Australian Government

ICTRFN2163B Install a satellite antenna

Release 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

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
- 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 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
- 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.
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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
- 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: • 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
	• 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
	• 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.
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