



**Australian Government**

# **ICTTEN4245A Design infrastructure for telecommunications network installations**

**Release 1**

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## Modification History

Release	Comments
Release 1	This version first released with <i>ICT10 Integrated Telecommunications Training Package Version 3.0</i> .

## 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.

## 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
<i>Elements describe the essential outcomes of a unit of competency.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.</i>

## Elements and Performance Criteria

1. Prepare for design of infrastructure work	<p>1.1 Review preparation to ensure work complies with requirements of <b>relevant legislation, codes, regulations and standards</b></p> <p>1.2 Notify <b>customer</b> to arrange site access and obtain plans and specifications</p> <p>1.3 Conduct <b>site survey</b> to verify that <b>infrastructure</b> design requirements can be met</p> <p>1.4 Identify site <b>hazards</b> and notify appropriate personnel to make site safe</p> <p>1.5 Develop a design activity schedule to minimise disruption to the workplace according to relevant regulations and standards</p> <p>1.6 Discuss <b>material supplies, safety equipment, resources, tools and test equipment</b> with the construction group so that they are available when required for installation</p>
2. Design network equipment infrastructure	<p>2.1 Prepare infrastructure designs according to electrical safety and work health and safety (WHS) and environmental requirements after consultation with operational staff</p> <p>2.2 Design metal superstructure to house equipment according to manufacturer specifications</p> <p>2.3 Design cable pathways, including cable distribution frames and support materials, according to specifications</p>
3. Design power infrastructure	<p>3.1 Design power supply and earthing according to specifications and standard electrical practices</p> <p>3.2 Design battery and rectifier equipment for project according to manufacturer and WHS requirements</p> <p>3.3 Design high Ohmic distribution (HOD) and associated power distribution systems</p>
4. Design and monitor DC power distribution work	<p>4.1 Design <b>power distribution work</b> to meet electrical safety requirements and certifications</p> <p>4.2 Monitor electrical work by <b>qualified personnel</b> to ensure compliance with installation plan</p> <p>4.3 Identify and rectify faults where possible or escalate according to enterprise policy</p>
5. Complete documentation and restore site	<p>5.1 Attach infrastructure <b>labels and designations</b> according to enterprise requirements</p> <p>5.2 Complete inspection sheets and declare asset ready for next</p>

	<p>stage of installation using appropriate sign-off documentation</p> <p>5.3 Clean up and prepare site in readiness for next installation phase</p> <p>5.4 Notify carrier and obtain sign-off</p>
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## 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 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.
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### 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.

## Evidence Guide

*The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.*

<b>Overview of assessment</b>	
<b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b>	<p>Evidence of the ability to:</p> <ul style="list-style-type: none"> <li>• conduct a site survey to identify infrastructure features, including:             <ul style="list-style-type: none"> <li>• potential earthing locations</li> <li>• cable routes</li> <li>• locations for cables trays, data cabinets, telecommunication enclosures, and distributors</li> </ul> </li> <li>• design infrastructure for access network</li> <li>• design protective earth and functional earth installations</li> <li>• design power infrastructure</li> <li>• design and monitor DC power distribution work.</li> </ul>
<b>Context of and specific resources for assessment</b>	<p>Assessment must ensure:</p> <ul style="list-style-type: none"> <li>• site where installation of supporting infrastructure may be conducted</li> <li>• use of plant, tools and equipment currently used in industry</li> <li>• relevant regulatory and equipment documentation that impacts on work activities.</li> </ul>
<b>Method of assessment</b>	<p>A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:</p> <ul style="list-style-type: none"> <li>• direct observation of the candidate designing metal superstructure to house equipment</li> <li>• direct observation of the candidate designing protective earth and functional earth installations</li> <li>• review of design drawings prepared by the candidate</li> <li>• oral or written questioning to assess knowledge of design issues, types of systems and applications.</li> </ul>
<b>Guidance information for assessment</b>	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:</p>

- 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.



## Range Statement

*The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.*

<p><b><i>Relevant legislation, codes, regulations and standards</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• appropriate licences:             <ul style="list-style-type: none"> <li>• crane</li> <li>• forklift</li> <li>• winch</li> </ul> </li> <li>• AS Communications Cabling Manual (CCM) Volume 1</li> <li>• AS/ACIF S008:2006</li> <li>• AS/ACIF S009:2006</li> <li>• AS/NZS 3000:2007</li> <li>• AS/NZS 3080:2003</li> <li>• AS/NZS 3084:2003</li> <li>• AS/NZS 3085.1:2004</li> <li>• AS/NZS IEC 61935.1:2006</li> <li>• AS/NZS IEC 61935.2:2006</li> <li>• AS/NZS ISO/IEC 14763.3:2007</li> <li>• AS/NZS ISO/IEC 15018:2005</li> <li>• AS/NZS ISO/IEC 24702:2007</li> <li>• Australian Construction Industry Forum (ACIF) standards and codes</li> <li>• cabling security codes and regulations</li> <li>• Environment Protection Acts</li> <li>• WHS Acts and relevant codes and standards.</li> </ul>
<p><b><i>Customer</i></b> may be:</p>	<ul style="list-style-type: none"> <li>• architect</li> <li>• asset manager</li> <li>• builder</li> <li>• nominated representative</li> <li>• project manager</li> <li>• service provider.</li> </ul>
<p><b><i>Site survey</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• access</li> <li>• cable tunnels</li> <li>• equipment bays</li> <li>• floor layout</li> <li>• floor loadings</li> <li>• lighting</li> <li>• preparation area</li> </ul>

	<ul style="list-style-type: none"> <li>• roof structures</li> <li>• ventilation requirements</li> <li>• wall structures.</li> </ul>
<b>Infrastructure</b> may include:	<ul style="list-style-type: none"> <li>• air conditioning requirements</li> <li>• alarm panels</li> <li>• cable entries</li> <li>• distribution frames</li> <li>• duct and cable trays</li> <li>• electrical supply</li> <li>• equipment racks</li> <li>• power supplies</li> <li>• radio structure.</li> </ul>
<b>Hazards</b> may include:	<ul style="list-style-type: none"> <li>• building debris</li> <li>• earth potential rise (EPR)</li> <li>• glass fibre</li> <li>• live power lines</li> <li>• manual handling</li> <li>• mud and water</li> <li>• natural gas and other gas build-up</li> <li>• needle stick injury</li> <li>• optical fibre cable, which may contain hazardous light</li> <li>• radio frequency (RF) equipment emitting radiation</li> <li>• remote power feeding services that operate at above telecommunications network voltage (TNV)</li> <li>• vermin.</li> </ul>
<b>Material supplies</b> may include:	<ul style="list-style-type: none"> <li>• back shelf cards</li> <li>• cable racks</li> <li>• cable trays, nuts and bolts</li> <li>• distribution frames or blocks</li> <li>• earth terminal and rod</li> <li>• frames and cabinets</li> <li>• insulation blocks</li> <li>• iron support structures</li> <li>• jumper wire</li> <li>• lacing, twine and cable ties</li> <li>• patch panels</li> <li>• termination blocks.</li> </ul>
<b>Safety equipment</b> may include:	<ul style="list-style-type: none"> <li>• electrical isolators</li> <li>• elevated work platforms (EWP)</li> <li>• harnesses</li> <li>• manual lifters</li> </ul>

	<ul style="list-style-type: none"> <li>• personal protective equipment: <ul style="list-style-type: none"> <li>• acid proof clothing</li> <li>• earmuffs</li> <li>• face masks</li> <li>• gloves</li> <li>• head protection</li> <li>• kneepads</li> <li>• safety boots</li> <li>• safety glasses</li> </ul> </li> <li>• safety barriers.</li> </ul>
<b>Resources</b> may include:	<ul style="list-style-type: none"> <li>• finance</li> <li>• labour</li> <li>• materials</li> <li>• tools and test equipment</li> <li>• vehicles.</li> </ul>
<b>Tools and test equipment</b> may relate to:	<ul style="list-style-type: none"> <li>• test equipment: <ul style="list-style-type: none"> <li>• anti-static testers</li> <li>• cable testers</li> <li>• displacement tools</li> <li>• humidity and temperature testers</li> <li>• insulation testers</li> <li>• load testers</li> <li>• multimeters</li> <li>• optical fibre power meters</li> <li>• oscilloscopes</li> <li>• tong meters</li> <li>• volt meters</li> </ul> </li> <li>• tools: <ul style="list-style-type: none"> <li>• anti-static wrist strap</li> <li>• PC board or sub-rack removal tool</li> <li>• pliers</li> <li>• power drills</li> <li>• screwdrivers</li> <li>• sockets</li> <li>• soldering irons</li> <li>• spanners.</li> </ul> </li> </ul>
<b>WHS and environmental requirements</b> may relate	<ul style="list-style-type: none"> <li>• decommissioning and isolating work site and lines before work begins</li> <li>• environmental considerations:</li> </ul>

to:	<ul style="list-style-type: none"> <li>• clean-up protection</li> <li>• stormwater protection</li> <li>• waste management</li> <li>• identifying other services, including power and gas</li> <li>• safety equipment: <ul style="list-style-type: none"> <li>• flashing lights</li> <li>• gas and other hazard detection equipment</li> <li>• safety barriers</li> <li>• trench guards</li> <li>• warning signs and tapes</li> <li>• witches hats</li> </ul> </li> <li>• safe work practices, such as the safe use and handling of: <ul style="list-style-type: none"> <li>• asbestos</li> <li>• chemicals</li> <li>• materials</li> <li>• tools and equipment</li> <li>• work platforms</li> </ul> </li> <li>• special access requirements</li> <li>• suitable light and ventilation.</li> </ul>
<b><i>Power distribution work</i></b> may include:	<ul style="list-style-type: none"> <li>• 240V rectifier panels</li> <li>• back-up motor generator set</li> <li>• certifying electrical installation</li> <li>• installation of power distribution panel and cables</li> <li>• termination and connection of power cables to equipment</li> <li>• testing of electrical cabling.</li> </ul>
<b><i>Qualified personnel</i></b> may include:	<ul style="list-style-type: none"> <li>• confined spaces worker</li> <li>• electrical contractor</li> <li>• internal electrician</li> <li>• lines worker</li> <li>• power company staff</li> <li>• track worker.</li> </ul>
<b><i>Labels and designations</i></b> may include:	<ul style="list-style-type: none"> <li>• cabinets</li> <li>• cables</li> <li>• distribution panels</li> <li>• racks</li> <li>• vendor labels.</li> </ul>

## **Unit Sector(s)**

Telecommunications - Telecommunications networks engineering