***staff records system*** to provide timely and accurate information, in accordance with confidentiality, legal and taxation requirements 4.2. Monitor and accurately maintain the system for recording and retrieving personnel and payroll information and seek specialist advice where required
5. Manage staff	5.1. Regularly review contribution and skills of self and other team members to ensure performance is in line with agreed ***performance measures*** 5.2. Monitor and adjust staffing requirements to respond to any changes in tasks and functions required by the business 5.3. Support and encourage staff, and acknowledge and reward their contribution to the business 5.4. Regularly provide opportunities for staff to discuss work related issues 5.5. Develop ***contingency plans*** to cope with unexpected or extreme situations and take appropriate corrective action as required
6. Review team performance	6.1. Develop positive and constructive relationships with and between ***team members*** 6.2. Review and update team objectives in support of business goals on a regular basis in consultation with team members 6.3. Identify strengths and weaknesses of team against current and expected work requirements 6.4. Schedule time, on a regular basis, for team members to review work operations in order to maintain and improve operational efficiency 6.5. Encourage team members to monitor their own

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ELEMENT	PERFORMANCE CRITERIA
	performance, suggest improvements and to identify professional development needs, in accordance with personal and business requirements 6.6. Monitor and review staff turnover rate

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analytical skills to identify workplace skill gaps • coaching skills • communication skills to relate to staff • conflict resolution skills • literacy skills to interpret legal requirements, to compile reports and to prepare a job/position description • team building and motivation skills.
Required knowledge
• commonwealth, state/territory and local government legislative requirements relating to business operation, especially in regard to occupational health and safety (OHS) and environmental issues, equal employment opportunity (EEO), industrial relations and anti-discrimination • OHS responsibilities and procedures for managing hazards • relevant industry awards/enterprise agreements • staff development and career planning • staff counselling, grievance and disciplinary procedures • unfair dismissal legislation and procedures.

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • managing a small team including staff selection, staff records, induction, training and development • developing and maintaining team performance to enhance business operations • knowledge of relevant legislative requirements affecting business operation.
Context of and specific resources for assessment	Assessment must ensure: • access to relevant documentation • candidate's individual circumstances and work in the context of running a small business, are the basis for assessment.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • portfolio of evidence including staff policies and records, and contingency plans • oral or written questioning to assess knowledge of staff recruitment procedures, staff development and review programs • review of job/position descriptions and selection criteria developed • review of documentation monitoring and reviewing staff turnover rate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBSMB405A Monitor and manage small business operations.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating

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RANGE STATEMENT	
conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Staffing requirements may include:	• full-time, part-time, permanent, temporary or casual • number of staff • responsibilities, competencies required • self, other owners, family and/or friends • sub-contractors or external advisors/consultants • time commitment, performance expectations
Policies and procedures must include:	• complaint and grievance procedures • culturally appropriate entitlements e.g. funeral leave, national/religious days • culturally appropriate procedures e.g. how business will enact cultural requirements for relationships between owner/operator, employees and service providers • employment conditions, equal opportunity, anti-discrimination, cultural diversity • induction and training • OHS • recruitment and selection • performance measures • professional development
Staff development program and career paths may include	• attendance at courses • career planning • coaching • flexible learning • job rotation • mentoring • on-the-job training • professional development • staff exchanges • succession planning
Advertising staff vacancies may include:	• electronic (radio, television and internet) • noticeboards • print media • word-of-mouth
Industrial relations may include:	• awards and/or industrial agreements and

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RANGE STATEMENT	
	relevant industrial instruments • counselling, dismissal procedures
Legal requirements and codes of practice may include:	• award and enterprise agreements and relevant industrial instruments • commonwealth, state/territory and local government legislative requirements affecting business operation, especially in regard to OHS and environmental issues, EEO, industrial relations and anti-discrimination • relevant industry codes of practice
Staff records system must include:	• disciplinary and grievance procedures • employee records (including tax file number, remuneration, leave and training records) • job/position descriptions • OHS record • records of taxation and superannuation payments made
Performance measures may include:	• overall staff productivity • percentage of chargeable hours/days per week • performance of key people • ratio of direct workers to those who support, supervise or manage them • ratio of sales dollars per employee • staff morale, work ethic, work satisfaction
Contingency plans may include:	• accidents or emergencies • environmental issues • fluctuating workloads • OHS • unpredicted customer demand/busy periods • unpredicted staff shortages
Team members may include:	• employees, trainees/apprentices, sub-contractors or external advisers/consultants • owner/s, partners, family members

Unit Sector(s)

Unit sector	

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Competency field

Competency field	Management and Leadership - Small and Micro Business

Co-requisite units

Co-requisite units		

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BSBSUS201A Participate in environmentally sustainable work practices

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively measure current resource use and to carry out improvements including reducing the negative environmental impact of work practices. This unit requires the ability to access industry information, and applicable legislative and occupational health and safety (OHS) guidelines. While no licensing, legislative, regulatory or certification requirements apply holistically to this unit at the time of publication, relevant national, state and territory legislation, regulations and codes of practice impact upon this unit.

Application of the Unit

Application of the unit	This unit applies to operators/team members under supervision or guidance, who are required to follow workplace procedures and instructions, and to work in an environmentally sustainable manner. It covers: efficient resource use potential environmental hazards regulatory compliance improving environmental performance (within the scope of competency, authority and own level of responsibility). It addresses the knowledge, processes and techniques necessary to participate in environmentally sustainable work practices.

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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify current resource use	1.1. Identify workplace ***environmental and resource efficiency issues*** 1.2. Identify resources used in own work role 1.3. Document and measure current usage of resources using ***appropriate techniques*** 1.4. Record and file documentation measuring current usage, using technology (such as software systems) where applicable 1.5. Identify and report workplace environmental

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ELEMENT	PERFORMANCE CRITERIA
	hazards to appropriate personnel
2. Comply with environmental regulations	2.1. Follow workplace procedures to ensure ***compliance*** 2.2. Report breaches or potential breaches to appropriate personnel
3. Seek opportunities to improve resource efficiency	3.1. Follow ***organisational plans*** to improve environmental practices and resource efficiency 3.2. Work as part of a team, where relevant, to identify possible areas for improvements to work practices in own work area 3.3. Make ***suggestions*** for improvements to workplace practices in own work area

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to comply with all relevant legislation associated with job specifications and procedures
- communication and problem-solving skills to question, seek clarification and make suggestions relating to work requirements and efficiency
- communication and teamwork skills to recognise procedures; to follow instructions; to respond to change, such as current workplace environmental/sustainability frameworks; and to support team work and participation in a sustainable organisation
- literacy, numeracy and technology skills to interpret workplace information in relation to work role, and to document and measure resource use
- technology skills to select and use technology appropriate for a task.

Required knowledge

- environmental and resource hazards/risks
- environmental or sustainability legislation, regulations and codes of practice applicable to own work role
- OHS issues and requirements
- organisational structure, and reporting channels and procedures
- relevant environmental and resource efficiency systems and procedures
- sustainability in the workplace
- terms and conditions of employment including policies and procedures, such as

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REQUIRED SKILLS AND KNOWLEDGE
daily tasks, employee and employer rights, equal opportunity.

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • accessing, interpreting and complying with a range of environment/sustainability legislation and procedural requirements relevant to daily responsibilities • accurately following organisational information to participate in and support an improved resource efficiency process and reporting as required • developing and/or using tools such as inspection checklists, to collect and measure relevant information on organisation resource consumption, within work role • identifying organisational improvements by applying efficient resource use to daily activities • knowledge of environmental and resource hazards/risks.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • evidence is relevant to the particular workplace role, including work area, equipment, systems, and documentation • review of current work area directly relating to own work, to assess measurement of resources used, hazards and compliance • individual or team discussion about potential for increased resource efficiency within current work area • access to workplace documents, information and resources (such as compliance obligations, enterprise

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EVIDENCE GUIDE	
	plans, work responsibilities).
Method of assessment	A range of assessment methods should be used t assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of demonstrated techniques over time and in a range of situations • analysis of responses to case studies and scenarios • review of documentation measuring current resource usage • evaluation of techniques used to document and measure current usage of resources • review of identified and reported workplace environmental hazards • evidence of active participation in organisational plans to improve environmental practices and resource efficiency.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBINN201A Contribute to workplace innovation • BSBSMB301A Investigate micro business opportunities • BSBWOR202A Organise and complete daily work activities.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Environmental and resource	• maximising opportunities to improve business environmental performance

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RANGE STATEMENT	
efficiency issues may include:	• minimising environmental risks • promoting more efficient production and consumption of natural resources, for example minimising waste by participating in or using a waste management system • using resources efficiently such as material usage, energy usage (seeking alternative sources of energy or energy conservation) or efficient water usage
Appropriate techniques may include:	• examining and documenting resources in work area • examining invoices from suppliers • examining relevant information and data • measuring resource usage under different conditions • reports from other parties involved in the process of identifying and implementing improvements

Compliance may include:	• meeting relevant laws, by-laws and regulations or best practice to support compliance in environmental performance and sustainability at each level as required (such as Environmental Protection or Biodiversity Conservation Act):
	  • international
	  • commonwealth
	  • state/territory
	  • local government
	  • industry
	  • organisation

Organisational plans may include:	• documented policies and procedures • work plans to minimise waste or to increase efficiency of resources such as a green office program, supply chain program for purchasing sustainable products or an environmental management framework
Suggestions may include ideas that help to:	• improve energy efficiency • increase use of renewable, recyclable, reusable and recoverable resources • maximise opportunities such as use of solar power or other alternative forms of energy, where appropriate

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RANGE STATEMENT	
	• prevent and minimise risks • reduce emissions of greenhouse gases • reduce use of non-renewable resources

Unit Sector(s)

Unit sector	

Competency field

Competency field	Industry Capability - Sustainability

Co-requisite units

Co-requisite units		

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BSBSUS301A Implement and monitor environmentally sustainable work practices

Modification History

Release	Comments
Release 2	New release of this Unit with *version 7.0 of BSB07 Business Services Training Package*. Environmental assets italicised and bolded in PC 3.6 AND identified in Range Statement.
Release 1	Initial release of this Unit.

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to effectively analyse the workplace in relation to environmentally sustainable work practices and to implement improvements and monitor their effectiveness.

This unit requires the ability to access industry information, applicable legislative and occupational health and safety (OHS) guidelines.

Application of the Unit

Application of the unit	This unit applies to those with responsibility for a specific area of work or who lead a work group or team. It addresses the knowledge, processes and techniques necessary to implement and monitor environmentally sustainable work practices, including the development of processes and tools, such as: • identifying areas for improvement • developing plans to make improvements • implementing and monitoring improvements in environmental performance. A person who demonstrates competence in this unit must be able to provide evidence of the ability to implement and monitor integrated environmental and resource efficiency management policies and procedures within an organisation. Evidence must be strictly relevant to the

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	particular workplace role.

Licensing/Regulatory Information

While no licensing, legislative, regulatory or certification requirements apply holistically to this unit at the time of publication, relevant national, state and territory legislation, regulations and codes of practice impact upon this unit.

Pre-Requisites

Prerequisite units		

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Investigate current practices in relation to resource usage	1.1 Identify environmental regulations applying to the enterprise 1.2 Analyse procedures for assessing ***compliance*** with environmental/sustainability regulations 1.3 Collect information on environmental and resource efficiency systems and procedures, and provide to the work group where appropriate

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	1.4 Collect, analyse and organise information from a range of ***sources*** to provide information/advice and tools/resources for improvement opportunities 1.5 Measure and document current resource usage of members of the work group 1.6 Analyse and document current ***purchasing strategies*** 1.7 Analyse current work processes to access information and data to assist in identifying areas for improvement
2. Set targets for improvements	2.1 Seek input from ***stakeholders, key personnel and specialists*** 2.2 Access external sources of information and data as required 2.3 Evaluate alternative solutions to workplace environmental issues 2.4 Set efficiency targets
3. Implement performance improvement strategies	3.1 Source and use appropriate ***techniques and tools*** to assist in achieving efficiency targets 3.2 Apply continuous improvement strategies to own work area of responsibility, including ideas and possible solutions to communicate to the work group and management 3.3 Implement and integrate ***environmental and resource efficiency improvement plans*** for own work group with other operational activities 3.4 Supervise and support team members to identify possible areas for improved practices and resource efficiency in work area 3.5 Seek ***suggestions*** and ideas about environmental and resource efficiency management from stakeholders and act upon where appropriate 3.6 Implement costing strategies to fully utilise ***environmental assets***
4. Monitor performance	4.1 Use and/or develop evaluation and monitoring, tools and technology 4.2 Document and communicate outcomes to report on efficiency targets to key personnel and stakeholders 4.3 Evaluate strategies and improvement plans 4.4 Set new efficiency targets, and investigate and apply new tools and strategies 4.5 Promote successful strategies and reward participants where possible

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to analyse problems, to devise solutions and to reflect on approaches taken
- change management skills
- communication skills to answer questions, clarify and acknowledge suggestions relating to work requirements and efficiency
- communication/consultation skills to support information flow from stakeholders to the work group
- innovation skills to identify improvements, to apply knowledge about resource use to organisational activities and to develop tools
- literacy skills to comprehend documentation, to interpret environmental and energy efficiency requirements, to create tools to measure and monitor improvements and to report outcomes
- numeracy skills to analyse data on organisational resource consumption and waste product volumes
- planning and organising skills to implement environmental and energy efficiency management polices and procedures relevant to own work area
- problem-solving skills to devise approaches to improved environmental sustainability and to develop alternative approaches as required
- technology skills to operate and shut down equipment; where relevant, to use software systems for recording and filing documentation to measure current usage; and to use word processing and other basic software for interpreting charts, flowcharts, graphs and other visual data and information
- supervisory skills to work effectively with a team.

Required knowledge

- best practice approaches relevant to own area of responsibility and industry
- compliance requirements within work area for all relevant environmental/sustainability legislation, regulations and codes of practice including resource hazards/risks associated with work area, job specifications and procedures
- environmental and energy efficiency issues, systems and procedures specific to industry practice
- external benchmarks and support for particular benchmarks to be used within organisation, including approaches to improving resource use for work area and expected outcomes

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- OHS issues and requirements
- organisational structure and reporting channels and procedures
- quality assurance systems relevant to own work area
- strategies to maximise opportunities and to minimise impact relevant to own work area
- supply chain procedures
- terms and conditions of employment including policies and procedures, such as daily tasks, work area responsibilities, employee, supervisor and employer rights, equal opportunity.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • knowledge of relevant compliance requirements within work area • developing plans to make improvements • planning and organising work group activities in relation to measuring current use and devising strategies to improve usage • monitoring resource use and improvements for environmental performance relative to work area and supervision • ensuring appropriate action is taken within work area in relation to environmental/sustainability compliance and potential hazards • implementing new approaches to work area in an effort to resolve and improve environmental and resource efficiency issues and reporting as required.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • access to a range of environment/sustainability legislation, standards, guidelines and procedural requirements relevant to specific work area, daily

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	responsibilities and supervision • access to a range of information, workplace documentation and resources such as compliance obligations, organisation plans, work supervision and responsibilities • access to reports from other parties involved in the process of identifying and implementing improvements • evidence is relevant to the particular workplace role, including work area, staff, stakeholders, equipment, systems and documentation.
Method of assessment	A range of assessment methods should be used t assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • response to case studies • review of reports of activities of work group in relation to measuring resource use and developing improvement strategies • review of work plans outlining approaches to improved practices with documented benchmarks • analysis of the way in which advice is sought and suggestions are made about improvements • observation over time and in a range of situations in relation to review of overall work area and staff, to assess and measure resource use, hazards and compliance • review of checklists to identify and assess resource usage at the beginning and end of the unit; reports on meetings around procedures and improvement processes and monitoring within the workplace; lists of environmental hazards/risks or inefficiencies or opportunities for improvements identified in the workplace • analysis of implementation of programs such as a green office program, supply chain program for purchasing sustainable products, or an environmental management framework • oral or written questioning to assess knowledge of environmental and energy efficiency issues, systems and procedures specific to industry practice.

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Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Compliance may include:	• meeting relevant laws, by-laws and regulations or best practice or codes of practice to support compliance in environmental performance and sustainability at each level as required (such as Environmental Protection or Biodiversity Conservation Act):
	  • international
	  • commonwealth
	  • state/territory
	  • industry
	  • organisation.

Sources may include:	• organisation specifications • regulatory sources • relevant stakeholders • resource use.
Purchasing strategies may include:	• influencing suppliers to take up environmental sustainability approaches • researching and participating in programs such as a supply chain program to purchase sustainable products.

Stakeholders, key personnel and specialists may include:	• individuals and groups both inside and outside the organisation who have direct or indirect interest in the organisation's conduct, actions, products and services, including:
	  • customers
	  • employees at all levels of the organisation
	  • government

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	• investors • local community • other organisations • suppliers • key personnel within the organisation, and specialists outside the organisation who may have particular technical expertise.
Techniques and tools may include:	• examination of invoices from suppliers • examination of relevant information and data • measurements made under different conditions • others as appropriate to the specific industry context.

Environmental and resource efficiency improvement plans may include:	• addressing environmental and resource sustainability initiatives such as environmental management systems, action plans, green office programs, surveys and audits
	• applying the waste management hierarchy in the workplace
	• determining organisation's most appropriate waste treatment including waste to landfill, recycling, re-use, recoverable resources and wastewater treatment
	• initiating and/or maintaining appropriate organisational procedures for operational energy consumption, including stationary energy and non-stationary (transport)
	• preventing and minimising risks, and maximising opportunities such as:
	  • improving resource/energy efficiency
	  • reducing emissions of greenhouse gases
	• reducing use of non-renewable resources
	• referencing standards, guidelines and approaches such as:
	  • ecological footprinting
	  • Energy Efficiency Opportunities Bill 2005
	  • Global Reporting Initiative
	  • green office program – a cultural change program
	  • green purchasing
	  • Greenhouse Challenge Plus (Australian government initiative)
	  • ISO 14001:1996 Environmental management systems life cycle analyses

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	• product stewardship • supply chain management • sustainability covenants/compacts • triple bottom line reporting.

Suggestions may include ideas that help to:	• prevent and minimise risks and maximise opportunities such as:
	  • usage of solar or renewable energies where appropriate
	  • reducing emissions of greenhouse gases
	  • reducing use of non-renewable resources
	  • making more efficient use of resources, energy and water
	• maximising opportunities to re-use, recycle and reclaim materials
	• identifying strategies to offset or mitigate environmental impacts:
	  • purchasing carbon credits
	  • energy conservation
	  • reducing chemical use
	  • reducing material consumption
	• expressing purchasing power through the selection of suppliers with improved environmental performance e.g. purchasing renewable energy
	• eliminating the use of hazardous and toxic materials.

Environmental assets may include:	• assets of the natural environment such as:
	  • biological assets (produced or natural)
	  • land
	  • water areas with their ecosystems
	  • subsoil, and
	  • air.

Unit Sector(s)

Unit sector	

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Competency field

Industry Capability – Sustainability

Co-requisite units

Co-requisite units		

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BSBSUS501A Develop workplace policy and procedures for sustainability

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to develop and implement a workplace sustainability policy, including the modification of the policy to suit changed circumstances. This unit requires the ability to access industry information, applicable legislative and occupational health and safety (OHS) guidelines. While no licensing, legislative, regulatory or certification requirements apply holistically to this unit at the time of publication, relevant national, state and territory legislation, regulations and codes of practice impact upon this unit.

Application of the Unit

Application of the unit	This unit addresses the knowledge, processes and techniques necessary to develop approaches to sustainability within workplaces, including the development and implementation of policy. This unit applies to people with managerial responsibility who undertake work developing approaches to create strategies within workplaces, including the development and implementation of policy and includes: • communicating with relevant stakeholders • developing and monitoring policies • reviewing and improving policies. A person who demonstrates competence in this unit must be able to provide evidence of the ability to develop and implement integrated sustainability policies and

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	procedures within an enterprise. The review of the policy after implementation will also need to be evidenced. The context of the unit applies to all sectors of the business industry; it may be applied to all sections of an organisation, including the office, the factory floor, or work area. With such a broad application, the unit will need to be contextualised as it is applied across an organisation and across different industry sectors.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Develop workplace sustainability policy	1.1. Define ***scope*** of sustainability policy 1.2. Gather information from a range of ***sources*** to plan and develop policy 1.3. Identify and consult ***stakeholders*** as a key component of the policy development process 1.4. Include appropriate ***strategies*** in policy at all stages of work for minimising resource use, reducing toxic material and hazardous chemical use, and employing life cycle management approaches 1.5. Make recommendations for policy options based on likely effectiveness, timeframes and cost 1.6. Develop policy that reflects the organisation's commitment to sustainability as an integral part of business planning and as a business opportunity 1.7. Agree to appropriate methods of implementation
2. Communicate workplace sustainability policy	2.1. Promote workplace sustainability policy, including its expected outcome to key stakeholders 2.2. Inform those involved in implementing the policy as to outcomes expected, activities to be undertaken and responsibilities assigned
3. Implement workplace sustainability policy	3.1. Develop and communicate procedures to help implement workplace sustainability policy 3.2. Implement strategies for continuous improvement in resource efficiency 3.3. Establish and assign responsibility to use recording systems for tracking continuous improvements in sustainability approaches
4. Review workplace sustainability policy implementation	4.1. Document outcomes and provide feedback to key personnel and stakeholders 4.2. Investigate successes or otherwise of policy 4.3. Monitor records to identify trends that may require remedial action and use to promote continuous improvement of performance 4.4. Modify policy and or procedures as required to ensure improvements are made

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to adjust communication to suit different audiences; to respond effectively to diversity; to work as a member of a team to consult on and validate policy • literacy skills to read and evaluate complex and formal documents such as policy and legislation • problem skills to effectively manage different points of view and dissenting stakeholders • research, analytical and writing skills to research, analyse and present information; to prepare written reports requiring precision of expression and language and structures suited to the intended audience
Required knowledge
• best practice approaches relevant to own work area • environmental or sustainability legislation, regulations and codes of practice applicable to industry and organisation • equal employment opportunity, equity and diversity principles and occupational health and safety implications of policy being developed • policy development processes and practices • principles, practices and available tools and techniques of sustainability management relevant to the particular industry context • quality assurance systems relevant to own organisation • relevant industry competency • relevant organisational polices, procedures and protocols • relevant systems and procedures to aid in the achievement of workplace sustainability

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

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EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • candidate's involvement as a key person in planning, developing and implementing organisational policy and that the developed policy complies with legislative requirements • implementation strategy, as part of the policy, that has been devised, implemented and reviewed showing a measurable improvement utilising the chosen benchmark indicators • communicating with stakeholders to discuss possible approaches to policy development and implementation, and contributing to the resolution of disputes among stakeholders • developing and monitoring policies for analysing data on enterprise resource consumption • using software systems for recording and filing documentation for measurement of current usage and using word processing and other basic software for interpreting charts, flowcharts, graphs and other visual data and information • reviewing and improving policies by identifying improvements and benchmarking against industry best practice and attempting new approaches continuously over time.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • access to relevant legislation/standards/guidelines • access to a range of workplace documentation and personnel, information and resources (such as compliance obligations, organisational plans, work responsibilities) • access to reports from other parties involved in the development and implementation of policy • evidence is collected over time, involving both formative and summative assessment • evidence is relevant to the particular workplace role, including work area, equipment, systems, and documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

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EVIDENCE GUIDE	
	• direct questioning combined with review of portfolios of evidence and third party workplace reports of on the job performance by the candidate • response to case studies • review of policy developed and procedural documentation outlining the approach taken • review of implementation strategy, plans and work plans • analysis of methods used to involve stakeholders in policy development, implementation and review • analysis of inefficiencies or opportunities for improvements identified in the workplace • evaluation of participation in sustainability work practices and programs such as an environmental management framework • observation over time in relation to review of work area relating to policy and procedures being developed to assess measurement of resources used, hazards and compliance.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • BSBATSIM419A Contribute to the development and implementation of organisational policies • BSBHRM506A Manage recruitment, selection and induction processes • BSBHRM602B Manage human resources strategic planning • BSBINN502A Build and sustain an innovative work environment • BSBMGT515A Manage operational plan • BSBMGT516C Facilitate continuous improvement • BSBMGT608C Manage innovation and continuous improvement • BSBMGT616A Develop and implement strategic plans • BSBMGT617A Develop and implement a business plan • BSBRSK501A Manage risk.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Scope of workplace sustainability policy may include:	• addressing sustainability initiatives through reference to standards, guidelines and approaches such as:
	  • ecological foot printing
	  • Energy Efficiency Opportunities Bill 2005l
	  • Global Reporting Initiative
	  • green office program
	  • green purchasing
	  • Greenhouse Challenge Plus (Australian government initiative)
	  • ISO 14001:1996 Environmental management systems life cycle analyses
	  • life cycle analyses
	  • product stewardship
	  • supply chain management
	  • sustainability covenants/compacts
	  • triple bottom line reporting
	• integrated approach to sustainability which includes environmental, economic and social aspects, or a specific approach that focuses on each aspect individually
	• investigating particular business and market context of the industry/organisation
	• meeting relevant laws, by laws and regulations or best practice to support compliance in environmental performance and sustainability at each level as required (such as Environmental Protection or Biodiversity Conservation Act):
	  • international
	  • commonwealth
	  • state/territory
	  • industry

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RANGE STATEMENT	
	• organisation • parts of the organisation to which it is to apply, including whether it is for the whole organisation, one site, one work area or a combination of these.
Sources may include:	• regulatory sources • relevant personnel • organisational specifications.

Stakeholders may include:	• individuals and groups both inside and outside the organisation who have some direct interest in the organisation's conduct, actions, products and services, including:
	  • customers
	  • employees at all levels of the organisation
	  • government
	  • investors
	  • local community
	  • other organisations
	  • regulators
	  • suppliers
	• key personnel within the organisation and specialists outside the organisation who may have particular technical expertise.

Strategies may include:	• promotional activities • raising awareness among stakeholders • training staff in sustainability principles and techniques.

Unit Sector(s)

Unit sector	

Competency field

Competency field	Industry Capability - Sustainability

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Co-requisite units

Co-requisite units		

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BSBWOR401A Establish effective workplace relationships

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to collect, analyse and communicate information and to use that information to develop and maintain effective working relationships and networks, with particular regard to communication and representation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	Frontline managers play an important role in developing and maintaining positive relationships in internal and external environments so that customers, suppliers and the organisation achieve planned outputs and outcomes. They play a prominent part in motivating, mentoring, coaching and developing team cohesion through providing leadership for the team and forming the bridge between the management of the organisation and team members. At this level, work will normally be carried out within routine and non routine methods and procedures, which require planning and evaluation, and leadership and guidance of others.

Licensing/Regulatory Information

Not applicable.

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Collect, analyse and communicate information and ideas	1.1. Collect relevant ***information*** from appropriate sources and analyse and share with the work team to improve work performance 1.2. Communicate ideas and information in a manner which is appropriate and sensitive to the cultural and social diversity of the audience and any specific needs 1.3. Implement ***consultation processes*** to encourage employees to contribute to issues related to their work, and promptly relay feedback to the work team in regard to outcomes 1.4. Seek and value contributions from internal and external sources in developing and refining new ideas and approaches

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ELEMENT	PERFORMANCE CRITERIA
	1.5. Implement ***processes*** to ensure that issues raised are resolved promptly or referred to ***relevant personnel*** as required
2. Develop trust and confidence	2.1. Treat all internal and external contacts with integrity, respect and empathy 2.2. Use the ***organisation's social***, ***ethical and business standards*** to develop and maintain effective relationships 2.3. Gain and maintain the trust and confidence of ***colleagues***, ***customers and suppliers*** through competent performance 2.4. Adjust interpersonal styles and methods to meet organisation's social and cultural environment 2.5. Encourage other members of the work team to follow examples set, according to ***organisation's policies and procedures***
3. Develop and maintain networks and relationships	3.1. Use ***networks*** to identify and build relationships 3.2. Use networks and other work relationships to provide identifiable benefits for the team and organisation
4. Manage difficulties into positive outcomes	4.1. Identify and analyse difficulties, and take action to rectify the situation within the requirements of the organisation and relevant legislation 4.2. Guide and support colleagues to resolve work difficulties 4.3. Regularly review and improve ***workplace outcomes*** in consultation with relevant personnel 4.4. Manage ***poor work performance*** within the organisation's processes 4.5. Manage conflict constructively within the organisation's processes

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• coaching and mentoring skills to provide support to colleagues

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REQUIRED SKILLS AND KNOWLEDGE

• literacy skills to research, analyse, interpret and report information
• relationship management and communication skills to:
  • deal with people openly and fairly
  • forge effective relationships with internal and/or external people, and to develop and maintain these networks
  • gain the trust and confidence of colleagues
  • respond to unexpected demands from a range of people
  • use supportive and consultative processes effectively.

Required knowledge

• relevant legislation from all levels of government that affects business operation, especially in regard to occupational health and safety (OHS), and environmental issues, equal opportunity, industrial relations and anti-discrimination
• theory associated with managing work relationships to achieve planned outcomes:
  • developing trust and confidence
  • maintaining consistent behaviour in work relationships
  • understanding the cultural and social environment
  • identifying and assessing interpersonal styles
  • establishing, building and maintaining networks
  • identifying and resolving problems
  • resolving conflict
  • managing poor work performance
  • monitoring, analysing and introducing ways to improve work relationships.

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • range of methods and techniques for communicating information and ideas to a range of stakeholders • range of methods and techniques for developing positive work relationships that build trust and

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EVIDENCE GUIDE	
	confidence in the team • accessing and analysing information to achieve planned outcomes • techniques for resolving problems and conflicts and dealing with poor performance • knowledge of the theory associated with managing work relationships to achieve planned outcomes.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • demonstration of techniques in managing poor performance and communicating effectively • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of performance in role plays • observation of presentations • oral or written questioning to assess knowledge of relevant legislation • review of consultation processesimplemented to encourage employees to contribute to issues related to their work • review of documentation outlining reviewing ofworkplace outcomes.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Certificate IV in Frontline Management.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised

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RANGE STATEMENT	
wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Information may include:	• data appropriate to work roles and organisational policies that is shared and retrieved in writing or verbally, electronically or manually such as: • archived, filed and historical background data • individual and team performance data • marketing and customer related data • planning and organisational documents including the outcomes of continuous improvement and quality assurance • policies and procedures
Consultation processes may include:	• feedback to the work team and relevant personnel in relation to outcomes of the consultation process • opportunities for all employees to contribute to ideas and information about organisational issues
Processes to ensure that issues raised are resolved promptly or referred may include:	• conducting informal meetings • coordinating surveys or questionnaires • distributing newsletters or reports • exchanging informal dialogue with relevant personnel • participating in planned organisational activities
Relevant personnel may include:	• managers • OHS committee and other people with specialist responsibilities • other employees • supervisors • union representatives/groups
Organisation's social, ***ethical and business standards*** may refer to:	• implied standards such as honesty and respect relative to the organisational culture and generally accepted within the wider community • rewards and recognition for high performing staff

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	• standards expressed in legislation and regulations such as anti-discrimination legislation
	• written standards such as those expressed in:
	  • code of workplace conduct/behaviour
	  • dress code
	  • policies
	  • statement of workplace values
	  • vision and mission statements

Colleagues, customers and suppliers may include:	• both internal and external contacts • employees at the same level and more senior managers • people from a wide variety of social, cultural and ethnic backgrounds • team members
Organisation's policies and procedures may refer to:	• Materials Safety Data Sheets • organisational tasks and activities undertaken to meet performance outcomes • sets of accepted actions approved by the organisation • Standard Operating Procedures
Networks may be:	• established structures or unstructured arrangements and may include business or professional associations • informal or formal and with individuals or groups • internal and/or external
Workplace outcomes may include:	• OHS processes and procedures • performance of the work team
Poor work performance may refer to:	• individual team members • organisation as a whole • self • whole work team

Unit Sector(s)

Unit sector	

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Competency field

Competency field	Industry Capability - Workplace Effectiveness

Co-requisite units

Co-requisite units		

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CPCSUS4001A Implement and monitor environmentally sustainable work practices

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit of competency specifies the outcomes required to effectively analyse, implement and monitor environmentally sustainable work practices and their effectiveness on a work site, including contributing to consumer environmental efficiency.

Application of the Unit

Application of the unit This unit of competency supports the needs of those with responsibility for a specific area or site of work, or those who lead a work group or team by using processes and techniques necessary to implement and monitor environmentally sustainable work practices, including the development of processes and tools.

The context of this competency applies to all sectors of the construction industry. It may be applied to all sections of an organisation, including a work site, designated work area, in transit and/or an office.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units Nil

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Investigate current practices in relation to resource usage.	1.1. Environmental regulations applying to the organisation are identified. 1.2. Procedures for ensuring ***compliance*** with environmental regulations are assessed. 1.3. Information on ***environmental and resource efficiency*** systems and procedures are collected, and where appropriate, provided to ***stakeholders***, ***key personnel and specialists***. 1.4. Current resource usage is measured and documented by members of the work group. 1.5. Current ***purchasing strategies*** are analysed and documented. 1.6. Current work processes and products are analysed to access information and data and to assist in identifying areas for improvement.
2. Set targets for improvement.	2.1. Input is sought from stakeholders, key personnel and specialists and shared with them as appropriate. 2.2. External sources of information and data are accessed as required. 2.3. Alternative solutions to work site environmental issues are evaluated.

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ELEMENT	PERFORMANCE CRITERIA
	2.4. Efficiency targets are set.
3. Implement performance improvement strategies.	3.1. ***Techniques and tools*** are sourced to assist in achieving targets. 3.2. Continuous improvement strategies are applied to work site, including ideas and possible solutions to communicate to stakeholders, key personnel and specialists. 3.3. Environmental and resource efficiency improvement plans for work site and clients are integrated with other operational activities and implemented. 3.4. ***Suggestions*** and ideas about environmental and resource efficiency management are sought from stakeholders, key personnel and specialists and shared with them to act on as appropriate. 3.5. Costing strategies are implemented to fully value environmental assets and are shared with stakeholders, key personnel and specialists as necessary.
4. Monitor performance.	4.1. Outcomes are documented and reports on targets are communicated to key personnel and stakeholders. 4.2. Strategies are evaluated. 4.3. New targets are set and new tools and strategies investigated and applied. 4.4. Successful strategies are promoted and, where possible, participants rewarded.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- ability to source/identify the latest industry environmental sustainability concepts and technologies
- applying learning to future opportunities
- change management skills
- communication skills to:

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REQUIRED SKILLS AND KNOWLEDGE

- answer questions
- clarify and acknowledge suggestions relating to work requirements and environmental efficiency with stakeholders
- enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
- read and interpret:
  - documentation
  - environmental and resource efficiency requirements
- support information flow between various internal and external stakeholders to resolve and report on environmental and resource efficiency issues
- use and interpret non-verbal communication
- use language and concepts appropriate to cultural differences
- creating tools to measure and monitor improvements and report on outcomes to stakeholders
- innovation skills to identify improvements, apply knowledge about resource use to organisational activities and customer service, and develop resource efficiency tools
- numeracy skills to analyse data on company and stakeholder resource consumption and waste product volumes
- problem solving skills to recognise and analyse problems, including:
  - devising approaches
  - implementing and reflecting on environmental and water, energy or resource efficiency management policies and procedures relevant to work site to improve environmental sustainability
  - share alternative approaches as required
- skills to relate to different genders and people from a range of social, cultural and ethnic backgrounds and with a range of physical and mental abilities
- technology skills, including the ability to:
  - operate and shut down equipment
  - where relevant, use software systems for recording and filing documentation for measurement and improvement of resource usage and consumption.

Required knowledge

Required knowledge for this unit is:

- how tradespersons can contribute to environmental sustainability
- knowledge of compliance requirements for all relevant environmental and sustainability legislation, regulations and codes of practice including resource hazards and risks associated with work site:
  - supervision
  - job specifications
  - strategies and procedures to maximise opportunities and minimise impacts

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REQUIRED SKILLS AND KNOWLEDGE

relevant to stakeholders and personal area of responsibility

- relevant knowledge of environmental, resource and energy/water efficiency issues, systems and procedures specific to industry practice
- knowledge of best practice approaches and quality assurance systems relevant to area of responsibility and industry
- ability to identify and advise on water/energy efficiency opportunities for stakeholders and key personnel
- supply chain procedures
- OHS issues and requirements
- organisational structure and reporting channels and procedures
- terms and conditions of employment, including policies and procedures, such as:
  - daily tasks
  - equal opportunity
  - work area responsibilities
  - worker, supervisor and employer rights.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	This unit of competency could be assessed by analysing and monitoring effective sustainable work practices on a construction project work site. This unit of competency can be assessed in the workplace or a close simulation of the workplace environment, provided that simulated or project-based assessment techniques fully replicate construction workplace conditions, materials, activities, responsibilities and procedures.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • implement and monitor integrated environmental and resource efficiency management policies and procedures within a work site, including:

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EVIDENCE GUIDE

- access, collect, analyse and organise information from a number of sources to provide information, advice and tools or resources for improvement opportunities to stakeholders and key personnel
- identify possible areas for improved practices and resource efficiency for stakeholders
- communicate benefits of changing practices to work team and customers
- implement new approaches and improvement plans, including planning and organising activities for staff and stakeholders in relation to:
  - measurement of current use
  - devising strategies to improve environmental and resource efficiency issues
  - reporting as required ensuring appropriate action is taken within work site in relation to environmental and sustainability compliance and potential hazards
- monitor and evaluate improvement plans and efficiency targets, using evaluation and monitoring tools and technology to potentially revise and adjust approaches and strategies to ensure continuous improvement.

Evidence that could be used, reflecting the requirements of the unit of competency and work being performed as evidence, include:

- reports of activities of work group in relation to:
  - measurement of resources and efficiency
  - development of improvement strategies
- work plans outlining approaches to improved practices, with documented benchmarks
- invoices from stakeholders specifying materials recommended for improved efficiency and those actually used
- quotes and tenders
- lists of environmental hazards, risks and inefficiencies, and opportunities for

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EVIDENCE GUIDE

improvements identified in the work site
- work samples, tools, techniques or simulated activities and the outcomes.

Processes may include:

- relevant authenticated correspondence
- way in which advice is sought and suggestions made about improvements from stakeholders and key personnel
- evidence of implementation of programs, such as:
  - green building program
  - supply chain program for purchasing sustainable products
  - environmental site management framework or product recommendations
- notes on understanding external benchmarks and support for particular benchmarks to be used, with expected outcomes and including approaches to recommend products and practices to stakeholders for improving their resource use.

Resource implications for assessment must include:

- observation by the assessor over a period of time and in a range of situations and/or evidence provided to the assessor in written or verbal form, including:
- implementing tools and techniques
- review of work site and stakeholders/key personnel to assess and measure resource use, hazards and compliance
- application of learning to future activities
- recommended products and practices to stakeholders
- access to a range of information and resources for assessment as listed in the range statement, such as:
  - environmental and sustainability legislation
  - compliance documentation
  - organisational and procedural requirements or organisation plans
  - work supervision and work site documentation, including personnel and

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EVIDENCE GUIDE

	responsibilities • quotes, tenders, invoices.
Context of and specific resources for assessment	This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints. Assessment of essential underpinning knowledge will usually be conducted in an off-site context. Assessment is to comply with relevant regulatory or Australian standards' requirements. Resource implications for assessment include: • an induction procedure and requirement • realistic tasks or simulated tasks covering the mandatory task requirements • relevant specifications and work instructions • support materials appropriate to activity • workplace instructions relating to safe work practices and addressing hazards and emergencies • material safety data sheets • research resources, including industry-related systems information. Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.
Method of assessment	Assessment methods must: • satisfy the endorsed Assessment Guidelines of the Construction, Plumbing and Services Training Package • include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application • reinforce the integration of employability skills with workplace tasks and job roles • confirm that competency is verified and able to be transferred to other circumstances and environments.

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EVIDENCE GUIDE

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice, with a decision on competency only taken at the point when the assessor has complete confidence in the person's demonstrated ability and applied knowledge
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence.

Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed.

Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Compliance includes:

- meeting relevant Acts, laws, by-laws and regulations, codes of practice or best practice to support compliance in environmental performance and sustainability at each level as required (such as Environmental Protection,

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RANGE STATEMENT

	Biodiversity Conservation Act and Building Code of Australia)
	• levels include:
	  • federal
	  • industry
	  • international
	  • local government
	  • organisation
	  • reporting breaches
	  • state and territory.

Environmental and resource efficiency includes:	• approaches of industry associations, such as:
	  • Australian Building Greenhouse Rating
	  • green plumbers
	  • green purchasing
	  • Housing Industry Association (HIA) GreenSmart
	  • ISO 14001 Environmental Management Systems
	  • lifecycle thinking
	  • Master Builders Association of Victoria Green Living, Leadership in Energy and Environmental Design (LEED), or Green Building Council of Australia (GBCA) Green Star environmental rating system
	  • National Australian Building Environmental Rating Scheme (NABERS)
	  • product stewardship
	  • supply chain management
	  • Victoria Stormwater Management Guidelines of the Environment Protection Authority (EPA)
	• implementing and using alternative practices, procedures or materials to reduce or eliminate resource consumption on work site
	• recommendations to stakeholders, including:
	  • addressing environmental and resource sustainability initiatives, such as an environmental framework, action plan, recommendations, surveys and audits with stakeholders and key personnel
	  • efficient water use (e.g. rainwater tanks,

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	grey water sprinkler systems or timers) • energy use (e.g. equipment/appliances installed; equipment, appliance and tool maintenance; transporting materials; heating and cooling; and building efficiency) • environmental site management • evaluating and implementing most appropriate waste treatment, including waste to landfill, recycling, re-use, recoverable resources and wastewater treatment through site management • improving resource, energy and water efficiency • including environmental performance in tender and quote specifications • initiating and maintaining appropriate work site procedures for operational energy consumption, including stationary and non-stationary (transport) energy • preventing and minimising risks and maximising opportunities on work site and for stakeholders • reducing emissions of greenhouse gases • reducing material usage • reducing stormwater pollution • reducing use of non-renewable resources • types of products and materials used • reference to standards, guidelines, industry association standards, codes of practice and best practice approaches such as: • federal government standards, including five-star rating for all new homes.
Stakeholders, ***key personnel and specialists*** (individuals and groups) both within and external to the organisation who have direct or indirect interest in the organisation's conduct, actions, products and services, include:	• clients • employees at all levels of the organisation • government • investors • key personnel within the organisation • local community • specialists outside the organisation who may have particular technical expertise • suppliers

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RANGE STATEMENT

	• other organisations.
Purchasing strategies include:	• influencing stakeholders to take up environmental sustainability approaches and products • researching and participating in programs, such as a supply chain program to purchase sustainable products (such as radial timber, sustainable timber, and low flow fittings and appliances).
Techniques and tools include:	• accessing the skills of others as appropriate to the specific industry context • environmental site management plans • examination of invoices from suppliers • examination of relevant information and data • integration of environmental and sustainability specifications in quotes and tenders • measurements made under different conditions • recommendation of sustainable products and practices to stakeholders.
Suggestions include:	• eliminating the use of hazardous and toxic materials • expressing green purchasing power through using and recommending a selection of suppliers with improved environmental performance (e.g. green power, lifecycle thinking, product stewardship, energy or water efficiency) • ideas that help to improve energy and water efficiency • making more efficient use of resources, materials, energy and water • maximising opportunities to use renewable, recyclable, reusable and recoverable resources (energy, water, materials, products and waste) • preventing and minimising risks and maximising opportunities, such as use of renewable energy such as solar or grey water, and other alternative forms of water, energy and resources • recommending and using alternative sustainable products, materials, procedures, practices and installation techniques • reducing emissions of greenhouse gases by

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RANGE STATEMENT

	reducing waste and transport • reducing the consumption of non-renewable resources, such as water, fuel, and materials • seeking alternative sources of water and energy or encouraging conservation.

Unit Sector(s)

Unit sector Construction

Co-requisite units

Co-requisite units Nil

Functional area

Functional area

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CPCCLDG3001A Licence to perform dogging

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit specifies the outcomes required to perform slinging techniques, including the selection and inspection of lifting gear and/or the directing of the crane operator in the movement of the load when the load is out of view of the crane/ operator for licensing purposes.

Application of the Unit

Application of the unit

This unit covers the scope of work to demonstrate competency in the application of slinging techniques, selection and inspection of lifting gear and/or the directing of the crane/ operator in the movement of the load.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units Nil

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. ***Site information*** is obtained and related to the task. 1.2. ***Hazard*** s and potential hazards associated with the slinging and directing of loads are identified. 1.3. ***Hazard control measures*** consistent with ***appropriate standards*** are identified to ensure the safety of personnel and equipment. 1.4. The weight, dimensions and centre of gravity of the load are identified and assessed. 1.5. Suitable lifting/slinging points on the load are identified. 1.6. Appropriate ***lifting equipment*** needs are assessed. 1.7. Appropriate ***communication methods*** are assessed with ***crane***/ operators and other ***appropriate personnel***. 1.8. Manufacturer's specifications/information is obtained for special loads where necessary.
2. Select and inspect equipment.	2.1. Lifting equipment appropriate to the task is selected. 2.2. Lifting equipment is inspected for serviceability. 2.3. Damaged or excessively worn lifting equipment is identified, labelled and rejected.

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ELEMENT	PERFORMANCE CRITERIA
	2.4. Appropriate communication methods for the crane/operator and appropriate personnel are selected. 2.5. Appropriate ***communication equipment*** is selected and its serviceability is checked. 2.6. Appropriate ***personal protective equipment*** (PPE) is selected and checked.
3. Prepare site and equipment.	3.1. Hazard prevention/control measures are applied consistent with appropriate standards to ensure the safety of personnel and equipment. 3.2. Appropriate slinging method is selected. 3.3. Lifting equipment is prepared and assembled where appropriate. 3.4. Load destination is prepared.
4. Perform task.	4.1. Lifting equipment is attached and secured to the lifting hook using appropriate techniques. 4.2. Lifting hook is positioned over the load centre of gravity. 4.3. Lifting equipment is attached and secured to the load in an appropriate manner. 4.4. Tag line is attached and secured where appropriate. 4.5. Test lift is conducted to ensure security of load. 4.6. Load is moved maintaining stability and control at all times. 4.7. Appropriate communication methods and ***communication signals*** are applied to safely coordinate the load movement both within sight and out-of-sight of crane operator. 4.8. The load is landed to ensure that it is stable and secure from movement. 4.9. Lifting equipment is removed or disconnected from load and prepared for next task or storage.
5. Shut down job and clean up.	5.1. Unserviceable lifting equipment inspected and rejected. 5.2. ***Defective equipment*** is isolated and tagged. 5.3. Lifting equipment is stored in accordance with procedures and appropriate standards. 5.4. Hazard prevention/control measures are removed where appropriate. 5.5. Excess materials from the work area are removed (where applicable).

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ELEMENT	PERFORMANCE CRITERIA
	5.6. Defects are reported and recorded according to procedures and appropriate action is taken.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- communication techniques in the workplace including whistles, hand signals and use of fixed channel two-way radios
- communication skills at a level sufficient to communicate with other site personnel
- calculate rated capacity of lifting equipment
- apply different methods for making temporary connections to loads using fibre and synthetic ropes
- ability to interpret rated capacity and working load limit tags
- hazard identification and control
- slinging techniques
- selection and inspection of lifting equipment
- directing crane operators in the moving of loads in a safe manner, using a slewing crane
- inspection and care of a wide range of lifting equipment to appropriate Australian Standards and/or manufacturer's specifications.

Required knowledge

Required knowledge for this unit is:

- appropriate mathematical procedures for estimation and measurement of loads
- basic knowledge of types of cranes and their functions
- Commonwealth, state or territory OHS legislation, standards and codes of practice relevant to the full range of techniques for undertaking dogging activities
- load stability and safety factors in line with manufacturer's specifications
- types of lifting equipment and slinging techniques for use, and their limitations and performance in a wide range of conditions (including but not limited to slings, beams, accessories, clamps, work-boxes, bins and pallets)
- understanding of the hierarchy of control.

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Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	Successful assessment of this unit meets the competency requirement of the National Standard for licensing Persons Performing High Risk Work. State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for Assessment of this unit which have been endorsed by the national body responsible for OHS matters.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • comply with Commonwealth, state or territory OHS legislation, standards relevant to safe dogging and crane operations. • communicate and work safely with others in the work area. • apply Hazard prevention and control measures consistent with appropriate standards. • apply to move loads in conjunction with cranes including, the reading of tags, slinging, loading, directing and landing loads with a slewing mobile crane with a telescopic boom and a winch, in and out of sight of the crane/ operator, moving four loads of varying shapes, sizes and weights. • use fibre and/or synthetic rope as tag lines, and connecting to loads using clove hitch, rolling hitch, bowline and single sheetbend. • conduct pre and post operational checks of the lifting equipment.
Context of and specific resources for assessment	• Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the national OHS endorsed Assessment Instrument • Assessment of performance must be

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	undertaken either in the workplace or in a realistically simulated workplace setting
	• Assessors must ensure that the assessment in the workplace is organised through a workplace supervisor to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace
	• Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints
	• Assessment is to comply with the requirements of any relevant Standards or operating procedures for dogging activities
	• Applicants must have access to:
	  • personal protective equipment (PPE) for the purpose of the performance assessment.
	  • four different loads as prescribed in the endorsed assessment instrument
	  • lifting and associated equipment
	  • suitable slewing crane
	  • communication equipment (eg. fixed channel, two-way radios) as applicable.

Method of assessment	Assessment must be conducted using the national OHS endorsed Assessment Instrument. This Instrument provides instruction on the application of the assessment. Assessment may be in conjunction with the assessment of other units of competency. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for assessment	Further information about endorsed Assessment Instruments may be obtained from state/territory OHS regulators.

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Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Site informationmay include but not be limited to	• local conditions such as access and egress • work method statements.
Hazards may include but not limited to:	• ground stability (eg. ground condition, recently filled trenches, slopes) • overhead hazards (e.g. power lines, service pipes, trees, buildings, etc) • insufficient lighting • traffic (e.g. pedestrians, vehicles, plant) • weather (e.g. wind, lightning, storms) • other specific hazards (e.g. trip hazards, heights, radio interference, etc).
Hazard prevention/control measures	The systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of controls, including: 1. elimination. 2. substitution. 3. isolation. 4. engineered control measures. 5. safe work practices. 6. personal protective equipment.
Appropriate standard s may include:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards.

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RANGE STATEMENT

Lifting Equipment may include but not limited to:	• fibre ropes • wire ropes • chain • wire and synthetic slings • shackles • eyebolts • beam clamps • plate clamps • spreader beams • lifting beams • pallet forks and cages • concrete kibbles • personnel boxes.
Communication Methods may include but are not limited to:	• written instructions • signage, • hand signals • listening • questioning to confirm understanding • appropriate worksite protocol.
Cranes may include but not limited to:	• tower cranes (including self erecting) • portal boom cranes • vehicle loading cranes • slewing mobile cranes • non-slewing cranes • derrick cranes.
Appropriate personnel may include but are not limited to:	• supervisors • colleagues • managers who are authorised to take responsibility for the workplace or operations.
Communication Equipment may include but not limited to:	• fixed channel two-way radios • whistles • bells.
Personal protective equipment (PPE) may include but not limited to:	• hard hat • safety boots • gloves • high visibility clothing • reflective vest • relevant breathing, hearing, sight, skin and sun protection.
Load destination may include but	• ground

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RANGE STATEMENT

not limited to:	• loading platforms • suspended floors • vehicles.
Communication signals may include but not limited to:	• stop - hand • stop - whistle • hoist up - hand • hoist up - whistle • hoist down - hand • hoist down - whistle • luff boom down - hand • luff boom down - whistle • luff boom up - hand • luff boom up - whistle • telescope out - hand • telescope out - whistle • telescope in - hand • telescope in - whistle • slew left - hand • slew left - whistle • slew right - hand • slew right - whistle.
Defective Equipment may include but not limited to:	• excessive wear • damage • stretched • broken wires • cut/damaged fibres.

Unit Sector(s)

Unit sector Construction

Co-requisite units

Co-requisite units Nil

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Co-requisite units Nil

Functional area

Functional area

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CPCCLRG3001A Licence to perform rigging basic level

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit specifies the outcomes required to perform basic rigging work associated with movement of plant and equipment, steel erections, hoists (including mast climbing hoists), placement of pre-cast concrete, safety nets and static lines, perimeter safety screens and shutters; and cantilever crane loading platforms for licensing purposes.

Application of the Unit

Application of the unit

This unit requires the applicant to be able plan the work, select and inspect equipment, set up task, erect structures and plant and dismantle structures and plant.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

This unit has a pre-requisite requirement. This requirement may be met by either the successful completion of the unit *CPCCLDG3001A Licence to perform dogging* or holding a valid licence for dogging.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units

CPCCLDG3001A	Licence to perform dogging

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. Task to be undertaken is assessed. 1.2. Potential workplace ***hazards*** are identified. 1.3. ***Hazard control measures*** are identified consistent with ***appropriate standards*** to ensure the safety of personnel and equipment. 1.4. Site information is obtained. 1.5. All ***forces and loads*** associated with erecting and dismantling ***structures*** and ***associated plant*** are considered in consultation with ***appropriate personnel***. 1.6. ***Rigging equipment*** and ***associated equipment*** are identified in consultation with appropriate personnel according to ***procedures*** and site information.

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ELEMENT	PERFORMANCE CRITERIA
	1.7. *Safety equipment* is identified.
	1.8. Appropriate ***communication methods*** are identified with appropriate personnel.
2. Select and inspect equipment.	2.1. Rigging equipment and associated equipment are selected and inspected according to procedures and the appropriate standard.
	2.2. Safety equipment is selected and inspected according to procedures.
	2.3. All defective rigging equipment, associated equipment and safety equipment is isolated, reported and recorded according to procedures.
	2.4. ***Communication equipment*** is selected and inspected for serviceability (where applicable.
3. Set up task.	3.1. Appropriate ***hazard prevention***/***control measures*** are applied to the work area according to procedures.
	3.2. ***Ground suitability*** is inspected and checked (where appropriate).
	3.3. Site information is reviewed, interpreted and communicated to appropriate personnel and ***appropriate personnel***.
	3.4. All forces and loads associated with erecting and dismantling structures and associated plant are determined in consultation with appropriate personnel.
	3.5. Safety equipment is fitted and worn correctly (where appropriate).
	3.6. Rigging equipment and associated plant are positioned for work application and stability according to procedures.
	3.7. Methods of applying ***temporary connections*** using fibre rope are applied according to procedures and the appropriate standard.
4. Erect structures and plant.	4.1. Structures and associated plant are erected according to procedures and site information.
	4.2. Stability of structures and associated plant is maintained during erection according to procedures.
	4.3. Work is conducted safely at heights including safe and effective use of safety equipment.
	4.4. Appropriate communication methods and communication equipment, are used to co-ordinate the tasks.
	4.5. Associated plant and rigging equipment is used

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ELEMENT	PERFORMANCE CRITERIA
	according to procedures and the appropriate standard. 4.6. Temporary guys, ties, propping and shoring, including ***flexible steel wire rope***, and tubing, are connected where required. 4.7. Associated equipment is used in a safe and appropriate manner. 4.8. The completed task is inspected according to the appropriate standard. 4.9. Excess materials are removed from the work area (where applicable).
5. Dismantle structures and plant.	5.1. Structures and associated plant are dismantled according to procedures and the appropriate standard. 5.2. Work is conducted safely at heights including safe and effective use of safety equipment. 5.3. Stability of structures and associated plant is maintained during dismantling according to procedures. 5.4. Rigging equipment, associated equipment, safety equipment and associated plant are inspected for damage and defects. 5.5. All defective rigging equipment, associated equipment, associated plant and safety equipment are isolated reported and recorded according to procedures. 5.6. Rigging equipment and associated equipment are stored. according to procedures and the appropriate standard. 5.7. Hazard prevention/control measures are removed (where appropriate).

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

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REQUIRED SKILLS AND KNOWLEDGE

Required skills for this unit are:

- ability to calculate Safe Working Load (SWL) and Working Load Limit (WLL)
- ability to erect and dismantle, level, plumb and stabilise associated plant and structures
- ability to work safely at heights including the correct application of safety equipment.
- accurate interpretation of basic structural charts and structural plans (site information)
- applying methods for making temporary connections of ropes using fibre and synthetic types
- apply methods of splicing and whipping fibre and synthetic ropes
- correct application and use of all rigging and associated equipment
- risk assessment and hazard control strategies
- interpersonal and communication skills at a level sufficient to site/workplace requirements. This includes the relevant communication methods and equipment.
- verify problems and equipment faults and demonstrate appropriate response.

Required knowledge

Required knowledge for this unit is:

- appropriate mathematical procedures for estimation and measurement of loads
- ability to interpret manufacturer's specifications for all plant and equipment use in rigging operations
- knowledge of principles relating to all plant, equipment and structural stability
- knowledge of the types and functions of rigging, safety and associated equipment including an understanding of their limitations.
- organisational and workplace standards, requirements, policies and procedures for rigging
- understanding of the hierarchy of hazard identification and control
- relevant Commonwealth, state or territory and local government OHS legislation, standards and codes of practice for undertaking rigging activities
- understanding of inspection and maintenance requirements of a wide range of appropriate plant and equipment in line with Australian Standards or manufacturer's specifications
- estimation of ground bearing pressures of the full range of soil types and associated ground conditions for setting up plant and equipment.

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Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

Successful assessment of this unit meets the competency requirement of the National Standard for licensing Persons Performing High Risk Work.

State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for Assessment endorsed by the national body responsible for OHS matters for the assessment of this unit.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- comply with OHS licensing legislation.
- effectively communicate and work safely with others in the work area.
- effectively conduct risk assessment and management procedures.
- effectively complete the following tasks:-
  - inspection of all plant and equipment, and
  - installation of a fall arrest system (Static line), and
  - use of a safety harness / fall arrest system, and
  - installation of crane loading platforms and
  - installation of a safety net, and
  - installation of a shutter and safety screen, and
  - demonstrated ability to work safely at heights, and
  - erection of structural steel, and
  - erection of precast panel, and
  - set up and operation of a winch for load movement, and
  - installation of a materials hoist, or
  - installation of a mast climber.
- effectively demonstrate the following knots,

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	bends and hitches:- • Sheet bend, • Becket hitch, • Running bowline, • Double bowline. • effectively demonstrate the following splices and whippings:- • Eye splice, • Back splice, • Short splice, • Sail makers whipping, • Common whipping, • West countryman's
Context of and specific resources for assessment	Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the National OHS endorsed Assessment Instrument. Assessment of performance must be undertaken either in the workplace or in a realistically simulated workplace setting. Assessors must ensure that the assessment in the workplace is organised to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace. Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints. Assessment is to comply with the requirements of any relevant Standards or operating procedures for basic rigging. Applicants must have access to: • personal protective equipment (PPE) for the purpose of the Performance Assessment. • appropriate safety equipment in safe condition • appropriate rigging equipment, associated equipment associated plant in safe condition as described in the endorsed assessment instrument • communication equipment (e.g. two-way

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	radios) where applicable • appropriate materials as required for safe erection of structures • appropriate materials for conducting fibre rope slicing, whipping, knots, bends and hitches.
Method of assessment	Assessment must be conducted using the national OHS endorsed Assessment Instruments. These Instruments provide advice on their application. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment may be in conjunction with the assessment of other units of competency. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for assessment	Further information about endorsed Assessment Instruments may be obtained from state/territory OHS regulators.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Hazards may include but are not limited to:	• ground stability (e.g. ground condition, recently filled trenches, slopes) • overhead hazards (e.g. power lines, service pipes) (**NB**: minimum clearance distance from powerlines or electrical equipment as determined by relevant state authority or

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RANGE STATEMENT

	electrical supply authority.) • traffic (e.g. pedestrians, vehicles, other plant) • insufficient lighting • environmental conditions (e.g. wind, lightning, storms) • other specific hazards (e.g. dangerous materials).
Hazard control measures:	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: • elimination • substitution • isolation • engineering control measures • using safe work practices • personal protective equipment.
Appropriate standards may include:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards (where applicable).
Site Information may include, but not limited to:	• local conditions such as access and egress, • work method statements, • site specific job safety analyses and other site specific documentation as required. • task plans / Schedules and structural plans.
Forces and Loads may include, but not limited to:	• dead loads • live loads • static load • dynamic loads • wind loads.
Structures may include but are not limited to:	• structural steel • precast panels.
Associated plant may include but not limited to:	• static lines • safety nets • hoists

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RANGE STATEMENT

	• mast climbers • loading platforms.
Appropriate personnel may include:	• engineers • supervisors • colleagues • managers who are authorised to take responsibility for the workplace or operations.

Rigging Equipment may include but is not limited to:	• scaffolds
	• elevated work platforms
	• personnel box
	• cantilevered crane loading platforms
	• mast climbers.
	• safety screens and shutters
	• cranes including but not limited to:
	  • non-slewing cranes
	  • mobile slewing cranes
	  • vehicle loading cranes
	  • tower cranes
	  • self-erecting tower cranes
	  • portal boom cranes
	  • derrick cranes
	  • bridge and gantry cranes.

Associated equipment may include but is not limited to:	• all types of power and manually operated lifting gear • fibre ropes • flexible steel wire rope (FSWR) • chains • wire and synthetic slings • shackles • terminations • wedge sockets • eye bolts • beam clamps • plate clamps • rope grips • turnbuckles • rigging screws • chain blocks • lever blocks • lever-action winches

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RANGE STATEMENT

	• sheaves • spreader bars • lifting beams • jacks • levers • skates • wedges • rollers • girder trolley
Procedures may include but is not limited to:	• manufacturer's guidelines (instructions, specifications or checklists) • industry operating procedures, relevant codes of practice • workplace procedures (work instructions, operating procedures, checklists).
Safety Equipment may include but not limited to:	• safety harness • energy absorber • lanyard • inertia reel • static safety lines • safety nets.
Communication Methods may include but is not limited to:	• verbal and non-verbal language • written instructions • signage • hand signals • listening, • questioning to confirm understanding, and appropriate worksite protocol. **NB**: Mobile phones are not to be used for signalling purposes during the rigging process.
Communication equipment may include but is not limited to:	• fixed channel two-way radios
Hazard prevention/control measures may include but is not limited to:	• safety tags on electrical switches/isolators • powerlines are insulated • safety observer used inside exclusion zone • power disconnected • traffic barricades and control • pedestrian barricades • trench covers

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RANGE STATEMENT

	• movement of obstructions • personal protective equipment • adequate illumination • safety shutters and screens.
Ground suitability may include but is not limited to:	• rough uneven ground • backfilled ground • soft soils • hard compacted soil • rock • bitumen • concrete • suspended concrete floors • building roofs • landings • ground bearing pressure.
Appropriate personnel may include but not limited to	• other riggers • doggers • crane operators.
Temporary connections may include but not limited to:	• knots • bends • hitches • spicing • whipping.
Flexible Steel Wire Rope (***FSWR***) includes:	• identification, uses and connections. May include termination for: • static lines, • guys, • purchase systems, • lashing, • cranes, • hoist and winch ropes.

Unit Sector(s)

Unit sector Construction

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Co-requisite units

Co-requisite units Nil

Functional area

Functional area

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CPCCLRG3002A Licence to perform rigging intermediate level

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit specifies the outcomes required to perform rigging work at the intermediate level, which includes all the outcomes for rigging work at the basic level, and also includes rigging of cranes, rigging of conveyors, rigging of dredges and excavators, rigging associated with tilt slabs, rigging associated with demolition work, and dual lifts for licensing purposes.

Application of the Unit

Application of the unit

This unit requires the applicant to be able plan the work, select and inspect equipment, set up task, erect structures and plant and dismantle structures and plant.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

This unit has a pre-requisite requirement. This requirement may be met by either the successful completion of the unit *CPCCLRG3001A Licence to perform rigging basic level* or holding a valid licence for basic rigging.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units

CPCCLRG3001A	Licence to perform rigging basic level

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. Task to be undertaken is assessed 1.2. Potential workplace ***hazards*** are identified 1.3. ***Hazard control measures*** are identified consistent with ***appropriate standards*** to ensure the safety of personnel and equipment 1.4. Site information is obtained 1.5. All ***forces and loads*** associated with erecting and dismantling ***structures*** and ***associated plant*** are considered in consultation with ***appropriate personnel***. 1.6. ***Rigging equipment*** and ***associated equipment*** are identified in consultation with appropriate personnel

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ELEMENT	PERFORMANCE CRITERIA
	according to ***procedures*** and site information.
	1.7. *Safety equipment* is identified.
	1.8. Appropriate ***communication methods*** are identified with appropriate personnel.
2. Select and inspect equipment.	2.1. Rigging equipment and associated equipment are selected and inspected according to procedures and the appropriate standard.
	2.2. Safety equipment is selected and inspected according to procedures.
	2.3. All defective rigging equipment, associated equipment and safety equipment is isolated, reported and recorded according to procedures.
	2.4. ***Communication equipment*** is selected and inspected for serviceability (where applicable)
3. Set up tasks.	3.1. Appropriate ***hazard prevention***/***control measures*** are applied to the work area according to procedures.
	3.2. ***Ground suitability*** is inspected and checked (where appropriate).
	3.3. Site information is reviewed, interpreted and communicated to appropriate personnel and ***appropriate personnel***.
	3.4. All forces and loads associated with erecting and dismantling structures and associated plant are determined in consultation with appropriate personnel.
	3.5. Safety equipment is fitted and worn correctly (where appropriate).
	3.6. Rigging equipment and associated plant are positioned for work application and stability according to procedures.
4. Erect structures and plant.	4.1. Structures and associated plant is erected according to procedures and site information.
	4.2. Stability of structures and associated plant is maintained during erection according to procedures.
	4.3. Work is conducted safely at heights including safe and effective use of safety equipment.
	4.4. Appropriate communication methods and communication equipment, are used to co-ordinate the tasks.
	4.5. Temporary guys, ties, propping and shoring, including ***flexible steel wire rope***, and tubing, are connected where required.

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ELEMENT	PERFORMANCE CRITERIA
	4.6. Associated plant and rigging equipment is used according to procedures and the appropriate standard. 4.7. Associated equipment is used in a safe and appropriate manner. 4.8. The completed task is inspected according to the appropriate standard. 4.9. Excess materials are removed from the work area (where applicable)
5. Dismantle structures and plant.	5.1. Structures and associated plant are dismantled according to procedures and the appropriate standard. 5.2. Work is conducted safely at heights including safe and effective use of safety equipment. 5.3. Stability of structures and associated plant is maintained during dismantling according to procedures. 5.4. Rigging equipment, associated equipment, safety equipment and associated plant are inspected for damage and defects 5.5. All defective rigging equipment, associated equipment, associated plant and safety equipment are isolated reported and recorded according to procedures. 5.6. Rigging equipment and associated equipment are stored according to procedures and the appropriate standard. 5.7. Hazard prevention/control measures are removed (where appropriate)

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- ability to calculate Safe Working Load (SWL) and Working Load Limit (WLL)

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REQUIRED SKILLS AND KNOWLEDGE

- ability to erect and dismantle, level, plumb and stabilise associated plant and structures
- ability to work safely at heights including the correct application of safety equipment.
- accurate interpretation of structural charts and structural plans (site information)
- correct application and use of all rigging and associated equipment
- risk assessment and hazard control strategies
- interpersonal and communication skills at a level sufficient to site/workplace requirements. This includes the relevant communication methods and equipment.
- verify problems and equipment faults and demonstrate appropriate response.

Required knowledge

Required knowledge for this unit is:

- appropriate mathematical procedures for estimation and measurement of loads
- ability to interpret manufacturer's specifications for all plant and equipment use in rigging operations
- knowledge of principles relating to all plant, equipment and structural stability
- knowledge of the types and functions of rigging, safety and associated equipment including an understanding of their limitations
- organisational and workplace standards, requirements, policies and procedures for rigging
- understanding of the hierarchy of hazard identification and control
- relevant Commonwealth, state or territory and local government OHS legislation, standards and codes of practice for undertaking rigging activities
- understanding of inspection and maintenance requirements of a wide range of appropriate plant and equipment in line with Australian Standards or manufacturer's specifications
- estimation of ground bearing pressures of the full range of soil types and associated ground conditions for setting up plant and equipment.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	Successful assessment of this unit meets the competency requirement of the National Standard

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	for licensing Persons Performing High Risk Work. State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for Assessment for this unit which have been endorsed by the national body responsible for OHS matters.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to:
	• comply with OHS licensing legislation.
	• effectively communicate and work safely with others in the work area.
	• effectively conduct risk assessment and management procedures.
	• effectively complete the following tasks:
	  • adding and removing a tower crane section, or
	  • adding and removing a crane lattice boom section, or
	  • erecting a non guyed tower (e.g. light tower, and
	  • perform a multiple crane lift, or
	  • a multiple winch lift, or
	  • a combination of a crane and winch lift, and
	  • lifting and installing a series of tilt-up panels, or
	  • lifting and installing a series of scenery panels (i.e. entertainment industry), and
	  • demolish/remove a series of tilt-up panel structures, or
	  • demolish/remove a series of scenery panel structures, and
	  • demolishing a concrete encased structural steel column and beam.
	• **NB**: All specifications for these performance tasks are detailed in the endorsed assessment instrument.
	• effectively conduct pre and post operational checks of intermediate rigging equipment.

Context of and specific resources for assessment	Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the

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	endorsed Assessment Instrument. Assessment of performance must be undertaken either in the workplace or in a realistically simulated workplace setting. Assessors must ensure that the assessment in the workplace is organised to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace. Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints. Assessment is to comply with relevant appropriate standard requirements. Applicants must have access to: • personal protective equipment (PPE) for the purpose of the Performance Assessment • appropriate safety equipment is safe condition • appropriate rigging equipment, associated equipment associated plant in safe condition as described in the endorsed assessment instrument • communication equipment (e.g. radios) where applicable • appropriate materials as required for safe erection of structures.
Method of assessment	Assessment must be conducted using the endorsed Assessment Instruments. These Instruments provide advice on their application. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment may be in conjunction with the assessment of other units of competency. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.

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EVIDENCE GUIDE

Guidance information for assessment	Further information about endorsed Assessment Instruments may be obtained from state/territory OHS regulators.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Hazards may include but not limited to:	• ground stability (e.g. ground condition, recently filled trenches, slopes) • overhead hazards (e.g. power lines, service pipes) (**NB**: Minimum clearance distance from powerlines or electrical equipment as determined by relevant state authority or electrical supply authority) • traffic (e.g. pedestrians, vehicles, other plant) • insufficient lighting • environmental conditions (e.g. wind, lightning, storms) • other specific hazards (e.g. dangerous materials).
Hazard control measures:	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: • elimination • substitution • isolation • engineering control measures • using safe work practices • personal protective equipment.

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RANGE STATEMENT

Appropriate standards may include but are not limited to:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards (where applicable).
Site Information may include but is not limited to:	• local conditions such as access and egress • work method statements • site-specific job safety analyses and other site specific documentation as required • task plans /schedules and structural plans.
Forces and Loads may include but are not limited to:	• dead loads • live loads • static load • dynamic loads • wind loads.
Structures may include but not limited to:	• concrete tilt-up panels • scenery panels (used in entertainment) • non guyed light towers.
Associated plant may include but is not limited to:	• all types of cranes • conveyors • dredges • excavators.
Appropriate personnel may include but not limited to:	• supervisors • engineers • colleagues • managers who are authorised to take responsibility for the workplace or operations.

Rigging Equipment may include but is not limited to:	• scaffolds
	• elevated work platforms
	• stages
	• personnel box
	• cantilevered crane loading platforms,
	• mast climbers
	• safety screens and shutters
	• cranes including but not limited to:
	  • non-slewing cranes
	  • mobile slewing cranes
	  • vehicle loading cranes
	  • tower cranes

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RANGE STATEMENT

	• self-erecting tower cranes • portal boom cranes • derrick cranes • bridge and gantry cranes.
Associated equipment may include but is not limited to:	• all associated equipment at the basic rigging level, and • lifting clutches (swift lifts) • chain motors.
Procedures may include but are not limited to:	• manufacturer's guidelines (instructions, specifications or checklists) • industry operating procedures, relevant codes of practice • workplace procedures (work instructions, operating procedures, checklists).
Safety Equipment may include but not limited to:	• safety harness • energy absorber • lanyard • inertia reel • safety nets • static lines.
Communication Methods may include but not limited to:	• verbal and non-verbal language • written instructions • signage • hand signals • listening, • questioning to confirm understanding, and appropriate worksite protocol. **NB**: Mobile phones are not to be used for signalling purposes during the rigging process.
Communication equipment may include but is not limited to:	• fixed channel two-way radios
Hazard prevention/control measures may include but is not limited to:	• safety tags on electrical switches/isolators • powerlines are insulated • safety observer used inside exclusion zone • power disconnected • traffic barricades and control • pedestrian barricades • trench covers • movement of obstructions

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RANGE STATEMENT

	• personal protective equipment • adequate illumination.
Ground suitability may include but is not limited to:	• rough uneven ground • backfilled ground • soft soils • hard compacted soil • rock • bitumen • concrete • suspended concrete floors • building roofs • landings • ground bearing pressure.
Appropriate personnel may include but not limited to:	• other riggers • doggers • crane operators.
Flexible Steel Wire Rope (***FSWR***) includes:	• identification, uses and connections. May include termination for: • static lines • guys • purchase systems • lashing • cranes • hoist and winch ropes.

Unit Sector(s)

Unit sector Construction

Co-requisite units

Co-requisite units Nil

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Functional area

Functional area

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CPCCLRG4001A Licence to perform rigging advanced level

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit specifies the outcomes required to perform rigging work at the advanced level, which includes all the outcomes for rigging work at the basic and intermediate levels, and also includes rigging of gin poles and shear legs, flying foxes and cable ways, guyed derricks and structures, and suspended scaffolds and fabricated hung scaffolds for licensing purposes.

Application of the Unit

Application of the unit

This unit requires the applicant to be able plan the work, select and inspect equipment, set up task, erect structures and plant and dismantle structures and plant.

This unit is based upon the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

This unit has a pre-requisite requirement. This requirement may be met by either the successful completion of the unit *CPCCLRG3002A Licence to perform rigging intermediate level* or holding a valid licence for intermediate rigging.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units

CPCCLRG3002A	Licence to perform rigging intermediate level

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan job.	1.1. Task to be undertaken is assessed. 1.2. Potential workplace ***hazards*** are identified. 1.3. ***Hazard control measures*** are identified consistent with ***appropriate standards*** to ensure the safety of personnel and equipment. 1.4. Site information is obtained. 1.5. All ***forces and loads*** associated with erecting and dismantling ***associated plant*** are considered in consultation with ***appropriate personnel***. 1.6. ***Rigging equipment*** and ***associated equipment*** are identified in consultation with appropriate personnel according to ***procedures*** and site information.

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ELEMENT	PERFORMANCE CRITERIA
	1.7. ***Safety equipment*** is identified. 1.8. Appropriate communication methods are identified with appropriate personnel.
2. Select and inspect equipment.	2.1. Rigging equipment and associated equipment are selected and inspected according to procedures and the appropriate standard. 2.2. Safety equipment is selected and inspected according to procedures. 2.3. All defective rigging equipment, associated equipment and safety equipment is isolated, reported and recorded according to procedures. 2.4. ***Communication equipment*** is selected and inspected for serviceability (where applicable)
3. Prepare site and equipment.	3.1. Appropriate ***hazard prevention***/***control measures*** are applied to the work area according to procedures. 3.2. ***Ground suitability*** is inspected and checked (where appropriate). 3.3. Site information is reviewed interpreted and communicated to appropriate personnel and appropriate personnel. 3.4. All forces and loads associated with erecting and dismantling associated plant are determined in consultation with appropriate personnel. 3.5. Safety equipment is fitted and worn correctly (where appropriate). 3.6. Rigging equipment and associated plant are positioned for work application and stability according to procedures. 3.7. Methods of applying ***temporary connections*** using fibre rope are applied according to procedures and the appropriate standard.
4. Erect structures and plant.	4.1. Associated plant is erected according to procedures and site information. 4.2. Stability of associated plant is maintained during erection according to procedures. 4.3. Work is conducted safely at heights including safe and effective use of safety equipment. 4.4. Appropriate communication methods and communication equipment, are used to co-ordinate the tasks. 4.5. Temporary guys, ties, propping and shoring, including ***flexible steel wire rope***, and tubing, are

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ELEMENT	PERFORMANCE CRITERIA
	connected where required. 4.6. Associated plant and rigging equipment is used according to procedures and the appropriate standard. 4.7. Associated equipment is used in a safe and appropriate manner. 4.8. The completed task is inspected according to the appropriate standard. 4.9. Excess materials are removed from the work area (where applicable)
5. Dismantle structures and plant.	5.1. Associated plant is dismantled according to procedures and the appropriate standard. 5.2. Work is conducted safely at heights including safe and effective use of safety equipment. 5.3. Stability of associated plant is maintained during dismantling according to procedures. 5.4. Rigging equipment, associated equipment, safety equipment and associated plant are inspected for damage and defects 5.5. All defective rigging equipment, associated equipment, associated plant and safety equipment are isolated reported and recorded according to procedures. 5.6. Rigging equipment and associated equipment are stored according to procedures and the appropriate standard. 5.7. Hazard prevention/control measures are removed (where appropriate)

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- ability to calculate Safe Working Load (SWL) and Working Load Limit (WLL)
- ability to erect and dismantle, level, plumb and stabilise associated plant

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REQUIRED SKILLS AND KNOWLEDGE

- ability to work safely at heights including the correct application of safety equipment.
- accurate interpretation of structural charts and structural plans (Site information)
- applying methods for making temporary connections of ropes using fibre and synthetic types
- correct application and use of all rigging and associated equipment
- risk assessment and hazard control strategies
- interpersonal and communication skills at a level sufficient to site/workplace requirements. This includes the relevant communication methods and equipment.
- verify problems and equipment faults and demonstrate appropriate response.

Required knowledge

Required knowledge for this unit is:

- appropriate mathematical procedures for estimation and measurement of loads
- ability to interpret manufacturer's specifications for all plant and equipment use in rigging operations
- knowledge of principles relating to all plant, equipment and structural stability
- knowledge of the types and functions of rigging, safety and associated equipment including an understanding of their limitations
- organisational and workplace standards, requirements, policies and procedures for rigging
- understanding of the hierarchy of hazard identification and control
- relevant Commonwealth, state or territory and local government OHS legislation, standards and codes of practice for undertaking rigging activities
- understanding of inspection and maintenance requirements of a wide range of appropriate plant and equipment in line with Australian Standards or manufacturer's specifications
- estimation of ground bearing pressures of the full range of soil types and associated ground conditions for setting up plant and equipment.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	Successful assessment of this unit meets the competency requirement of the National Standard

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EVIDENCE GUIDE

	for licensing Persons Performing High Risk Work. State/Territory OHS regulators have mandated the use of Assessment Instruments and Instructions for Assessment for this unit which have been endorsed by the national body responsible for OHS matters

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to:
	• comply with OHS licensing legislation.
	• effectively communicate and work safely with others in the work area.
	• effectively conduct risk assessment and management procedures.
	• effectively complete the following tasks:
	  • rig a span rope, or
	  • rig a flying fox, and
	  • install a swinging stage, or
	  • install a bosuns chair, and
	  • set up a gin pole and conduct a lift with a powered winch, and
	  • erect and dismantle a hung or suspended scaffold
	
	NB: All specifications for these performance tasks are detailed in the endorsed assessment instrument.
	• effectively demonstrate the following knots, bends and hitches:
	  • Alpine hitch
	  • Bosun chair hitch
	  • Prusik hitch
	  • Figure eight
	• effectively conduct pre and post operational checks of advanced rigging equipment.

Context of and specific resources for assessment	Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the endorsed Assessment Instrument. Assessment of performance must be undertaken either in the workplace or in a realistically

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EVIDENCE GUIDE

	simulated workplace setting. Assessors must ensure that the assessment in the workplace is organised to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace. Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints. Assessment is to comply with relevant appropriate standard requirements. Applicants must have access to: • personal protective equipment (PPE) for the purpose of the Performance Assessment • appropriate safety equipment is safe condition • Appropriate rigging equipment, associated equipment associated plant in safe condition as described in the endorsed assessment instrument • communication equipment (e.g. radios) where applicable • appropriate materials as required for safe erection and dismantling of performance tasks • appropriate materials for conducting fibre rope knots, bends and hitches.
Method of assessment	Assessment must be conducted using the endorsed Assessment Instruments. These Instruments provide advice on their application. The use of **'simulators'** in the assessment of this unit of competency is **not acceptable**. Assessment may be in conjunction with the assessment of other units of competency. Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for	Further information about endorsed Assessment

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EVIDENCE GUIDE

assessment	Instruments may be obtained from state/territory OHS regulators.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Hazards may include but are not limited to:	• ground stability (e.g. ground condition, recently filled trenches, slopes) • overhead hazards (e.g. power lines, service pipes) (**NB**: Minimum clearance distance from powerlines or electrical equipment as determined by relevant state authority or electrical supply authority) • traffic (e.g. pedestrians, vehicles, other plant) • insufficient lighting • environmental conditions (e.g. wind, lightning, storms) • other specific hazards (e.g. dangerous materials).
Hazard control measures:	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls. It includes the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: • elimination • substitution • isolation • engineering control measures • using safe work practices • personal protective equipment.
Appropriate standards may	• codes of practice

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RANGE STATEMENT

include:	• legislation • Australian Standards • manufacturer's specifications • industry standards (where applicable).
Site information may include but is not limited to:	• local conditions such as access and egress • work method statements • site-specific job safety analyses and other site specific documentation as required • task plans /schedules and structural plans.
Forces and loads may include but are not limited to:	• dead loads • live loads • static load • dynamic loads • wind loads.
Associated plant may include but is not limited to:	• gin poles • flying foxes • shear legs • cable ways • guyed derricks • structures, and • suspended scaffolds • fabricated hung scaffolds.
Appropriate personnel may include but not limited to:	• engineers • supervisors • colleagues • managers who are authorised to take responsibility for the workplace or operations.

Rigging equipment may include but is not limited to:	• scaffolds
	• elevated work platforms
	• stages
	• personnel box
	• cantilevered crane loading platforms
	• mast climbers
	• safety screens and shutters
	• cranes including but not limited to:
	  • non-slewing cranes
	  • mobile slewing cranes
	  • vehicle loading cranes
	  • tower cranes
	  • self-erecting tower cranes

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RANGE STATEMENT

	• portal boom cranes • derrick cranes • bridge and gantry.
Associated equipment may include but not limited to:	• all associated equipment at the basic and intermediate rigging level.
Procedures may include but not limited to:	• manufacturer's guidelines (instructions, specifications or checklists) • industry operating procedures, relevant codes of practice • workplace procedures (work instructions, operating procedures, checklists).
Safety equipment may include but not limited to:	• safety harness • energy absorber • lanyard • inertia reel • safety nets • static lines.
Communication methods may include but are not limited to:	• verbal and non-verbal language • written instructions • signage • hand signals • listening • questioning to confirm understanding • appropriate worksite protocol. **NB**: Mobile phones are not to be used for signalling purposes during the rigging process.
Appropriate personnel may include but are not limited to:	• other riggers • doggers • crane operators.
Communication equipment may include but is not limited to:	• fixed channel two-way radios.
Hazard prevention/control measures may include but are not limited to:	• safety tags on electrical switches/isolators • powerlines are insulated • safety observer used inside exclusion zone • power disconnected • traffic barricades and control • pedestrian barricades • trench covers

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RANGE STATEMENT

	• movement of obstructions • personal protective equipment • adequate illumination.
Ground suitability may include but not limited to:	• rough uneven ground • backfilled ground • soft soils • hard compacted soil • rock • bitumen • concrete • suspended concrete floors • building roofs • landings • ground bearing pressure.
Temporary connections may include but not limited to:	• knots • bends • hitches • whipping.
Flexible Steel Wire Rope (***FSWR***) ***includes***:	• identification, uses and connections. May include termination for: • static lines • guys • purchase systems • lashing • cranes • hoist and winch ropes.

Unit Sector(s)

Unit sector Construction

Co-requisite units

Co-requisite units Nil

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Co-requisite units Nil

Functional area

Functional area

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CPCCOHS1001A Work safely in the construction industry

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to undertake Occupational Health and Safety (OHS) induction training within the construction industry.

It requires the ability to demonstrate personal awareness of OHS legislative requirements, and the basic principles of risk management and prevention of injury and illness in the construction industry.

Licensing requirements will apply to this unit of competency depending on the regulatory requirements of each jurisdiction.

Application of the Unit

Application of the unit

This unit of competency supports the attainment of the basic OHS knowledge required prior to undertaking designated work tasks within any of the sectors within the construction industry. The unit relates directly to the general induction training program specified by the *National Code of Practice for Induction for Construction Work* (ASCC 2007).

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units

Nil

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Prerequisite units Nil

Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify OHS legislative requirements.	1.1. Applicable ***OHS legislative requirements*** relevant to own work, role and responsibilities are identified and explained. 1.2. Duty of care requirements are identified. 1.3. Own responsibilities to comply with ***safe work practices*** are identified and explained.
2. Identify construction hazards and control measures.	2.1. Basic principles of risk management are identified. 2.2. ***Common construction hazards*** are identified and discussed. 2.3. ***Measures for controlling*** hazards and risks are identified.
3. Identify OHS communication and reporting processes.	3.1. OHS communication processes, information and documentation are identified and discussed. 3.2. Role of ***designated OHS personnel*** is identified and explained.

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ELEMENT	PERFORMANCE CRITERIA
	3.3. ***Safety signs and symbols*** are identified and explained. 3.4. Procedures and ***relevant authorities*** for reporting hazards, ***incidents*** and injuries are identified.
4. Identify OHS incident response procedures.	4.1. ***General procedures*** for responding to incidents and ***emergencies*** are identified and explained. 4.2. Procedures for accessing first aid are identified. 4.3. Requirements for the selection and use of relevant ***personal protective equipment*** are identified and demonstrated. 4.4. ***Fire safety equipment*** is identified and discussed.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- communication skills to:
  - clarify OHS legislative requirements
  - verbally report construction hazards and risks
  - ask effective questions
  - relay information to others
  - discuss OHS issues and information
- comprehension skills to:
  - explain the basic OHS legislative requirements which will be applicable to own work
  - explain the meaning of safety signs and symbols
  - identify common construction hazards
  - discuss the basic principles of risk management.

Required knowledge

Required knowledge for this unit is:

- applicable Commonwealth, State or Territory OHS legislation, regulations, standards, codes of practice and industry standards/guidance notes relevant to own

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REQUIRED SKILLS AND KNOWLEDGE

work, role and responsibilities

- basic principles of risk management and assessment for construction work
- common construction hazards
- common construction safety signage and its meanings
- general construction emergency response and evacuation procedures
- general construction work activities that require licenses, tickets or certificates of competency
- general first aid response requirements
- general procedures for raising OHS issues
- general procedures for reporting OHS hazards, accidents, incidents, emergencies, injuries, near misses and dangerous occurrences
- general procedures for responding to hazards, incidents and injuries
- general workers' compensation and injury management requirements
- OHS hierarchy of controls
- OHS responsibilities and rights of duty holders, including:
  - persons in control of construction work/projects
  - employers and self-employed persons
  - supervisors
  - employees
  - designers
  - inspectors
  - manufacturers and suppliers
- own responsibilities to comply with safe work practices relating to:
  - housekeeping
  - identification of hazards
  - preventing bullying or harassment
  - smoking
  - use of amenities
  - use of drugs and alcohol
- role of OHS committees and representatives
- types of common personal protective equipment and fire safety equipment
- types of OHS information and documentation.

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence must confirm personal awareness of the following: • applicable OHS legislative and safety requirements for construction work including duty of care • the range of common construction hazards and procedures for the assessment of risk and application of the hierarchy of control • OHS communication processes, information and documentation including the role of OHS committees and representatives, the meaning of common safety signs and symbols, and procedures for reporting hazards, incidents and injuries • general procedures for responding to incidents and emergencies including evacuation, first aid, fire safety equipment and PPE.
Context of and specific resources for assessment	• Resources must be available to support the program including participant materials and other information or equipment related to the skills and knowledge covered by the program. • It is recommended that the assessment tool designed specifically to support this unit of competency will provide consistency in assessment outcomes. • Where applicable, physical resources should include equipment modified for people with disabilities • Access must be provided to appropriate assessment support when required. • Assessment processes and techniques must be culturally appropriate, and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed • In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in such a

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EVIDENCE GUIDE

	manner as is appropriate to the oracy, language and literacy levels of the operator, any cultural issues that may affect responses to the questions, and reflecting the requirements of the competency and the work being performed.
Method of assessment	Assessment methods may include more than one of the following: • practical assessment • oral questioning • written test • work-based activities • simulated project based activity

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

OHS legislative requirements relate to:	• Australian standards • construction industry OHS standards and guidelines • duty of care • health and safety representatives, committees and supervisors • licences, tickets or certificates of competency • National Code of Practice for Induction Training for Construction Work • national safety standards • OHS and welfare Acts and regulations • safety codes of practice.
Duty of care requirements relate to:	• legal responsibility under duty of care to do everything reasonably practicable to protect others from harm

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RANGE STATEMENT

	• own responsibilities to comply with safe work practices, including activities that require licences, tickets or certificates of competency • relevant state OHS requirements, including employers and self-employed persons, persons in control of the work site, construction supervisors, designers, manufacturers and suppliers, construction workers, subcontractors and inspectors.
Safe work practices include:	• access to site amenities, such as drinking water and toilets • general requirements for safe use of plant and equipment • general requirements for use of personal protective equipment and clothing • housekeeping to ensure a clean, tidy and safer work area • no drugs and alcohol at work • preventing bullying and harassment • smoking in designated areas • storage and removal of debris.
Risk relates to:	• likelihood of a hazard causing injury or harm.
Principles of risk management include:	• assessing the risks involved • consulting and reporting ensuring the involvement of relevant workers • controlling the hazard • identifying hazards • reviewing to identify change or improvement.
Hazard relates to:	• any thing (including an intrinsic property of a thing) or situation with the potential to cause injury or harm.
Common construction hazards include:	• confined spaces • electrical safety • excavations, including trenches • falling objects • hazardous substances and dangerous goods • HIV and other infectious diseases • hot and cold working environments • manual handling • noise • plant and equipment

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RANGE STATEMENT

	• traffic and mobile plant • unplanned collapse • ultraviolet (UV) radiation • working at heights.
Measures for controlling risk to eliminate or minimise hazards in accordance with the hierarchy of control include:	• elimination • substitution • isolation • engineering control • administrative control • personal protective equipment.
OHS communication processes include:	• discussions with OHS representatives • OHS meetings • OHS notices, newsletters, bulletins and correspondence • OHS participative arrangements • processes for raising OHS issues • toolbox talks • workplace consultation relating to OHS issues and changes.
OHS information and documentation includes:	• accident and incident reports • Acts and regulations • Australian standards • codes of practice • construction documentation and plans • emergency information contact • evacuation plans • guidance notes • job safety analyses • labels • material safety data sheets (MSDS) • proformas for reporting hazards, incidents and injuries • reports of near misses and dangerous occurrences • risk assessments • safe work method statements • safety meeting minutes • site safety inspection reports.
Designated OHS personnel includes:	• first aid officers • OHS committee members

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RANGE STATEMENT

	• OHS representatives • supervisors.
Safety signs and symbols include:	• emergency information signs (e.g. exits, equipment and first aid) • fire signs (e.g. location of fire alarms and firefighting equipment) • hazard signs (e.g. danger and warning) • regulatory signs (e.g. prohibition, mandatory and limitation or restriction) • safety tags and lockout (e.g. danger tags, out of service tags).
Relevant authorities include:	• emergency services (e.g. police, ambulance, fire brigade and emergency rescue) • OHS regulatory authority • supervisor.
Incidents include:	• accidents resulting in personal injury or damage to property • near misses or dangerous occurrences which do not cause injury but may pose an immediate and significant risk to persons or property, and need to be reported so that action can be taken to prevent recurrence, for example: • breathing apparatus malfunctioning to the extent that the user's health is in danger • collapse of the floor, wall or ceiling of a building being used as a workplace • collapse or failure of an excavation more than 1.5 metres deep (including any shoring) • collapse or partial collapse of a building or structure • collapse, overturning or failure of the load bearing of any scaffolding, lift, crane, hoist or mine-winding equipment • damage to or malfunction of any other major plant • electric shock. • electrical short circuit, malfunction or explosion • uncontrolled explosion, fire or escape of gas, hazardous substance or steam • any other unintended or uncontrolled incident or event arising from operations carried on at a

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RANGE STATEMENT

	workplace.
General procedures for responding to incidents and emergencies include:	• basic emergency response (keep calm, raise alarm, obtain help) • evacuation • notification of designated OHS personnel and authorities • notification of emergency services (e.g. when and how) • referring to site emergency plans and documentation.
Emergencies include:	• chemical spill • fire • injury to personnel • structural collapse • toxic and/or flammable vapours emission • vehicle/mobile plant accident.
Personal protective equipment includes:	• aprons • arm guards • eye protection • gloves • hard hat • hearing protection • high visibility retro reflective vests • protective, well fitting clothing • respiratory protection • safety footwear • UV protective clothing and sunscreen.
Fire safety equipment includes:	• breathing apparatus • fire blankets • firefighting equipment.

Unit Sector(s)

Unit sector Construction

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Co-requisite units

Co-requisite units Nil

Functional area

Functional area

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CPPSEC3034A Operate information gathering equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to operate equipment to gather information about persons, items or assets. It requires the ability to determine surveillance methods, operate surveillance equipment and document information. It also requires compliance with legislation applicable to investigation processes.

This unit may form part of the licensing requirements for persons engaged in investigative work in those states and territories where these are regulated activities.

Application of the Unit

Application of the unit

This unit of competency has application in a range of work roles in investigative services. Work is performed under limited supervision and competency requires some judgement and decision-making. The knowledge and skills described in this unit are to be applied within relevant legislative guidelines.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge section and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Select equipment required.	1.1 ***Assignment instructions*** are reviewed to identify ***information gathering activities*** and ***equipment*** needs in accordance with client and ***legislative requirements***.
	1.2 Necessary equipment is ***sourced*** and accessed in accordance with assignment instructions.
	1.3 Routine ***pre-operational checks*** are carried out according to ***manufacturer's instructions***.
	1.4 Faults and malfunctions are reported and action initiated to rectify problems or seek replacement as appropriate.
2 Operate equipment.	2.1 Training, licensing and legislative requirements are identified and complied with prior to and during equipment operation.
	2.2 Equipment is operated in a safe and controlled manner according to manufacturer's instructions.
	2.3 ***Occupational Health and Safety*** (***OHS***) ***issues*** are identified and appropriate risk control measures implemented.
3 Maintain and store equipment.	3.1 Cleaning and maintenance of equipment are conducted in accordance with manufacturer's instructions.
	3.2 Complex faults or repair requirements outside area of responsibility or competence are reported for specialist advice.
	3.3 Equipment is stored in a safe and secure area in

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ELEMENT	PERFORMANCE CRITERIA
	accordance with manufacturer's instructions.
	3.4 Records and ***documentation*** are completed and maintained with due regard to client confidentiality.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge and their level required for this unit.

Required skills

- apply safe workplace practices and procedures
- communicate in a clear and concise manner
- communicate using appropriate channels and communication modes
- identify and comply with applicable legal and procedural requirements, including licensing requirements relevant to information gathering activities
- identify faults and determine appropriate repair or replacement action
- interpret and follow instructions and procedures
- maintain inventory of equipment and consumables
- measure and calculate consumption and servicing requirements
- operate a range of information gathering equipment
- organise equipment and resource requirements
- read and interpret basic technical information
- record, report and document information which may be used as evidence
- relate to people from a range of social, cultural and ethnic backgrounds and of varying physical and mental abilities
- risk assessment
- solve routine problems
- use and interpret maps and street directories.

Required knowledge

- applicable licensing and legal requirements relevant to investigative operations
- common and complex equipment faults
- configuration and operation of information gathering equipment used from a vehicle
- interviewing, reviewing and debriefing processes
- legal implications relating to use of ancillary equipment for listening, tracking, observation, record keeping associated with note taking
- observation and monitoring techniques

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REQUIRED SKILLS AND KNOWLEDGE

- operational functions of a range of investigative equipment
- pre-operational checking functions and procedures
- principles of effective communication including interpersonal techniques
- procedures for gathering information by factual investigation or surveillance
- reporting and documentation requirements
- requirements for the securing and storage of information gathering equipment and consumables
- routine maintenance procedures for investigative equipment.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- selecting information gathering equipment appropriate to the investigative operation based on information gathered and a review of client and assignment instructions
- carrying out pre-operational checks and identifying and reporting faulty, malfunctioning or damaged equipment for repair or replacement
- safely and effectively operating a range of information gathering equipment in compliance with applicable legislative and licensing requirements
- Cleaning, maintaining and storing information gathering equipment and completing and maintaining associated records and documentation.

Context of and specific resources for assessment

Context of assessment includes:

- a setting in the workplace or environment that simulates the conditions of performance described in the elements, performance criteria and range statement.

Resource implications for assessment include:

- access to a registered provider of assessment services
- access to a suitable venue and equipment
- access to plain English version of relevant statutes and

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procedures
- assessment instruments including personal planner and assessment record book
- work schedules, organisational policies and duty statements.

Reasonable adjustments must be made to assessment processes where required for people with disabilities. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

This unit of competency should be assessed using questioning of underpinning knowledge and skills.

Guidance information for assessment

Assessment processes and techniques must be culturally appropriate and suitable to the language, literacy and numeracy capacity of the candidate and the competency being assessed. In all cases where practical assessment is used, it should be combined with targeted questioning to assess the underpinning knowledge.

Oral questioning or written assessment may be used to assess underpinning knowledge. In assessment situations where the candidate is offered a choice between oral questioning and written assessment, questions are to be identical.

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Assignment instructions may include:

- client identification information
- incident and security risk response procedures
- investigation purpose and objective
- investigation tasks and procedures
- investigation timeframe
- personal presentation requirements
- premises location and layout

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- reporting and documentation requirements
- resource and equipment requirements
- surveillance plan
- travel routes and schedules.

***Information gathering activities* may include**:

- mobile and static foot surveillance
- mobile and static vehicle surveillance
- use of 35mm camera
- use of electronic surveillance equipment
- use of video equipment.

Equipment for information gathering may include:

- audible and visual warning devices
- binoculars, telephoto lens, tripod
- detection devices
- electronic counter surveillance equipment
- electronic readers and recognition controls
- infra-red, night vision equipment
- measuring tape
- mirrors
- mobile phone and other means of communication
- scanners
- spares and consumables (notepads, guise, pens, film, batteries, licences, street maps, telephone directories, light bulbs, credit cards, cash, protective clothing, public transport tickets, vehicle fuel)
- torch
- videos, cameras, recorders
- voice recorders.

***Legislative requirements* may relate to**:

- applicable commonwealth, state and territory legislation which affects investigative work such as:
  - workplace safety
  - environmental issues
  - equal employment opportunity
  - industrial relations
  - anti-discrimination and diversity
- Australian standards and quality assurance
- authority to conduct investigation
- award and enterprise agreements
- evidence collection
- freedom of information
- licensing arrangements and certification requirements
- privacy requirements
- relevant industry codes of practice
- restrictions in the use of recording devices

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	• surveillance and listening devices • trade practices.
***Sources* of information gathering equipment may include**:	• data • distributor • internal records • manufacturer • market availability • organisational stores • publications such as industry newsletters, advertising brochures, magazines, professional association magazines • retailer.
***Routine pre-operational checks* may include**:	• checking log books and maintenance schedule • cleaning, priming, tightening, basic repairs and adjustments • identification and segregation of unsafe or faulty equipment for repair or replacement • observing and monitoring noise levels for correct operation • visual checks for wear and tear.
***Manufacturer's instructions* may be found in**:	• attached to the equipment • equipment specifications • operator manual • plans and diagrams • printed instruction leaflets • warranty documents.
Occupational Health and Safety* (*OHS*) *issues may relate to:	• potential or existing hazards or risks • safety of self and others.
***Documentation* may include**:	• computer-based information • diary logs • inventory • maintenance records • original and back-up tapes • original, copy and negative film or photographs • record of usage of equipment (written, card, electronic).

Unit Sector(s)

Unit sector	Security

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Competency field

Competency field Investigative services

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FNSORG506A Prepare financial forecasts and projections

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan and schedule a financial forecast or projection, identify assumptions and parameters, and collect, consolidate and analyse data to make forecasts or projections before documenting results and obtaining approval. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit may apply to forecasting job roles in any sector of the financial services industry.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan preparation timetable	1.1. All critical milestones are identified to ensure financial ***forecasts*** and projections can be prepared within timeframes 1.2. Business plans, financial forecasting and processing systems are reviewed to identify timeframes and parameters and any potential conflicts
2. Identify assumptions and parameters	2.1. Business plans and exception reports are reviewed to identify and resolve conflicts in assumptions 2.2. Assumptions and parameters are reviewed to ensure compliance with ***organisation policy and procedures*** 2.3. ***Current and historical financial reports*** are analysed to establish trends and the ***external environment*** examined to gain an objective overview
3. Issue instructions and relevant aids for preparation of forecasts and projections	3.1. Instructions issued are clear and unambiguous and comply with organisation format to ensure ease of use and consistency of interpretation 3.2. Types of business are identified to enable effective ***financial models*** to be selected with training provided to ensure comprehensive understanding and effective use of the models by users
4. Collect, consolidate, model and analyse data	4.1. Data is reviewed to ensure consistency with actual results and model used with analysis results documented in a clear and unambiguous way

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ELEMENT	PERFORMANCE CRITERIA
	4.2. Data collected are reliable, valid, complete and comprehensive 4.3. Processing is completed in accordance with established timetable and data are consolidated in a logical structured format that enables ready analysis
5. Document results and obtain approval	5.1. Results are documented in a clear and understandable manner and in a format suitable to meet needs of target ***users*** 5.2. All approvals are obtained in accordance with management objectives, financial and organisation policies and the results distributed within the timetable

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- well-developed communication skills to:
  - determine and confirm forecasting and projection requirements, using questioning and active listening as required
  - negotiate timelines and responsibilities
  - liaise with others, share information, listen and understand
  - use language and concepts appropriate to cultural differences
- well-developed research and analysis skills for accessing, analysing and managing financial services information and analysing data
- well-developed literacy skills for preparing clear written reports for organisations and business units in required formats
- highly developed numeracy skills for financial calculations and analysis, estimating and forecasting
- IT skills for using integrated financial systems and using spreadsheets and databases and internet information
- learning skills to maintain knowledge of forecasting systems and best practice and procedures
- problem solving skills to identify any forecasting issues that have the potential to impact on organisations and to develop options to resolve these issues when they arise
- organisational skills, including the ability to plan and sequence work and correctly

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REQUIRED SKILLS AND KNOWLEDGE
schedule reporting
Required knowledge
• financial industry codes of practice • forecasting techniques, models and best practice • organisation policy and procedures • relevant Acts and regulations impacting on the financial services industry • relevant legal systems and procedures impacting on the financial services industry

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify, interpret and comply with organisation policies and procedures regarding preparing financial forecasts and projections • apply standard accounting principles and techniques • accurately identify assumptions and parameters of forecasts • collect, consolidate, model and analyse data in a timely manner, document results and obtain approval where required.
Context of and specific resources for assessment	Assessment must ensure: • competency is demonstrated in the context of the financial services work environment and conditions specified in the range statement either in a relevant workplace or a closely simulated work environment • access to and the use of a range of common office equipment, technology, software and consumables • access to an integrated financial software system and data • access to organisational policies and procedures documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples, in combination, are appropriate for this unit: • evaluating an integrated activity which combines the elements of

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EVIDENCE GUIDE	
	competency for the unit or a cluster of related units of competency • verbal or written questioning on underpinning knowledge and skills • setting and reviewing business simulations or scenarios • evaluating samples of work • accessing and validating third party reports.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Forecasts may include:	• capital expenditure • claims • investment income • long-term (e.g. 5 year) • management expenses • premiums • reinsurance levels • short-term (e.g. 1 year).
Organisation policy and procedures may include:	• computer system documentation • internal control guidelines • operations manuals.
Current and historical financial reports may include:	• change in renewal date of policies • commission and charges ratios • customer retention • loss reports • new business reports.
External environment may include:	• activities of competitors • consumer activity

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RANGE STATEMENT	
	• finance markets • government policy • inflation rates • market place • market conditions.
Financial models may include:	• account structure at summary level and key ratios • alternative scenarios • cost or profit centre analysis • format for calculations • standalone or be driven from computer ledgers • sensitivity analysis • simulations.
Users may include:	• Australian Bureau of Statistics (ABS) • banks • branch managers • claims managers • directors • distribution stream managers • finance section • product managers • regional or state managers • shareholders • underwriting managers.

Unit Sector(s)

Unit sector	Organisational skills

Competency field

Competency field	

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Co-requisite units

Co-requisite units		

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ICASAS301A Run standard diagnostic tests

Modification History

Version	Comments
ICASAS301A	This version first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to troubleshoot problems and conduct diagnostic tests on a range of platforms.

Application of the Unit

This unit applies to workers who require the information and communications technology (ICT) skills to run diagnostics to determine the status of a computer.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required*

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Element	Performance Criteria
	skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Identify common symptoms and preventative maintenance techniques	1.1 Develop a ***troubleshooting process*** to help resolve problems 1.2 Determine the ***specific symptoms*** relevant to different types of hardware, operating system and printer problems 1.3 Identify ***common preventative maintenance*** techniques to support maintenance strategies
2. Operate system diagnostics	2.1 Run the system diagnostic program according to specification 2.2 Modify the system configuration as indicated by the diagnostic program 2.3 Carry out preventative maintenance in line with ***organisational guidelines***
3. Scan system for viruses	3.1 Scan the system to check and maintain virus protection 3.2 Report identified viruses to an ***appropriate person*** 3.3 Remove virus infections found by the scan using ***software*** tools and procedures, or by restoring backups 3.4 Document relevant symptom and removal information

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to interpret test results
- communication skills to present information
- literacy skills to interpret computer manuals
- numeracy skills to:
  - interpret results

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    - take test measurements
- planning and organisational skills to plan, prioritise and monitor own work
- problem-solving skills for a defined range of predictable problems
- technical skills to use diagnostic tools.

Required knowledge

- client business domain, including client organisation structure and business functionality
- current industry-accepted hardware and software diagnostic tools, including products that manage:
    - backup procedures
    - configuration procedures
    - diagnostic software and hardware
    - hardware maintenance
    - organisational security procedures
- desktop applications and operating systems.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • troubleshoot hardware and OS problems • conduct diagnostic tests on a range of platforms according to preventative maintenance and diagnostic policy • identify the root causes of the problems • scan systems for computer viruses • remove viruses using software tools and procedures • remove viruses by restoring backups.
Context of and specific resources for assessment	Assessment must ensure access to: • security guidelines • backup procedures • diagnostic software • organisational guidelines • appropriate learning and assessment support when required • modified equipment for people with special needs.

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Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• direct observation of candidate:
	  • troubleshooting problems
	  • conducting diagnostic tests
	  • adhering to organisation's operational procedures
	• review of candidate's documented report of symptom and its removal
	• verbal or written questioning to assess candidate's knowledge of preventative maintenance within organisational guidelines.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Troubleshooting process may include:	• identifying the problem by questioning the user and identifying user changes to computer • performing backups before making changes • establishing a theory of probable cause • testing the theory to determine cause: • once theory is confirmed determine next steps to resolve

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	problem • if theory is not confirmed re-establish new theory or escalate • establishing a plan of action to resolve the problem and implement the solution • verifying full system functionality and if applicable implementing preventative measures • documenting findings, actions and outcomes.
Specific symptoms may include:	• hardware-related symptoms: • alerts • excessive heat • noise • odours • status light indicators • visible damage to cable or plastic • laptop or mobile devices: • issues: • keyboard • pointer • power conditions • stylus • video • wireless card issues • methods: • check LCD cut-off switch • check switch for built-in wi-fi or external antennas • plug in external monitor • remove unneeded peripherals • toggle Fn keys or hardware switches • verify backlight functionality and pixilation • verify power (e.g. LEDs, swap AC adapter) • operating system (OS) related symptoms: • application install • bluescreen • incorrect or incompatible driver • input or output device • print spool stalled • start or load • system lock-up • Windows-specific printing problems • printers:

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	• manage print jobs • failure to print a test page • print spooler • printer properties and settings • use documentation and resources: • internet or web-based • training materials • user or installation manuals.
Common preventative maintenance may include:	• backup procedures • ensuring proper environment • optimising hard drives • power devices appropriate source: • power strip • surge protector • UPS • physical inspection • scanning for viruses • scheduling fault-finding • scheduling preventative maintenance: • check disk • defrag • scandisk • start-up programs • updates: • driver • firmware • OS • security • use of appropriate repair tools and cleaning materials: • compressed air • computer vacuum and compressors • lint-free cloth.
Organisational guidelines may include:	• communication methods • content of emails • dispute resolution • document procedures and templates • downloading information and accessing particular websites • financial control mechanisms • opening mail with attachments • personal use of emails and internet access

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	• virus risk.
Appropriate person may include:	• authorised business representative • client • supervisor.
Software may include:	• diagnostic tools • OS and modules for configuration • types of virus and impact • virus protection software.

Unit Sector(s)

Systems administration and support

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ICAICT302A Install and optimise operating system software

Modification History

Version	Comments
ICAICT302A	This version first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit defines the performance outcomes, skills and knowledge required to install operating system (OS) software and to make adjustments as a means of optimising the system to accommodate business and client needs.

Application of the Unit

This unit applies to individuals in a technical support role who are required to identify the most suitable OS to meet organisational requirements. The unit develops the ability to install, configure and optimise the OS to identified vendor specifications.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised*

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Element	Performance Criteria
unit of competency.	*text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Determine function of operating system	1.1 Identify and demonstrate understanding of the purposes of ***operating system***
	1.2 Distinguish between batch system, real-time system, multi-tasking system
	1.3 Compare and contrast different operating systems and their features
	1.4 Identify and demonstrate knowledge of the basic functions of operating system, including file system, memory management, process scheduling
	1.5 Identify and demonstrate management of virtual memory
2. Obtain operating system	2.1 Contact operating system vendors to obtain technical specifications and system requirements
	2.2 Identify the process and steps required to install and configure the operating system using ***installation components***
	2.3 Document adjustment recommendations and provide to ***appropriate person***
	2.4 Determine and apply knowledge of licensing, hardware and security requirements
3. Install, configure and optimise operating system	3.1 Install, configure and test operating system using installation components and ***boot-utility options***
	3.2 Use the relevant ***operating system user interface*** to correctly configure the installation
	3.3 Optimise the system to meet ***organisational requirements***
	3.4 Document the system according to organisational requirements
	3.5 Install the operating system with minimal disruption to ***client*** or users
4. Provide instruction to meet new software	4.1 Provide one-to-one instruction about changes to the client or users as required

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requirements	4.2 Obtain client evaluation about new system to ensure requirements are met, using appropriate ***feedback mechanism***

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - liaise with people working across different levels and in different contexts, such as operating system vendors and clients
- literacy skills to:
  - interpret technical computer installation manuals
  - obtain written and verbal feedback from clients
  - present information, such as the use of diagnostic tools
  - provide verbal instructions to client
- technical skills to:
  - install and configure operating system software
  - write instructions for clients.

Required knowledge

- current industry-accepted hardware and software products
- functions and features of operating systems used by the organisation
- installation and configuration of systems software
- architecture of current technical systems
- deployment of current organisational systems
- organisational requirements for operating system software
- prerequisites for system software installation
- set-up and configuration procedures
- software packages supported by the organisation
- system’s current functionality
- system’s diagnostic software
- vendor specifications and requirements for installation.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • install, configure and test an operating system to improve system performance with minimum disruption to clients.
Context of and specific resources for assessment	Assessment must ensure access to: • personal computer where installation may be performed • OS software and technical documentation • organisational documentation • appropriate learning and assessment support when required • modified equipment for people with special needs.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:
	• direct observation of candidate:
	  • questioning team members, supervisors and clients
	  • installing and testing an operating system
	• review of candidate's practical assignments and reports.

Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Operating system may include:	• Linux:
	  • Debian
	  • Fedora
	  • Google Chrome OS
	  • Kubuntu
	  • Linux Mint
	  • Red Hat
	  • Ubuntu
	• Mac OS X
	• Microsoft Windows:
	  • Windows 2000
	  • Windows XP (32 bit versus 64 bit)
	  • Windows Vista (32 bit versus 64 bit)
	  • Windows 7 (32 bit versus 64 bit)
	• mobile operating systems:
	  • Android
	  • Blackberry
	  • iPhone
	  • Palm
	  • Symbian
	  • Windows Phone 7 series.

Installation components may include:	• configure power management:
	  • hibernate
	  • sleep timers
	  • standby
	  • suspend
	  • wake on local area network (LAN)
	• demonstrate safe removal of peripherals
	• device manager:
	  • driver signing
	  • install and update devices drivers

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	• verify
	• directory structures:
	  • create folders
	  • navigate directory structures
	• disk preparation order:
	  • format drive
	  • partition
	  • start installation
	• files:
	  • attributes
	  • creation
	  • extensions
	  • permissions
	• file systems, such as FAT32 versus new technology file system (NTFS)
	• installation methods:
	  • boot media, such as DVD, CD, floppy or universal serial bus (USB)
	  • factory recovery partition
	  • install from image
	  • network installation
	  • recover CD
	• operating system installation options:
	  • file system type
	  • network configuration
	  • repair install
	• user data migration - user state migration tool (USMT)
	• verification of hardware compatibility and minimum requirements
	• virtual memory.

Appropriate person may include:	• authorised business representative • client • supervisor.
Boot-utility options may include:	• automated system recovery (ASR) • boot options • boot to restore point • disk boot order or device priority • emergency repair disk (ERD) • recovery console • recovery options • safe mode

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	• types of boot devices (disk, network, USB).

Operating system user interface may include:	• Windows-adopting interface to undertake similar tasks with chosen operating system:
	  • administrative tools, such as performance monitor, event viewer, services and computer management
	  • command prompt utilities, such as ipconfig, Ping and Telnet
	  • control panel
	  • location of basic network settings between OS versions
	  • MMC
	  • my computer
	  • my network places or home group
	  • run line utilities:
	  • cmd
	  • direct diagnostics (DXdiag)
	  • msconfig
	  • MSINFO32
	  • REGEDIT
	  • start menu
	  • task bar or systray
	  • task manager
	  • Windows Explorer - Libraries in Windows 7.

Organisational requirements may include:	• availability of system to be optimised • client support documentation • in-house or vendor • contracting arrangements relating to IT purchasing • IT policy and procedures relating to service levels and installation • level of complexity of technical manuals.
Client may include:	• department within the organisation • person with special needs • person within a department • third party.
Feedback mechanism may include:	• interview • meeting • questionnaire • survey.

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Unit Sector(s)

General ICT

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ICAICT303A Connect internal hardware components

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to modify and connect system hardware components according to client and user requirements.

Application of the Unit

This unit applies to support technicians who modify and connect system components. Ensuring the integrity of the system after the operation is critical in the context of minimising client disruption and need for continuing desktop operation.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills*

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Element	Performance Criteria
	and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Identify, categorise and distinguish between the different types of internal hardware components	1.1 Identify and categorise the different ***internal hardware components*** 1.2 Explain the purpose and characteristics of the different internal hardware component categories 1.3 Distinguish between the different types of devices within each internal hardware component category
2. Determine components required	2.1 Identify and clarify user internal hardware component requirements according to ***organisational guidelines*** 2.2 Organise and record user component requirements, pass on to ***appropriate person*** for evaluation and vendor selection
3. Obtain components	3.1 Contact vendors to obtain technical specifications for the proposed components 3.2 Assess the options and provide recommendations to the appropriate person for final analysis 3.3 Obtain components to prepare for installation
4. Install components	4.1 Develop plans, with prioritised tasks and contingency arrangements, for the installation of selected components with minimum disruption to ***clients*** 4.2 Liaise with appropriate person to obtain approval for the plans 4.3 Install and configure components according to plan, installation procedures and ***organisational requirements*** 4.4 Test components for error-free performance, using available technology 4.5 Identify and resolve identified problems 4.6 Test and enhance system performance, using knowledge of the system, to meet organisational benchmarks 4.7 Document the installation and configuration process according to organisation guidelines
5. Evaluate modified	5.1 Collect client or user feedback and analyse against client

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system	requirements 5.2 Correct identified shortcomings in the system and record actions

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - consult with peers and supervisors, and internal and external clients
  - interpret technical computer installation manuals
  - interpret user manuals and help functions
- literacy skills to:
  - organise resources for one-to-one instruction
  - plan, prioritise and organise work
  - write technical reports and maintain records
- planning and organisational skills to address technical issues
- problem-solving skills to anticipate and respond to a range of driver-related errors that may arise
- technical skills to:
  - comprehend how the operating system will communicate with the installed component
  - install components
  - test components using available technology
  - test system performance.

Required knowledge

- areas of the operating system relevant to configuration and testing
- current industry-accepted hardware and software products
- environmental considerations in e-waste disposal
- organisational guidelines and organisational requirements with regard to safety, recycling and component installation
- system's diagnostic software and current functionality
- vendor specifications and requirements for component installation.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • identify and categorise the different types of internal hardware components • modify system's hardware to meet client requirements • plan the modification and connect internal hardware components according to vendor and technical specifications • install components across a variety of situations and account for unexpected contingencies.
Context of and specific resources for assessment	Assessment must ensure access to: • personal computer and internal hardware components for installation • current industry standard performance testing software • documents detailing organisational guidelines and requirements • technical manuals and tools • appropriate learning and assessment support when required • modified equipment for people with special needs. Note: The careful planning and promotion of hardware upgrades and changes are critical to the effective support of business functions. Hardware modifications need to be risk managed similar to other business processes. The effective management and execution of the component maintenance and replacement process may significantly determine the amount of downtime a company encounters.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate’s knowledge of system diagnostic software and system functionality • direct observation of candidate connecting internal hardware components • evaluation of client requirements and candidate’s final recommendations

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	• review of candidate's written notes. Note: Evidence for assessment from industry or vendor-certified training may be presented for the whole or part of this unit depending on the range of variables and performance criteria.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Internal hardware components may include:	• adapter card components:
	  • communications:
	  • modem
	  • network interface card (NIC)
	  • I/O:
	  • parallel
	  • small computer system interface (SCSI)
	  • serial
	  • universal serial bus (USB)
	  • multimedia:
	  • capture cards
	  • sound card
	  • TV tuner cards
	  • video:

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	• AGP • peripheral component interconnect (PCI) • PCIe • cooling system components: • CPU and case fans • heat sinks • liquid cooling systems • thermal compound • CPU components and features: • 32 bit versus 64 bit • hyper threading • identify CPU types: • AMD • Intel • multi-core: • dual core • quad core • triple core • onchip cache: • L1 • L2 • speed (real versus actual) • display device components: • connector types: • component or RGB • DVI pin compatibility • HDMi • S-Video • VGA • LCD technologies: • contrast ratio • native resolution • resolution (e.g. XGA, SXGA+, UXGA, WUXGA) • projectors, CRT and LCD • settings: • degauss • multi-monitor • refresh rate • resolution

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	• memory components and features:
	  • ECC versus non-ECC
	  • parity versus non-parity
	  • single channel versus dual channel
	  • single sided versus double-sided
	  • speed:
	  • PC100
	  • PC133
	  • PC2700
	  • PC3200
	  • DDR3-1600
	  • DDR2-667
	  • types:
	  • DRAM
	  • SRAM
	  • SDRAM
	  • DDR or DDR2 or DDR3
	  • RAMBUS
	• motherboard components:
	  • basic input/output system (BIOS), complementary metal oxide semiconductor (CMOS) or Firmware:
	  • CMOS battery
	  • POST
	  • bus architecture
	  • bus slots:
	  • AGP
	  • AMR
	  • CNR
	  • PCI
	  • PCIe
	  • Personal Computer Memory Card International Association (PCMCIA)
	  • chipsets
	  • contrast RAID (levels 0, 1, 5)
	  • form factor:
	  • ATX or BTX
	  • micro ATX
	  • NLX
	  • I/O interfaces:
	  • IEEE 1394 or Firewire

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	• modem • NIC • parallel • PS/2 • serial • sound • USB 1.1 and 2.0 • video • memory slots: • DIMM • RIMM • SIMM • SODIMM • parallel advanced technology attachment (PATA): • EIDE • IDE • processor sockets • riser card or daughterboard • serial advanced technology attachment (SATA) • eSATA • power supply components: • AC adapter • ATX proprietary • pins (20, 24) • voltage selector switch • voltage, wattage and capacity • storage devices and backup media components: • floppy disk drive (FDD) • hard disk drive (HDD): solid state versus magnetic • optical drives, such as CD, DVD, RW or blu-ray • removable storage: • external CD-RW and hard drive • hot swappable devices and non-hot swappable devices • solid state (e.g. thumb drive, flash, SD cards, USB) • tape drive.
Organisational guidelines may include:	• communication methods • content of emails • dispute resolution • document procedures and templates • downloading information and accessing particular websites

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	• financial control mechanisms • opening mail with attachments • personal use of emails and internet access • virus risk.
Appropriate person may include:	• authorised business representative • client • supervisor.
Clients may include:	• department within the organisation • person within a department • third party.
Organisational requirements may include:	• how and what the organisation wants in regard to work environment • preventative maintenance and diagnostic policy • problem solution processes • roles and technical responsibilities in the IT department • vendor and product service level support agreements.

Unit Sector(s)

General ICT

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ICASAS305A Provide IT advice to clients

Modification History

Version	Comments
ICASAS305A	This version first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to provide IT advice and support to clients, including the communication of comprehensive technical information.

Application of the Unit

This unit applies to frontline technical support personnel responsible for providing technical support explained in terms that a user can understand.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills*

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Element	Performance Criteria
	and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Review client support issues	1.1 Check for new problems logged by client 1.2 Check previous logs for similar problems or requests from client 1.3 Investigate and document the support issues affecting the client 1.4 Notify client of the results of ***investigation*** and provide ***advice and support*** on findings 1.5 Obtain client feedback and make changes
2. Provide advice on software, hardware or network	2.1 Confirm software, hardware or network requirements with client 2.2 Investigate and document a ***solution*** 2.3 Document additional requirements identified in the investigation and refer them to the client 2.4 Obtain approval from the client to implement the solution 2.5 Investigate and document the amount of technical support the client may require 2.6 Discuss and agree the level of technical support identified with the client 2.7 Arrange a time with the client when support will take place 2.8 Provide technical support as part of group or one-to-one instruction to the client 2.9 Provide manuals and help ***documentation*** to the client
3. Obtain client feedback	3.1 Create an appropriate evaluation or feedback form or other mechanism to gather feedback about the solution and support provided 3.2 Provide client with instructions on how to complete the form or use other means of providing feedback 3.3 Distribute the evaluation or feedback to the client 3.4 Review the feedback from the client to identify areas for improvement

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to review client requirements and provide advice and support on findings
- communication skills to:
  - convey and clarify complex information
  - investigate and assess client needs
  - provide one-to-one instruction to client
- customer-service skills to communicate with clients in a range of contexts at various levels
- literacy skills to:
  - develop reports
  - document:
    - additional requirements
    - amount of technical support the client may require
    - solutions
    - support issues affecting the client
  - interpret technical manuals
- technical communication skills to write macros and templates.

Required knowledge

- available in-house and vendor support
- contract and service agreements with vendors
- features of different types of hardware supported by the organisation
- information sources
- operating system (OS):
  - functions and basic features
  - supported by the organisation
- security and network guidelines and procedures
- software:
  - advanced features
  - functions
  - supported by the organisation.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • investigate client support requests and provide a documented solution after consultation with client • convey comprehensive technical information to clients in a clear, concise, jargon-free and coherent manner • access technical manuals and 'help' documentation.
Context of and specific resources for assessment	Assessment must ensure access to: • sites, peers and supervisors for obtaining information • software, hardware and networks • help-desk repository, technical records and documentation • appropriate learning and assessment support when required • modified equipment for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of candidate investigating and providing advice and support on findings • review of candidate's documented investigation and solution • evaluation of client feedback.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Client may include:	• employee • external organisation • individual • internal department.
Investigation may include:	• active listening to clients and colleagues • contacting vendor or maintenance organisations • on-site examination • questions and answers • reviewing technical advice about the organisation.

Advice and support may include:	• hardware supported by the organisation:
	  • CD or DVD drives
	  • laptops
	  • notebooks
	  • printers
	  • reconfiguration of settings
	  • scanners
	  • screens
	• identification of training needs for referral to supervisor
	• manuals
	• one-to-one training
	• provision of client documentation
	• software supported by the organisation:
	  • creation of templates
	  • generation of a complex report on a database
	  • password and log-on procedure
	  • statistical functions of spreadsheets
	  • use of macros
	• vendor documentation.

Solution may include:	• hardware:
	  • new
	  • upgrade
	• implementing a new system

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	• software:
	  • new
	  • upgrade
	• user training.

Documentation may include:	• additional support requirements • amount of technical support the client requires • client support solutions • collection of records for computer program, OS or hardware device • support issues affecting the client.

Unit Sector(s)

Systems administration and support

Custom Content Section

Not applicable.

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ICANWK305A Install and manage network protocols

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install and manage network protocols in a networking environment.

Application of the Unit

This unit applies to network administrators who are required to ensure that appropriate protocols have been installed in networks to allow user functionality. The role will also involve the maintenance of installed protocols.

This unit requires the application of transmission control protocol or internet protocol (TCP/IP) and OSI models. Protocols transcend organisational size and network complexity.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria

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Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

Elements and Performance Criteria

1. Install and manage network protocols	1.1 Select, test and validate appropriate ***network protocol services***
	1.2 Design a ***network*** addressing system, with subnet and host IDs, including appropriate ***devices***
	1.3 Configure hosts and workstations to use IP addresses either manually or through automatic allocation of addresses, such as found with dynamic host configuration protocol (DHCP)
2. Identify network protocol applications	2.1 Review a range of well-known network protocol ***applications***
	2.2 Evaluate client user requirement and recommend network-protocol services
	2.3 Apply IP addressing scheme according to approved policy and procedures

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to evaluate client user requirements and map to appropriate protocols
- learning skills to ensure currency with protocols development
- literacy skills to interpret technical manuals
- organisational skills to plan, prioritise and organise work
- problem-solving skills to develop and refine configuration protocols

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- technical skills to:
  - configure workstations
  - develop strategic initiatives when designing a network addressing system
  - test components using available technology
  - write detailed technical notes.

Required knowledge

- client business domain, including client organisation structure and business functionality
- current communications technologies and their associated protocols
- current industry-accepted hardware and software products and general features and capabilities
- network protocols currently in use in organisation and industry
- vendor product range and development directions.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • configure, test and validate network protocols in order to facilitate interconnectivity • install and manage network protocols in a network, and troubleshoot when problems arise.
Context of and specific resources for assessment	Assessment must ensure access to: • a live network • application software and operating system • appropriate learning and assessment support when required • modified equipment for people with special needs • networked computers • organisational guidelines • technical documentation and installation manuals • vendor software.
Method of assessment	A range of assessment methods should be used to assess practical

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	skills and knowledge. The following examples are appropriate for this unit: • verbal or written questioning to assess candidate's knowledge of communications technologies and network protocols • direction observation of candidate configuring network or application protocols • review of candidate's analysis of client user requirements and final recommendations • evaluation of performance test results conducted by candidate.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Network protocol services may include:	• address resolution protocol (ARP) • DHCP • electronic mail protocols • file transfer protocol (FTP) • H.323 protocol • hypertext transfer protocol (HTTP) • internet protocol (IP) • internet protocol version 4 (IPv4) • internet protocol version 6 (IPv6) • simple network management protocol (SNMP)

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	• simple object access protocol (SOAP) • TCP/IP • wireless application protocol (WAP).
Network may include:	• large and small local area networks (LANs) • virtual private networks (VPNs) • wide area networks (WANs) • wireless local area networks (WLANs).
Devices may include:	• emulators • gateways • routers.
Applications may include:	• FTP • HTTP • hypertext transfer protocol secure (HTTPS) • secure shell • secure socket layer (SSL) • simple mail transfer protocol (SMTP) • Telnet (not secure).

Unit Sector(s)

Networking

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ICANWK406A Install, configure and test network security

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to install, configure and test network security in an information and communications technology (ICT) network.

Application of the Unit

This unit applies to information technology (IT) professionals who install, configure and test secure networks of any size.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the*

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Element	Performance Criteria
	required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Assess network security threats and vulnerabilities to identify risk	1.1 Assess and report on current ***system*** security, according to required ***asset*** security level 1.2 Determine additional ***network, software, hardware*** and system ***security threats*** and ***vulnerabilities*** 1.3 Use identified threats and vulnerability information to identify security risks 1.4 Make recommendations to management to address security deficiencies, according to current and future ***commercial and business requirements***
2. Implement countermeasures for identified vulnerabilities and threats	2.1 Implement required level of ***perimeter security*** based on current and future business needs 2.2 Assess and implement best practice ***server*** and network ***hardening techniques*** and measures 2.3 Implement secure authentication and user account controls 2.4 Secure ***data integrity*** and transmission
3. Test and verify functionality and performance of security system implemented	3.1 Design test items to verify key function and performance measures against criteria 3.2 Conduct function and performance tests recording results 3.3 Modify and debug security system as necessary 3.4 Develop documentation on current system settings and file for future reference
4. Provide systems for monitoring and maintaining security	4.1 Monitor current network security, including physical aspects, using appropriate third-party testing software where applicable 4.2 Review logs and audit reports to identify and record security incidents, intrusions or attempts 4.3 Carry out spot checks and audits to ensure that

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	procedures are not being bypassed 4.4 ***Document*** newly discovered security threats, vulnerabilities and risks in a report for presentation to ***appropriate person*** to gain approval for changes to be made

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - analyse systems evaluation
  - review system security logs for breaches
- communication skills to liaise with clients
- literacy skills to write reports for evaluating system security status according to organisational security policies
- numeracy skills to undertake a cost-benefit comparison
- problem-solving skills to:
  - determine intrusion detection
  - troubleshoot and debug
- research skills to identify and analyse network security methodologies and technologies
- technical skills to:
  - develop enterprise policies strategies and procedures
  - implement local area network (LAN), wide area network (WAN), virtual private network (VPN) and wireless local area network (WLAN) solutions
  - implement security strategies and configure network security software and hardware
  - install hardware and software related to improving network security
  - undertake a network security risk assessment.

Required knowledge

- authentication issues
- overview knowledge of:
  - client business domain, including client organisation structure and business functionality
  - features and capabilities of networking technologies

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  - privacy issues and privacy legislation
  - security information sources
  - risk analysis
- common VPN issues, including bandwidth and dynamic security environment
- configuring routers and switches
- current industry-accepted hardware and software security products, with broad knowledge of general features and capabilities
- function and operation of VPN concepts, including encryption, firewalls, packet tunnelling and authentication
- network protocols and operating systems
- organisational issues surrounding security
- security perimeters and their functions
- security protocols, standards and data encryption
- security threats, including eavesdropping, data interception, data corruption, data falsification
- types of VPNs, including site-to-site, user-to-site internet traffic and extranets
- systems and procedures related to:
  - audit and intrusion detection systems
  - auditing and penetration testing techniques
  - cryptography
  - LAN, WLAN and WAN
  - screened subnets
  - transmission control protocols or internet protocols (TCPs/IPs) and applications
  - use of virus detection software.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • assess and identify security threats, vulnerabilities and risks • determine appropriate countermeasure for threat, vulnerability or risk • implement countermeasure per threat or risk • install, configure and test network elements to ensure perimeter security • test and verify function and performance of selected security

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	measures • monitor network for suspicious activity taking appropriate action where necessary • document newly discovered threats, vulnerabilities and risks, including change recommendations for approval.
Context of and specific resources for assessment	Assessment must ensure access to: • site where secure network installation may be conducted • network security documentation • equipment specifications • network components • hardware and software • firewalls (hardware and software) • live network • organisational guidelines • networked (LAN) computers • WAN service point of presence • appropriate learning and assessment support when required. Where applicable, physical resources should include equipment modified for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • documentation of current system security analysis that outlines required enterprise security requirements • identification of additional security threats and vulnerabilities • verbal or written questioning to assess candidate's knowledge of network security • direct observation of candidate performing tasks required to successfully install, configure and test a secure network • direct observation of candidate performing tasks required to successfully test function and performance of secure network • direct observation of candidate performing tasks required to successfully monitor and document newly discovered security threats, vulnerabilities and risks.

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Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

System may include:	• applications • databases • gateways • operating systems • servers • WAN communication links • workstations.
Asset may include:	• data and information • intellectual property • physical assets.
Network may include:	• intranets • large and small LANs • internet • VPNs • WANs • WLANs.
Software may include:	• applications: • commercial

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	• customised • in-house • packaged • encryption modules • operating systems • security: • antivirus • firewall • spyware • utilities: • audit • network monitoring.
Hardware may include:	• analog modems • digital subscriber line (DSL) modems • firewall devices • network cabling • wired and wireless networks • notebooks • personal computers • routers • servers • switches • workstations.
Security threats may include:	• by-pass • denial of service • eavesdropping • elevation of privilege • hacking • impersonation • manipulation • penetration • repudiation • viruses or malicious code.
Vulnerabilities may relate to:	• application bugs • communications devices • firmware flaws • firewall misconfigurations • operating system bugs • poor bandwidth control measures • transmitting data in plain text • unnecessary services and protocols

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	• weak authentication techniques • weak permissions • weak physical security.
Commercial and business requirements may include:	• availability • backup and recovery of data • confidentiality • firewalls • hacking prevention • integrity • password logons • remote access to internal network.
Perimeter security may include:	• access control • auditing • authentication • authorisation • hardware or software firewalls • identification • network address translation (NAT) • surveillance.
Server may include:	• application • web • email • file and print • firewall • file transfer protocol (FTP) • proxy, cache • voice over internet protocol (VoIP).
Hardening techniques may include:	• demilitarised zones (DMZ) • encryption • intrusion detection system (IDS) • operating system patch application and management • rigid shared resource permissions • service pack application • strong firewall configurations, including unused port blocking • strong physical security • strong user authentication techniques • unused services and protocols disablement.
Data integrity may include:	• encryption • hash encoding • protocol control • VPN.

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Document may include:	• audit trails • International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and Australian Standards (AS) standards • naming standards • project management templates • report writing principles • security analysis report • version control.
Appropriate person may include:	• supervisor • authorised business representative • client.

Unit Sector(s)

Networking

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ICANWK417A Build an enterprise wireless network

Modification History

Release	Comments
Release 1	This Unit first released with *ICA11 Information and Communications Technology Training Package version 1.0*

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to build an enterprise, community or mesh wireless network within and outside buildings.

Application of the Unit

This unit applies to individuals working in senior design roles in the networking area who are required to develop complex wireless networks for organisations.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement.*

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Element	Performance Criteria
	Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1. Confirm client requirements and network equipment required	1.1 Identify and clarify organisational ***requirements*** of the client 1.2 Evaluate client requirements along with business needs in order to translate into technical requirements 1.3 Review existing network design ***documentation*** to ensure it is authorised, current and complete 1.4 Identify ***network topology*** 1.5 Identify the ***components*** required to be installed to meet the technical requirements 1.6 Contact vendors and service suppliers to obtain specifications and availability of identified components 1.7 Ensure preliminary work is completed within the required timeframe
2. Prepare for installation	2.1 Ensure client and ***users*** are aware of date and time of installation 2.2 Gather, prepare and check installation and safety equipment 2.3 Assess on-site safety arrangements for installers and users
3. Select, install and configure access points and other wireless devices	3.1 Select appropriate ***hardware*** based on identified components 3.2 Install and configure hardware to provide wireless access to network 3.3 Ensure connections are secured against intrusion or data access by unauthorised persons, are safe for users, and are protected from the environment 3.4 Configure ***security***, monitoring, logging and quality of service features consistent with ***standards*** and protocols 3.5 Ensure test equipment is calibrated 3.6 Test wireless network systems performance and verify that it meets enterprise requirements and is consistent with standards and protocols

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4. Select, install and configure antennas	4.1 Select appropriate antennas based on design plan 4.2 Safely install and configure antennas to provide wireless access to network 4.3 Measure and assess signal strength within and outside building 4.4 Resolve and report radio frequency interference issues
5. Secure wireless network	5.1 Identify possible security threats to ***assets*** 5.2 Configure client server and helper security devices 5.3 Configure associations and filters
6. Train users	6.1 Provide training for users to establish and manage network connections 6.2 Resolve pairing and log-on difficulties for users 6.3 Inform users of wireless network etiquette and traffic capacity issues 6.4 Advise users of help-desk contact details
7. Monitor and administer wireless network	7.1 Monitor wireless network performance using diagnostic ***tools***, including appropriate software 7.2 Debug networking issues to maintain trouble-free wireless connection 7.3 Document current settings and store securely consistent with ***commercial and business requirements***
8. Finalise build process	8.1 Review network for performance issues, planned maintenance or upgrade requirements 8.2 Report to client with network documentation and recommendations for performance issues 8.3 File documentation according to organisational outlines

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to design, develop and implement various wireless network solutions

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- communication skills to:
  - communicate with users
  - liaise with vendors and obtain prices and product details
  - train users
- numeracy skills to prepare a cost-benefit analysis
- planning and organisational skills to plan and manage project according to time lines and cost schedules
- problem-solving skills to troubleshoot and debug
- technical skills to:
  - implement local area networks (LANs)
  - implement wireless networking strategies and configure wireless network software and hardware.

Required knowledge

- detailed knowledge of:
  - audit and intrusion detection systems
  - auditing and penetration testing techniques
  - bandwidth and quality of service
  - factors affecting signal quality
  - layer 2 and layer 3 design issues
  - small office home office (SOHO) and enterprise LANs
  - transmission control protocols or internet protocols (TCPs/IPs) and applications
  - wireless security strategies
  - wireless topologies
  - wireless local area network (WLAN) and wireless area network (WAN) solutions
- overview knowledge of:
  - features of security threats
  - network protocols and operating systems
  - security protocols, standards and data encryption.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for	Evidence of the ability to:

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assessment and evidence required to demonstrate competency in this unit	• develop and maintain wireless networks.
Context of and specific resources for assessment	Assessment must ensure access to: • network technical requirements • network infrastructure, including wireless hardware and software • appropriate learning and assessment support when required • modified equipment for people with special needs.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: verbal or written questioning to assess candidate's knowledge of: • wireless topologies • wireless security networks • wireless security strategies • review of candidate's client report and supporting documentation with recommendations.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, where appropriate. Assessment processes and techniques must be culturally appropriate, and suitable to the communication skill level, language, literacy and numeracy capacity of the candidate and the work being performed. Indigenous people and other people from a non-English speaking background may need additional support. In cases where practical assessment is used it should be combined with targeted questioning to assess required knowledge.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Requirements may include:	• how and what the organisation wants in regard to work environment • preventative maintenance and diagnostic policy • problem solution processes • roles and technical responsibilities in network management • vendor and product service level support agreements.
Client may include:	• external organisations • individuals • internal departments • internal employees.
Documentation may follow:	• audit trails • client training • International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and Australian Standards (AS) standards • maintaining equipment inventory • naming standards • project-management templates and report writing • satisfaction reports • version control.
Network topology may include:	• cabled, connected or single zone • carrier links • free space optics • indoor and outdoor installations • local multi-point distribution service (LMDS) • multi-channel multi-point distribution service (MMDS) • multiple zone • satellite connections • stand-alone or multi-zone wireless networks.

Components may include:	• hardware, such as:
	  • antennas and other connectivity devices
	  • digital subscriber line (DSL) modems
	  • mobile equipment

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	• modem wireless access points • networks • personal computers • power controllers • remote sites • servers • uninterruptible power supplies (UPS) • workstations • cabling, such as: • category 5e, 6 and 7 • coaxial • fibre optic • software, such as: • commercial applications • customised • in-house • organisation specific • packaged • wireless access.
Users may include:	• community members • department • department within the organisation • third party.
Hardware may include:	• access points • bridges • other wireless devices.
Security may include:	• authentication, authorisation and accounting (AAA) • diameter • IP security (IPSec) • lightweight extensible authentication protocol (LEAP) • privacy key management (PKM) • secure sockets layer (SSL) • smart cards • tokens • wi-fi protected access (WPA) • wired equivalent privacy (WEP).

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Standards may include:	• International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), Institute of Electrical and Electronics Engineers (IEEE), Internet Engineering Task Force (IETF), International Telecommunication Union (ITU) and Australian Standards (AS) • organisational • project.
Assets may include:	• data and information • intellectual property • physical assets.
Tools may include:	• cable testing • carrier-connection tests • data and voice-integration measurements • equipment testing • frequency and spectrum analysers • network performance software • policing and shaping tools • power meters • radiation meter.
Commercial and business requirements may include:	• availability • backup and recovery of data • confidentiality • firewalls • hacking prevention • integrity • password logons • remote access to internal network.

Unit Sector(s)

Networking

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TLILIC2005A Licence to operate a boom-type elevating work platform (boom length 11 metres or more)

Modification History

Release 2. This is the second release of this unit in the TLI10 Transport and Logistics Training Package Version 4.0.

In Release 2 the spelling of ‘meters’ has been changed to ‘metres’ throughout the unit (typo).

Release 2 is equivalent to the previous release.

Unit Descriptor

This unit specifies the outcomes required to operate a boom-type elevating work platform (boom length 11 metres or more) for licensing purposes, and involves the operation of a telescoping device, hinged device, or articulated device or any combination of these used to support a platform on which personnel, equipment and materials may be elevated to perform work. The 11 metre boom length shall be taken to mean the greater of the following:

(a) The vertical distance from the floor of the platform to the surface supporting the elevating work platform with the platform at its maximum height; or

(b) The nominal reach, measured horizontally from the centre point of rotation to the outer edge of the platform in its most extended position.

Application of the Unit

This unit requires the operator to plan the work, conduct routine checks, set up elevating work platform, operate elevating work platform and shut down and secure elevating work platform.

This unit is based on the requirements of the National Standard for Licensing Persons Performing High Risk Work.

This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Nil.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1 Plan work	1.1	Potential workplace hazards are identified
	1.2	Hazard control measures are identified consistent with appropriate standards to ensure the safety of personnel and equipment
	1.3	Elevating work platform is appropriate for the task
	1.4	Appropriate communication methods are identified
2 Conduct routine checks	2.1	Service logbook for elevating work platform is checked for compliance
	2.2	Elevating work platform is visually checked for any defects or damage according to procedures
	2.3	Routine pre-operational checks are carried out according to procedures
	2.4	Safety equipment is inspected according to procedures
	2.5	Elevating work platform is accessed in a safe manner
	2.6	Fit safety equipment and secure to platform according to procedures
	2.7	All controls are located and identified
	2.8	Elevating work platform is started according to procedures
	2.9	All safety devices are identified and tested according to procedures
	2.10	Post-start operational checks are carried out according to procedures
	2.11	All communication equipment is checked (where applicable)

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	2.12	All defects and damage are reported and recorded in according to procedures, and appropriate action is taken
3 Set up elevating work platform	3.1	Ground suitability is inspected and checked
	3.2	Elevating work platform is driven to or located at work area according to procedures (where applicable)
	3.3	Elevating work platform is positioned for work application and stability according to procedures
	3.4	Appropriate hazard prevention/control measures are applied to the work area according to procedures
	3.5	Work gear and tools are stowed and secured
4 Operate elevating work platform	4.1	Elevating work platform is operated using all relevant plant movements according to procedures and the appropriate standards
	4.2	Elevating work platform is mobiled using best mobile practice and appropriate procedures
	4.3	Elevated working platform operations are monitored constantly ensuring safety of personnel and stability
	4.4	Unplanned and/or unsafe situations are responded to in line with procedures
5 Shut down and secure elevating work platform	5.1	Elevating work platform is lowered and stowed according to procedures
	5.2	All relevant motion locks and brakes are applied (where applicable)
	5.3	Safety equipment is disconnected from platform
	5.4	Egress from elevated work platform is conducted according to procedures
	5.5	Outriggers/stabilisers are stowed and secured according to procedures (where applicable)
	5.6	Plates or packing are stowed and secured (where applicable)
	5.7	Elevating work platform is shut down according to procedures
	5.8	Routine post-operational checks are carried out according to procedures
	5.9	All defects and damage are reported and recorded according to procedures, and appropriate action is taken

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Required Skills and Knowledge

This section describes the knowledge and skills required for this unit.

Required knowledge:

- Appropriate mathematical procedures for estimation of loads, to ensure that the elevating work platform is not overloaded
- Commonwealth, state or territory OH&S legislation, standards and codes of practice relevant to the full range of processes for conducting elevating work platform operations
- Ability to read and comprehend manufacturer's instructions, procedures and safety signs
- Understanding of elevating work platform operations and operating techniques
- Emergency procedures and safety equipment, including the use of safety harness, energy absorber, lanyard and anchor points
- Understanding of organisational and workplace standards, requirements, policies and procedures for conducting elevating work platform operations
- Understanding of the hierarchy of hazard identification and control
- Procedures for the recording, reporting and maintenance of workplace records and information, including the use of the service logbook
- Typical routine problems encountered in the process and with equipment and adjustments required for correction

Required skills:

- Accurately record and maintain information relating to elevating work platform operations
- Assess ground conditions to confirm that the site is suitable (e.g. firm, level and safe) to extend and travel the elevating work platform
- Complete the positioning, stabilising, set up of elevating work platforms, including the use of outriggers/stabilisers and packing
- Operate mobile elevating work platform using best mobile practice
- Use communication skills at a level sufficient to communicate with other site personnel
- Operate and control an elevating work platform including all functions to their maximum extension within the safe working (rated) capacity
- Apply risk assessment and hazard control strategies, including hierarchy of control as applied to the positioning and safe operation of the elevating work platform (particular awareness of the risks associated with overhead powerlines/electrical cables, ground conditions, wind, pedestrians and tipping)
- Use and interpret manufacturer's specifications and data
- Identify problems and equipment faults and where practicable demonstrate appropriate response procedures

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills, the range statement and the assessment guidelines for this Training Package.

Overview of assessment	• Successful assessment of this unit meets the competency requirement of the National Standard for Licensing Persons Performing High Risk Work. • State/territory OH&S regulators have mandated the use of Assessment Instruments and Instructions for Assessment for this unit which have been endorsed by the national body responsible for OH&S matters.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	• Compliance with OH&S licensing legislation. • Emergency procedures and safety equipment, including the use of safety harnesses, energy absorbers, lanyard and anchor points. • Assessment of ground conditions to confirm that the site is suitable (e.g. firm, level and safe) to extend and travel the elevating work platform. • Risk assessment and hazard control strategies, including hierarchy of control as applied to the positioning and safe operation of the elevating work platform (particular awareness of the risks associated with overhead powerlines/electrical cables, ground conditions, wind, pedestrians and tipping). • Appropriate procedures for estimation of loads, to ensure that the elevating work platform is not overloaded. • Positioning and operation of the elevating work platform to ensure that the safest lift is performed.
Context of and specific resources for assessment	• Assessment of the safe and effective application of knowledge and skill to workplace tasks (performance) must be undertaken using the endorsed Assessment Instrument. • Assessment of performance must be undertaken either in the workplace or in a realistically simulated workplace. • Assessors must ensure that the assessment in the workplace is organised to ensure that all the required equipment and materials and a suitable working area is made available to suit the assessment and the workplace. • Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints. • Assessment is to comply with relevant appropriate standard requirements.

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	• Applicants must have access to:
	  • Personal Protective Equipment (PPE) for the purpose of the Performance Assessment
	  • appropriate safety equipment in safe condition
	  • appropriate elevated working platform and associated equipment in safe condition
	  • communication equipment (e.g. two-way radios, mobile phones etc.) where applicable.

Method of assessment	• Assessment must be conducted using the endorsed Assessment Instruments. These Instruments provide advice on their application. The use of 'simulators' in the assessment of this unit of competency is not acceptable. • Assessment may be in conjunction with the assessment of other units of competency. • Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstances, but is able to be transferred to other circumstances.
Guidance information for assessment	• Further information about endorsed Assessment Instruments may be obtained from state/territory OH&S regulators.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Hazards may include:	• ground stability (e.g. ground condition, recently filled trenches, slopes) • overhead hazards (e.g. powerlines, service pipes, trees, buildings etc.) • insufficient lighting • traffic (e.g. pedestrians, vehicles, plant) • environmental conditions (e.g. wind, lightning, storms, etc.) • other specific hazards (e.g. tidal areas, chainsaws, pressure washers, dangerous materials
Hazard control measures may include:	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls

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	It includes the application of the hierarchy of control - the six-step preference of control measures to manage and control risk: 1. elimination 2. substitution 3. isolation 4. engineering control measures 5. using safe work practices 6. personal protective equipment
Appropriate standards may include:	• codes of practice • legislation • Australian Standards • manufacturer's specifications • industry standards (where applicable)
Elevating work platform may include:	The operation of a telescoping device, hinged device, or articulated device or any combination of these used to support a platform on which personnel, equipment and materials may be elevated to perform work. Excluded from this definition are platforms of less than 11 metres boom length. The 11 metre boom length shall be taken to mean the greater of the following: (a) The vertical distance from the floor of the platform to the surface supporting the elevating work platform with the platform at its maximum height; or (b) The nominal reach, measured horizontally from the centre point of rotation to the outer edge of the platform in its most extended position
Communication method may include:	• verbal and non-verbal language • written instructions • signage • hand signals • listening • questioning to confirm understanding • appropriate worksite protocol
Service logbook may include:	• any logbook • service book • history record system where the service and maintenance history is kept
Procedures may include:	• manufacturer's guidelines (instructions, specifications, operators manual or checklists) • industry operating procedures • workplace procedures (work instructions, operating procedures,

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	checklists)
Safety equipment may include:	• safety harness • energy absorber • lanyard • anchor points
Safety devices may include:	• horns/sirens • audible and visual reversing devices • operator restraint devices (platform gate) • lights (where applicable)
Communication equipment may include:	• two-way radios • mobile phone
Ground suitability may include:	• rough uneven ground • backfilled ground • soft soils • hard compacted soil • rock • bitumen • concrete
Stability may include:	• deploying outriggers • establishing correct size plates or packing • correctly positioning plates or packing
Hazard prevention/control measures may include:	• safety tags on electrical switches/isolators • insulated powerlines • safety observer used inside exclusion zone • disconnected power • traffic barricades and controls • illumination requirements • pedestrian controls • trench covers • movement of obstructions • personal protective equipment • suitable area for set-up • suitable firm and stable standing
Relevant plant movements may include:	• raising boom • lowering boom • slewing • hinging • articulating • telescoping
Best mobile practice	• minimum speed

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may include:	• gentle acceleration and braking • minimum boom/jib length • avoiding ground depressions
Unplanned and/or unsafe situations may include:	• loss of power • failure of controls • contact with overhead electrical conductors • damage caused by contact with obstructions • illness of personnel
Shut down may include:	• retracting boom/jib (where applicable) • folding boom/jib into the transport position • retracting outriggers/stabilisers • idling engine to stabilise temperature • turning off engine (where applicable) • removing key from ignition (where applicable)

Unit Sector(s)

Not Applicable.

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