



Australian Government

Department of Education, Employment and Workplace Relations

ICTRFN3055A Install a radio communications antenna and feedline

Release: 1

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.
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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	

Prerequisite units		

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.
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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 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	4.1. Complete and store appropriate records and test results according to enterprise policy

ELEMENT	PERFORMANCE CRITERIA
and clean up site	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

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

REQUIRED SKILLS AND KNOWLEDGE

- 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
- 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 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:

EVIDENCE GUIDE

	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

RANGE STATEMENT	
	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 • 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

RANGE STATEMENT	
	• 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 • 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

RANGE STATEMENT	
	• 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
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Co-requisite units

Co-requisite units		

Competency field

Competency field	Radio frequency networks
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