Australian Government

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

Release 1

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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.

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.*

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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 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.

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.
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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 required to demonstrate competency in this unit	Evidence of the ability to: • 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. 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 • 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 network (ODN) may include:	• distribution fibre • distribution joint acting as and feeding LMs (DLM) • 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 - 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 include:	• 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	• alarms • electrical services

include:	• 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 include:	• delay • dispersion • optical attenuation and loss measurements • optical power levels • phase.

Unit Sector(s)

Telecommunications - Broadband and wireless networks