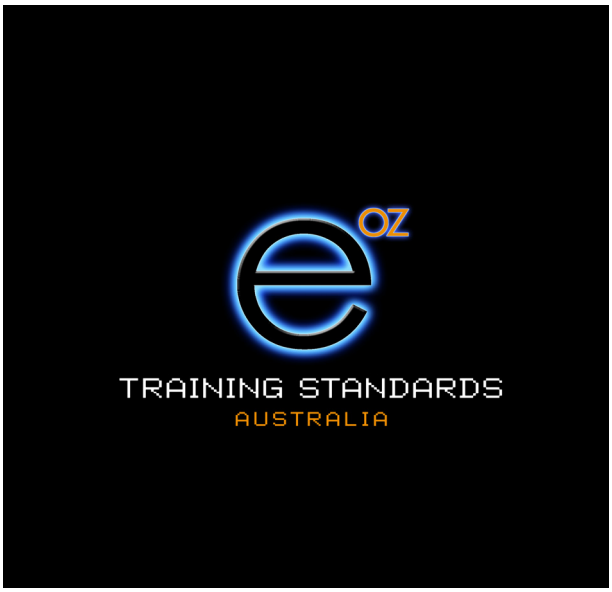
Competency Standard Units VC
Vegetation



UET06

Electricity Supply Industry
Transmission, Distribution and Rail Sector
Training Package

Volume 2 — Part 2.1
Competency Standard Units
VC – Vegetation

Volume 2 of 2

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Vegetation Units

UETTDRVC01A Cut vegetation above ground outside live work zone near live electrical apparatus (climbing)

Unit Descriptor 1)

This Unit covers cutting and/or pruning vegetation above ground (using climbing techniques) level and removal of vegetation obstructions up to the climber exclusion zone as defined for both Authorised and Instructed Persons in the industry guidelines associated with live electrical apparatus using the established cutting plan relevant to the vegetation type. It encompasses the safe use of appropriate/specialised tools and equipment according to requirements and established procedures. It includes the utilisation of climbing techniques in conjunction with aerial emergency rescue procedures and, inspection and preparation of climbing equipment with recommendations for corrective action being referred to appropriate authorities.

It includes safely accessing trees from above ground level to install restraints/slings, removing tree limbs in a safe manner and, clearing debris from the felling site to eliminate the occurrence of electrical incidents. It DOES NOT include entry of persons, mobile plant, equipment, and/or specialised tools into to the safe approach distance (SAD) as defined.

Also included is the preparation of risk assessment control measures that encompass job safety assessment. All work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, industry bi-partite body – Guidelines/Codes of Practices or other related requirements for safe work and access near live electrical and mechanical apparatus.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

UETTDRVC07A	Monitor safety compliance for vegetation work near live electrical apparatus

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	2	Writing	2	Numeracy	2

Application of the Unit

3)

This unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice

3.1)

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply..

Competency Field

4)

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to cut/prune vegetation above ground (using climbing technique) up to the vegetation exclusion zone near live electrical apparatus.	1.1 Work instructions and cutting plan are received and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the work to be performed in accord with the cutting are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.

1.4 Suggestions to assist and/or improve meeting the cutting of vegetation above ground level outside the climber exclusion zone near electrical apparatus outcomes are made to others involved in the work.

1.5 Hazards are identified, OHS risks associated with working near live electrical apparatus are identified and reported according to established procedures.

1.6 Scope of responsibility under the relevant work permit(s)/access authorisation(s) identified according to requirements and established procedures with relevant personnel.

1.7 Resources including, equipment, tools, approved platforms and personal protective equipment required for the job are obtained and, in working order according to established procedures.

1.8 Relevant responsibility associated with First Aid, working aloft, and/or other related work safety procedures at the worksite are confirmed in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.

1.9 Client issues including environmental values are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.

1.10 Site is prepared to produce a quality outcome, follow sustainable energy principles and practices, and to minimise risk and damage to property, commerce, stock and individuals in accordance with established procedures.

1.11 Road signs, barriers and warning devices are obtained and positioned in accordance with given instructions and requirements.

1.12 Pre-operational checks are undertaken to confirm safe and correct operation of tools and equipment for safe use near live electrical apparatus according to requirements and established procedures.

1.13 Work permit(s)/access authorisation(s) are confirmed and received, where applicable, for commencement of the work according to requirements and established procedures with relevant personnel.

2	Carry out the cutting/pruning of vegetation above ground (using climbing technique) up to the vegetation exclusion zone near live electrical apparatus.	2.1 OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are followed in accordance with given instructions, requirements and/or established procedures.
		2.2 Lifting, climbing, working in confined spaces and/or aloft, and use of tools/equipment, techniques and practices are safely followed in accordance with given instructions and, according to requirements confirmed to eliminate the prospects of incidents.
		2.3 Operational knowledge for the cutting of vegetation above ground level outside the climber exclusion zone near electrical apparatus is confirmed to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements and established procedures and established procedures.
		2.4 Cutting of vegetation above ground level outside the climber exclusion zone near electrical apparatus is carried out in accordance with the cutting plan and work schedule and, given instructions and established procedures.
		2.5 Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are monitored and reported/referred to the immediate authorised personnel for directions according to established procedures.
		2.6 Non-routine events are referred to the immediate authorised personnel for directions according to established procedures.
		2.7 Problems associated with cutting vegetation above ground level outside of the vegetation exclusion zone near electrical apparatus are attended to using acquired known solutions and skills related to routine procedures to ensure work instructions and established procedures are met.
		2.8 On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.

3	Complete the cutting/pruning of vegetation above ground (using climbing technique) up to the vegetation exclusion zone near live electrical apparatus.	3.1 Work undertaken is checked against cutting plan and work schedule, work schedule and anomalies reported to Authorised personnel in accordance with established procedures.
		3.2 Accidents and/or incidents are actioned and reported to authorised personnel in accordance with established procedures.
		3.3 Work site is rehabilitated, cleaned-up, sustainable energy principles and practices applied, and made safe in accordance with given instructions and established procedures or an agreed standard.
		3.4 Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.5 Appropriate personnel are notified of work completion according to established procedures.
		3.6 Post-operational checks, minor maintenance and/or relevant documentation of equipment and tools/platform are conducted according to requirements.
		3.7 Requirements for returning work permit(s) and/or access authorisation permits are confirmed, where applicable.
		3.8 Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of cutting vegetation above ground outside live work zone near live electrical apparatus (climbing).

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.18.1 Occupational Health and Safety principles

E2.18.2 Electrical Safe working practice

T2.3.1 Powerline safety practices

T2.5.5 Powerline clearances and approach distances

T2.5.16	Climbing techniques
T2.5.17	Emergency procedures for climbers
T2.8.1	Enterprises specific - policies and procedure instructions
T2.8.2	Enterprises specific - OHS instructions

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to the cutting and/or pruning vegetation above ground level (using climbing technique) and removal of vegetation obstructions up to the climber exclusion zone as defined for both Authorised and Instructed Persons in the industry guidelines associated with live electrical apparatus.

Utilisation of climbing techniques in conjunction with aerial emergency rescue procedures and, inspection and preparation of climbing equipment with recommendations for corrective action being referred to appropriate authorities

Aerial work is conducted using regulator and/or industry approved using climbing technique and includes height fall protection emergency rescue near live electrical apparatus

Use of established cutting plan(s) relevant to the vegetation type

Safety practices includes; the safe use of appropriate/specialised tools and equipment, the safe use of vegetation climbing equipment and techniques and may include safely accessing trees to install restraints/slings, removing tree limbs in a safe manner, clearing debris from the felling site to eliminate the occurrence of electrical incidents and reparation of risk assessment control measures that encompass job safety assessment. It also includes working safely up to the defined “ordinary person zone” near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker/ordinary persons and risk assessment control measures that encompass job safety assessment.

Excludes entry of persons, mobile plant, equipment, and/or specialised tools into to the safe approach distance (SAD) as defined.

Work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body– Guidelines/Codes of Practices or other related requirements for safe work and access near live electrical and mechanical Apparatus

Excludes any work that is or may be performed by other competent operatives within the defined “live work zone”

Electricity supply infrastructure assets condition – sagging, swaying, ties, cross arms, poles, insulators, conductors, service wires, electrical apparatus/equipment, etc.

Safe approach distances zones/Safe Working Clearance

Other areas which may need to be taken into consideration are: work permit(s) and/or access authorisation permits, technical standards and Industry Guidelines, rural applications, inclement weather, ground configuration and access – undulations, uneven ground, soft ground, damp, road construction, pavements, etc, feeder route plans and the use of technology and mathematical calculations

Equipment and specialised tools for use in electrical environments and loading and slinging techniques

Vegetation control includes: site rehabilitation, horticultural vegetation cutting and pruning techniques to minimise regrowth - chemicals and physical cutting and pruning tools/equipment, concerns for vegetation type/species and significance – heritage, significant, urban/rural; vegetation fire prone areas and areas of particular significance.

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and Sustainable Energy Procedures
- Environmental legislation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards

- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
    - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
    - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
    - Demonstrate an appropriate level of skills enabling employment; and
    - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables

Group No	The minimum number of items on which skill is to be demonstrated	Item List
A	Confirm operational knowledge associated with the cutting vegetation above ground outside Live Work Zone near live electrical apparatus in all of the following:	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage systems. Identification of Low Voltage Aerial Circuits. Identification of High Voltage Aerial Circuits. "Safe working zone" and "Ordinary person zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. System Control - Information required and function. Vicinity Permit - Information required and function. Sensitive Earth Fault (SEF) System Confirm environmental principals and procedures
B	Confirm safe practices associated with the cutting vegetation above ground outside Live Work Zone near live electrical apparatus in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Methods of identifying hazards. Risk assessment procedures for both worksite and pre-job checklist. Selection of the best position

		for monitoring and controlling work (cutting) Selection of correct line of site to the cutter Correct observation of the work from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and on-going weather conditions.
C	Confirm vegetation control associated with the cutting vegetation above ground outside Live Work Zone near live electrical apparatus in all of the following:	Identify tree types Confirm vegetation species and types Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans
D	Confirm the safe cutting of vegetation above ground outside Live Work Zone near live electrical apparatus in all of the following:	Use of cutting plans relevant to the vegetation type. Safe use of all relevant personnel protective equipment Safe rigging and climbing procedures and techniques Safe operation of restraints, slings, lifting and loads Safe use of tools and equipment such as hand saws, chainsaws, specialised tools and equipment and or power pruners above ground. Safe use of chemical control and application above ground. Safe cutting, pruning and tree trimming techniques above ground near electrical apparatus Safe stump removal Conduction of pre and post operational checks, inspection and minor maintenance.

		Safe deployment of equipment and tools in varying ground conditions and weather. Safe debris removal
E	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to safely undertake actual cutting/pruning of vegetation above ground up to the vegetation exclusion zone near live electrical apparatus using the climbing technique.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units:

UETTDRVC02A Operate vegetation control plant, machinery and equipment near live electrical apparatus

UETTDRVC03A	Plan for the removal of vegetation up to vegetation exclusion zone near live electrical apparatus
UETTDRVC05A	Cut vegetation above ground outside live work zone near live electrical apparatus (platform)
UETTDRVC08A	Safe use of EWP near live electrical apparatus

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2

How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment **8.7)**

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7

4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application:
		1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC02A Operate vegetation control plant, machinery and equipment near live electrical apparatus

Unit Descriptor 1)

This Competency Standard Unit covers the operation and routine maintenance of vegetation control machinery and equipment such as chippers, chainsaws, brush cutters, power pruners, chemical control and other related associated and powered vegetation control machinery and equipment used near live electrical apparatus. It excludes plant and machinery that encompasses driving/flying and associated licenses, such as aerial croppers, slashers, tritters, boom-operated mowers, stump grinders, insulated elevating work platforms and the like. Also included is the preparation of risk assessment control measures that encompass job safety assessment. It also includes traffic control measures and compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for safe use of equipment near live electrical and mechanical apparatus.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

UETTDRVC03A	Plan for the removal of vegetation up to vegetation exclusion zone near live electrical apparatus

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	2	Writing	2	Numeracy	2

Application of the Unit

3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice

3.1)

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field

4)

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to operate and conduct routine maintenance of vegetation control machinery and equipment near live electrical apparatus.	1.1 Work instructions are received and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the work to be preformed are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.
	1.4 Suggestions to assist and/or improve meeting safe operation of vegetation control machinery and equipment near live electrical apparatus outcomes are made to others involved in the work.
	1.5 Scope of responsibility under the relevant work permit(s)/access authorisation(s) identified according to requirements and established procedures with relevant personnel.
	1.6 Hazards are identified, OHS risks are identified and reported according to established procedures.

		1.7	Resources including, equipment, tools and personal protective equipment required for the job are obtained and, confirmed in working order according to established procedures.
		1.8	Relevant responsibility associated with First Aid and/or other related work safety procedures at the worksite are confirmed in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.
		1.9	Client issues are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.
		1.10	Site is prepared to produce a quality outcome, follow sustainable energy principles and practices, and to minimise risk and damage to property, commerce, stock and individuals in accordance with established procedures.
		1.11	Road signs, barriers and warning devices are obtained and positioned in accordance with given instructions and requirements.
		1.12	Pre-operational checks are undertaken to confirm safe and correct operation of machinery and equipment for safe use near live electrical apparatus according to requirements and established procedures.
		1.13	Work permit(s)/access authorisation(s) are confirmed and received, where applicable, for commencement of the work according to requirements and established procedures with relevant personnel.
2	Operate and conduct routine maintenance of vegetation control machinery and equipment near live electrical apparatus.	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are followed in accordance with given instructions, requirements and/or established procedures.
		2.2	Use of machinery and equipment, techniques and practices are safely followed in accordance with given instructions and, according to requirements confirmed to eliminate the prospects of incidents.

		2.3	Operational knowledge for the usage of vegetation control machinery and equipment near live electrical apparatus to be applied to the work is confirmed to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements and established procedures.
		2.4	Vegetation control machinery and equipment is safely operated near live electrical apparatus in accordance with the work schedule, requirements, given instructions and established procedures.
		2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are monitored and reported/referred to the immediate authorised personnel for directions according to established procedures.
		2.6	Non-routine events are referred to the immediate authorised personnel for directions according to established procedures.
		2.7	Problems associated with the operation of vegetation control machinery and equipment near live electrical apparatus are attended to using acquired known solutions and skills related to routine procedures to ensure work instructions and established procedures are met.
		2.8	On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.
3	Complete the operation and routine maintenance of vegetation control machinery and equipment near live electrical apparatus.	3.1	Work undertaken is checked against work schedule and anomalies reported to Authorised personnel in accordance with established procedures.
		3.2	Accidents and/or incidents are actioned and reported to authorised personnel in accordance with established procedures.
		3.3	Work site is rehabilitated, cleaned-up, sustainable energy principles and practices applied, and made safe in accordance with given instructions and established procedures or an agreed standard.
		3.4	Machinery, equipment, tools and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.

3.5 Appropriate personnel are notified of work completion according to established procedures.

3.6 Post-operational checks, minor maintenance and/or relevant documentation of machinery and equipment are conducted according to requirements.

3.7 Requirements for returning work permit(s) and/or access authorisation permits are confirmed, where applicable.

3.8 Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of operating vegetation control plant, machinery and equipment near live electrical apparatus.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.11.1 Hand tools

E2.11.2.1 Power tools

E2.18.1 Occupational Health and Safety principles

E2.18.2 Electrical safe working practice

T2.1.3 Engineering applications of material properties.

T2.1.7 Enterprise vehicles

T2.1.8. Chain saw principles

T2.2.1 Generation power systems

T2.3.1 Powerline safety practices.

T2.5.5 Powerline clearances and approach distances

T2.8.12 Enterprise specific - vegetation control equipment

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit is to be demonstrated in relation to the operation and routine maintenance of vegetation control machinery and equipment such as chippers, chainsaws, brush cutters, power pruners, chemical control and other related associated and powered vegetation control machinery and equipment used near live electrical apparatus.

Excludes plant and machinery that encompasses driving/flying and associated licenses, such as aerial croppers, slashers, tritters, boom-operated mowers, stump grinders, insulated elevating work platforms and the like.

Preparation of risk assessment control measures that encompass job safety assessment and includes traffic control measures and compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for Safe use of equipment near live Electrical and Mechanical Apparatus.

Prevailing Licensing Requirements

Excludes any work that is or may be performed by other competent operatives within the defined “ordinary person zone”

Working near energised live electricity supply infrastructure assets

Includes periodical and pre-operational checks of the machinery and equipment for safe operation and conduct of maintenance checks and, associated documentation

Safe approach distances zones/Safe Working Clearance

Work permit(s) and/or access authorisation permits

Technical standards and Industry Guidelines

It may also include other areas such as: Feeder route plans, infrastructure constructions and excavations, rural applications, road construction, pavements and inclement weather

Ground configuration – undulations, uneven ground, soft ground, damp, etc

Plant, equipment and tools for use in electrical environments

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities

- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	Confirm operational knowledge associated with the operation of control plant, machinery and equipment near	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage systems. Identification of Low

	live electrical apparatus in all of the following:	Voltage Aerial Circuits. Identification of High Voltage Aerial Circuits. "Safe working zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. System Control - Information required and function. Vicinity Permit - Information required and function. Sensitive Earth Fault (SEF) System Confirm environmental principals and procedures
B	Confirm safe practices associated with the operation of control plant, machinery and equipment near live electrical apparatus in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Methods of identifying hazards. Risk assessment procedures. Selection of the best position for monitoring and controlling work (cutting) Selection of correct line of site to the cutter Correct observation of the work from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and on-going weather conditions
C	Confirm vegetation control	Identify tree types

	associated with the operation of control plant, machinery and equipment near live electrical apparatus in all of the following:	Confirm vegetation species and types Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans Conduct calculations related to loading and slinging
D	Confirm the safe operation of machinery and equipment used in the control of vegetation near live electrical apparatus, in at least 6 of the following:	Chippers. Chainsaws. Brush cutters. Slashers. Power pruners. Chemical control. *Pre and post operational checks, inspections and minor maintenance. *Safe deployment of machinery and equipment in varying conditions and weather. (* Must do)
E	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to safely undertake actual operation and routine maintenance of vegetation control machinery and equipment near live electrical apparatus.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different

structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the following units:

UETNEEE001A	Comply with workplace OHS procedures and practices
UETTDREL03A	Comply with environmental and incidence response procedures
UETTDREL04A	Working safely near live electrical apparatus as non-electrical worker
UETTDRVC03A	Plan for the removal of vegetation up to vegetation exclusion zone near live electrical apparatus

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed	Refer to the following Performance Criteria for examples of application:	

and organised?	1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4

3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC03A Plan for the removal of vegetation up to vegetation exclusion zone near live electrical apparatus

Unit Descriptor 1)

This Competency Standard Unit covers the preparation for the controlled removal of vegetation near live electrical apparatus up to the live work zone as defined for both Authorised and Instructed Persons in the industry guidelines associated with live electrical apparatus. This includes electrical and communications conductors and cables/powerlines and associated equipment on poles and structures according to requirements and established procedures. It does not include the full gamut of rigging techniques and practices required of a Rigger or entry into to the safe approach distance (SAD) as defined for persons, mobile plant, equipment and specialised tools.

It includes the preparation of a plan for the control and removal of vegetation, specifying appropriate chemical control methods, using slinging and loading techniques and practices to be used, traffic management, and appropriate pruning and/or cutting techniques and practices (encompasses cutting plan) for given vegetation species to minimise regrowth within the electrical field according to requirements and procedures. Also included is the preparation of risk assessment control measures that encompass job safety assessment. Encompassed is compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for safe work and access near live electrical and mechanical apparatus.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

	UETNEEE001A	Apply OHS practices in the workplace
and	UETTDREL03A	Comply with environmental and incidence response procedures
and	UETTDREL04A	Working safely near live electrical apparatus as non-electrical worker

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	2	Writing	2	Numeracy	2

Application of the Unit

3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice

3.1)

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field

4)

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare for the development of the plan for the removal of vegetation up to vegetation exclusion zone near electrical apparatus.	1.1 Work instructions are received and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the development of the work plan are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.

		1.4	Suggestions to assist in meeting the planning for the removal of vegetation up to the live work zone near live electrical apparatus outcomes are made to others involved in the work.
		1.5	Hazards are identified, OHS risks are identified and reported according to established procedures.
		1.6	Scope of responsibility under the relevant work permit(s)/access authorisation(s) are identified and confirmed according to requirements and established procedures with relevant personnel.
		1.7	Resources including, plant, equipment, tools and personal protective equipment required for the job are identified in accordance with established procedures.
		1.8	Relevant responsibility associated with First Aid, Aerial Rescue, Tree-Top Rescue and/or other related work safety procedures at the worksite are confirmed, where appropriate, in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.
		1.9	Client issues are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.
		1.10	Site preparation requirements are confirmed according to given instructions and planning of the work schedule for a quality outcome and to meet sustainable energy principles and practices to minimise risk and damage to property, commerce, stock, and individuals in accordance and established procedures.
		1.11	Road signs, barriers and warning device requirements and positioning in accordance with given instructions and requirements are confirmed.
2	Carry out the development of the Plan for the removal of vegetation up to vegetation exclusion zone near live electrical apparatus	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are confirmed in accordance with given instructions, requirements and/or established procedures.

		2.2	Lifting, climbing, working in confined spaces and/or aloft, and use of power tools/equipment, techniques and practices are confirmed in accordance with given instructions and, according to requirements confirmed to eliminate the prospects of incidents.
		2.3	Operational knowledge for planning the removal of vegetation up to the live work zone near live electrical apparatus to be applied to the work, is confirmed to ensure completion will be within an agreed timeframe and, to quality standards with a minimum of waste according to requirements and established procedures.
		2.4	Produce plan for the removal of vegetation up to the live work zone near live electrical apparatus accordance with given instructions and established procedures.
		2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are monitored and reported/referred to the immediate authorised personnel for directions according to established procedures.
		2.6	Non-routine events are referred to the immediate authorised personnel for directions according to established procedures.
		2.7	Development of the plan is carried out in accordance with the work schedule and to requirements.
		2.8	Problems associated with producing the plan for the removal of vegetation up to the live work zone live electrical apparatus are attended to according to acquired known solutions and skills related to routine procedures to ensure the plan is produced as per instructions and established procedures.
		2.9	On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.
3	Complete development of the plan for the removal of vegetation up to vegetation exclusion zone near electrical apparatus.	3.1	Work undertaken is checked against work schedule and anomalies reported to Authorised personnel in accordance with established procedures.

3.2 Potential accidents and/or incidents are identified and reported to authorised personnel in accordance with established procedures.

3.3 Work site to be rehabilitated, cleaned up and made safe is identified in accordance with given instructions and established procedures.

3.4 Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.

3.5 Appropriate personnel are notified of work completion according to established procedures.

3.6 Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of planning for the removal of vegetation up to vegetation exclusion zone near live electrical apparatus.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.8.5 Magnetism

E2.8.8 Electrotechnology science and materials

E2.18.1 Occupational Health and Safety principles

E2.18.2 Electrical safe working practices

T2.3.1 Powerline safety practices

T2.5.5 Powerline clearances and approach distances

T2.5.6 Hazard assessment and risk management

T2.5.7 Pruning principles near powerline

T2.5.8 Establishing rigging requirements for vegetation control

T2.5.9 Powerline access and isolation procedures

T2.5.10	Tree preservation principles
T2.5.13	Chemical control of foliage
T2.8.1	Enterprises specific - policies and procedure instructions
T2.8.2	Enterprises specific - OHS instructions

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to preparation for the controlled removal of vegetation around live powerlines up to the live work zone as defined for both Instructed and Authorised Persons in the industry guidelines associated with live electrical apparatus.

Includes electrical and communications conductors and cables/powerlines and associated equipment on poles and structures according to requirements and established procedures.

Excludes the full gamut of rigging techniques and practices required of a Rigger or entry into to the safe approach distance (SAD) as defined for persons, mobile plant, equipment and specialised tools.

Includes the preparation of a plan for the control and removal of vegetation, specifying appropriate chemical control methods, using slinging and loading techniques and practices to be used, traffic management, and appropriate pruning and/or cutting techniques and practices (encompasses cutting plan) for given vegetation species to minimise regrowth within the electrical field according to requirements and procedures.

Includes the preparation of risk assessment control measures that encompass job safety assessment and compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for safe work and access near live electrical and mechanical apparatus.

Working safely up to the defined “ordinary person zone” near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker/ordinary persons and in some instances vegetation.

Risk assessment control measures that encompass job safety assessment.

Excludes any work that is or may be performed by other competent operatives within the defined “ordinary person zone”

Electricity supply infrastructure assets including electrical apparatus, electrical and communication conductors, and equipment

Safe approach distances zones/Safe Working Clearance

It may also include other areas such as: Feeder route plans, infrastructure constructions and excavations, rural applications, road construction, pavements and inclement weather

Plant, equipment and tools for use in electrical environments for vegetation control, loading

and slinging equipment.

Vegetation control includes: site rehabilitation, horticultural vegetation cutting and pruning techniques to minimise regrowth - chemicals and physical cutting and pruning tools/equipment, concerns for vegetation type/species and significance – heritage, significant, urban/rural; vegetation fire prone areas and areas of particular significance.

Constants and variables included in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement.

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification.
- OHS practices

- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the

assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	Confirm operational knowledge associated with the planning of the removal of vegetation in all of the following:	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage systems. Identification of Low Voltage Aerial Circuits. Identification of High Voltage Aerial Circuits. "Safe working zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. Confirm environmental principals and procedures.
B	Confirm safe practices associated with the planning of the removal of vegetation in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Hierarchy and methods of identifying and controlling hazards. Risk assessment procedures. Selection of the best position for monitoring and controlling work (cutting) Selection of correct line of site to the cutter Correct observation of the work

		from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and on-going weather conditions.
C	Confirm vegetation control associated with the planning of the removal of vegetation in all of the following:	Identify tree types Confirm vegetation species and types Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans Conduct calculations related to loading and slinging.
D	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to safely undertake actual planning for the removal of vegetation up to the vegetation exclusion zone near live electrical apparatus.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the unit(s) as stated in Section 2.1 "Competencies".

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2

How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment **8.7)**

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4

3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC04A Assess vegetation and recommend control measures for work near live electrical apparatus

Unit Descriptor 1)

This Competency Standard Unit covers the assessment of vegetation and in particular trees for defects and hazards prior to cutting and pruning around live powerlines up to the live work zone as defined for both Instructed and Authorised Persons in the industry guidelines associated with live electrical apparatus. The assessment is compiled and recorded in accordance with requirements and/or established procedures for defined species of vegetation and/or particular tree types.

Also included is the preparation of risk assessment control measures that encompass job safety assessment and compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

	UETTDRVC08A	Safe use of EWP near live electrical apparatus
or	UETTDRVC06A	Cut vegetation at ground level outside 'vegetation exclusion zone' near live electrical apparatus
or	UETTDRVC05A	Cut vegetation above ground outside live work zone near live electrical apparatus (platform)
or	UETTDRVC01A	Cut vegetation above ground outside work zone near live electrical apparatus (climbing)

Literacy and numeracy skills **2.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	2	Writing	2	Numeracy	2

Application of the Unit

3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice **3.1)**

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field **4)**

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare and plan to conduct assessment of vegetation and, recommend control measures for work near live electrical apparatus.	1.1 Work instructions are identified and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the work to be preformed are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.

		1.4	Recommendations to assist in meeting assessment of vegetation and recommendation of control measures for working near live electrical apparatus outcomes are made to others involved in the work.
		1.5	Hazards are identified, OHS risks associated with working near live electrical apparatus are identified and reported according to established procedures.
		1.6	Scope of responsibility under the relevant work permit(s)/access authorisation(s) are received and confirmed according to requirements and established procedures with relevant personnel.
		1.7	Resources including, equipment, tools and personal protective equipment required for the job are identified and, where to be used confirmed in working order according to established procedures.
		1.8	First Aid, Pole Top Rescue and/or other related work safety procedures at the worksite are identified in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.
		1.9	Client issues are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.
		1.10	Work schedule is prepared, to produce a quality outcome, follow sustainable energy principles and practices, and to minimise risk and damage to property, commerce, stock and individuals in accordance with established procedures.
		1.11	Road signs, barriers and warning devices are identified, where appropriate, in accordance with given instructions and requirements.
2	Conduct assessment of vegetation and, recommend control measures for work near live electrical apparatus.	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are followed in accordance with given instructions, requirements and/or established procedures.
		2.2	Lifting, climbing, working in confined spaces and/or aloft, and use of power tools/equipment, techniques and practices are identified for inclusion in the assessment report according to requirements confirmed to eliminate the prospects of incidents.

		2.3	Operational knowledge for the assessment of vegetation and recommendation of control measures for working near live electrical apparatus to be applied to the work is confirmed to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements and established procedures.
		2.4	Assessment of vegetation and in particular trees for defects is undertaken in accordance with established procedures.
		2.5	Analysis of assessment results and recommendation is made of vegetation control measures to be deployed for working near live electrical apparatus in accordance with requirements and/or established procedures.
		2.6	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are monitored and reported/referred to the immediate authorised personnel for directions according to established procedures.
		2.7	Non-routine events are responded and referred to the immediate authorised personnel for directions according to established procedures.
		2.8	Problems associated with the assessment of vegetation and the recommendation of control measures for working near live electrical apparatus are attended to using acquired known solutions and skills to ensure requirements and established procedures are met.
		2.9	On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.
3	Complete the assessment of vegetation and recommend control measures for work near live electrical apparatus.	3.1	Work undertaken is checked against work schedule and anomalies reported to authorised personnel in accordance with established procedures.
		3.2	Accidents and/or incidents are actioned and reported to authorised personnel in accordance with established procedures.
		3.3	Work site is made safe in accordance with given instructions and established procedures.

3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures
3.5	Appropriate personnel are notified of work completion according to established procedures.
3.6	Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of assessing vegetation and recommending control measures for work near live electrical apparatus.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.18.1	Occupational Health and Safety principles
E2.18.2	Electrical safe working practices
T2.3.1	Powerline safety practices
T2.5.12	Assessment of vegetation principles
T2.5.5	Powerline clearances and approach distances
T2.8.1	Enterprises specific - policies and procedure instructions
T2.8.2	Enterprises specific - OHS instructions

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to the assessment of vegetation and in particular trees for defects and hazards prior to cutting and pruning near live electrical apparatus up to the live work zone as defined for both Authorised and Instructed Persons in the industry guidelines associated with live electrical apparatus.

The assessment is compiled and recorded in accordance with requirements and/or established procedures for established species of vegetation and/or particular tree species, types and characteristics

Also included is the preparation of risk assessment control measures that encompass job

safety assessment and compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus

Working safely up to the defined "safe working zone" near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker/ordinary persons.

Risk assessment control measures that encompass job safety assessment.

Excludes any work that is or may be performed by other competent operatives within the defined "live work zone"

Electricity supply infrastructure assets condition – sagging, swaying, ties, cross arms, poles, insulators, conductors, service wires, electrical apparatus/equipment, etc.

Safe approach distances zones/Safe Working Clearance

Other areas which may need to be taken into consideration are: work permit(s) and/or access authorisation permits, technical standards and Industry Guidelines, rural applications, inclement weather, ground configuration and access – undulations, uneven ground, soft ground, damp, road construction, pavements, etc, feeder route plans and the use of technology and mathematical calculations

Equipment and specialised tools for use in electrical environments and loading and slinging techniques

Vegetation control includes: site rehabilitation, horticultural vegetation cutting and pruning techniques to minimise regrowth - chemicals and physical cutting and pruning tools/equipment, concerns for vegetation type/species and significance – heritage, significant, urban/rural; vegetation fire prone areas and areas of particular significance.

Areas of particular significance

Loading and slinging techniques

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage

of information

- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **8.1)**

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit **8.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range;

and

- Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
- Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	Confirm operational knowledge associated with the assessment of vegetation and making recommendations prior to working near live electrical apparatus, in all of the following:	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage systems. Identification of Low Voltage Aerial Circuits. Identification of High Voltage Aerial Circuits. "Safe working zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. System Control - Information required and function. Vicinity Permit - Information

		required and function. Sensitive Earth Fault (SEF) System Confirm environmental principals and procedures Safe approach distances for insulated cranes and plant. Safe approach distances for persons and hand held tools.
B	Confirm safe practices associated with the assessment of vegetation and making recommendations prior to working near live electrical apparatus, in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Methods of identifying hazards. Risk assessment procedures. Selection of the best position for monitoring and controlling work (cutting) Selection of correct line of site to the cutter Correct observation of the work from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and on-going weather conditions
C	Confirm vegetation control associated with	Identify tree types Confirm vegetation species and types

	the assessment of vegetation and making recommendations prior to working near live electrical apparatus, in all of the following:	Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans Conduct calculations related to loading and slinging
D	Confirm the safe assessment of vegetation and making recommendations prior to working near live electrical apparatus, in all of the following:	Safe use of tools, plant and equipment. Safe storage, transportation and use of chemicals. Pre and post operational checks, inspections and minor maintenance on tools and equipment. Safe deployment of machinery and equipment in varying conditions and weather. Safe use of appropriate personal protective equipment. Safe cutting/pruning and tree trimming methods Correct advice on vegetation species, types and characteristics Correct advice on cutting plans relevant to the vegetation species and type Analysis of vegetation control measures particularly of trees for defects Safe assessments techniques of vegetation for defects and hazards. Correct recommendations for appropriate pruning and/or cutting processes to be used near live electrical apparatus Preparing assessment reports with

		appropriate recommendations for course of action.
E	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to safely undertake an assessment of vegetation and make recommendations of control measures for work near live electrical apparatus.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the unit(s) as stated in Section 2.1 "Competencies".

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment **8.7)**

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC05A Cut vegetation above ground outside live work zone near live electrical apparatus (platform)

Unit Descriptor

1)

This Competency Standard Unit covers cutting and/or pruning vegetation above ground level and removal of vegetation obstructions up to the live work zone as defined for both Authorised and Instructed Persons in the industry guidelines associated with live electrical apparatus using the established cutting plan relevant to the vegetation type. It encompasses the safe use of appropriate/specialised tools and equipment according to requirements and established procedures. It includes safely accessing trees from above ground level to install restraints/slings, removing tree limbs in a safe manner and, clearing debris from the felling site to eliminate the occurrence of electrical incidents. It DOES NOT include entry of persons, mobile plant, equipment, and/or specialised tools into to the safe approach distance (SAD) as defined.

Also included is the preparation of risk assessment control measures that encompass job safety assessment. All work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body– Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus.

Prerequisite Unit(s)

2)

Competencies

2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

UETTDRVC07A	Monitor safety compliance for vegetation work near live electrical apparatus

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	2	Writing	2	Numeracy	2

Application of the Unit

3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice

3.1)

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field

4)

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to cut/prune vegetation above ground up to the vegetation exclusion zone near live electrical apparatus using an elevating platform.	1.1 Work instructions and cutting plan are received and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the work to be performed in accord with the cutting are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.
	1.4 Suggestions to assist and/or improve meeting the cutting of vegetation above ground level outside the live work zone near electrical apparatus outcomes are made to others involved in the work.
	1.5 Hazards are identified, OHS risks associated with working near live electrical apparatus are identified and reported according to established procedures.

	1.6	Scope of responsibility under the relevant work permit(s)/access authorisation(s) identified according to requirements and established procedures with relevant personnel.
	1.7	Resources including, equipment, tools, approved platforms and personal protective equipment required for the job are obtained and, in working order according to established procedures.
	1.8	Relevant responsibility associated with First Aid, working aloft, and/or other related work safety procedures at the worksite are confirmed in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.
	1.9	Client issues including environmental values are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.
	1.10	Site is prepared to produce a quality outcome, follow sustainable energy principles and practices, and to minimise risk and damage to property, commerce, stock and individuals in accordance with established procedures.
	1.11	Road signs, barriers and warning devices are obtained and positioned in accordance with given instructions and requirements.
	1.12	Pre-operational checks are undertaken to confirm safe and correct operation of tools and equipment for safe use near live electrical apparatus according to requirements and established procedures.
	1.13	Work permit(s)/access authorisation(s) are confirmed and received, where applicable, for commencement of the work according to requirements and established procedures with relevant personnel.
2 Carry out the cutting/pruning of vegetation above ground up to the vegetation exclusion zone near live electrical apparatus using an elevating platform.	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are followed in accordance with given instructions, requirements and/or established procedures.

	2.2	Lifting, climbing, working in confined spaces and/or aloft, and use of tools/equipment, techniques and practices are safely followed in accordance with given instructions and, according to requirements confirmed to eliminate the prospects of incidents.
	2.3	Operational knowledge for the cutting of vegetation above ground level outside the live work zone near electrical apparatus is confirmed to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements and established procedures and established procedures.
	2.4	Cutting of vegetation above ground level outside the live work zone near electrical apparatus using a EWP is carried out in accordance with the cutting plan and work schedule and, given instructions and established procedures.
	2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are monitored and reported/referred to the immediate authorised personnel for directions according to established procedures.
	2.6	Non-routine events are referred to the immediate authorised personnel for directions according to established procedures.
	2.7	Problems associated with cutting vegetation above ground level outside of the vegetation exclusion zone near electrical apparatus are attended to using acquired known solutions and skills related to routine procedures to ensure work instructions and established procedures are met.
	2.8	On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.
3 Complete the cutting/pruning of vegetation above ground up to the vegetation exclusion zone near live electrical apparatus using an elevating platform.	3.1	Work undertaken is checked against cutting plan and work schedule, work schedule and anomalies reported to Authorised personnel in accordance with established procedures.
	3.2	Accidents and/or incidents are actioned and reported to authorised personnel in accordance with established procedures.

3.3 Work site is rehabilitated, cleaned-up, sustainable energy principles and practices applied, and made safe in accordance with given instructions and established procedures or an agreed standard.

3.4 Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.

3.5 Appropriate personnel are notified of work completion according to established procedures.

3.6 Post-operational checks, minor maintenance and/or relevant documentation of equipment and tools/platform are conducted according to requirements.

3.7 Requirements for returning work permit(s) and/or access authorisation permits are confirmed, where applicable.

3.8 Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of cutting vegetation above ground outside live work zone near live electrical apparatus (platform).

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.18.1 Occupational Health and Safety principles

E2.18.2 Electrical safe working practices

T2.3.1 Powerline safety practices

T2.5.5 Powerline clearances and approach distances

T2.5.15 Operating tools and equipment from a platform

T2.8.1 Enterprises specific - policies and procedure instructions

T2.8.2 Enterprises specific - OHS instructions

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to the cutting and/or pruning of vegetation above ground level and removal of vegetation obstructions up to the live work zone (using platform technique) as defined for both Authorised and Instructed Persons in the industry guidelines associated with live electrical apparatus.

Aerial work is conducted using regulator and/or industry approved platform(s) and includes insulated type and aerial emergency rescue near live electrical apparatus

Use of established cutting plan(s) relevant to the vegetation type

Safety practices includes; the safe use of appropriate/specialised tools and equipment, the safe use of vegetation climbing equipment and techniques and may include safely accessing trees to install restraints/slings, removing tree limbs in a safe manner, clearing debris from the felling site to eliminate the occurrence of electrical incidents and reparation of risk assessment control measures that encompass job safety assessment. It also includes working safely up to the defined "ordinary person zone" near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker/ordinary persons and risk assessment control measures that encompass job safety assessment.

Excludes entry of persons, mobile plant, equipment, and/or specialised tools into to the safe approach distance (SAD) as defined.

Work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body– Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus

Working safely up to the defined "safe working zone" near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker/ordinary persons.

Excludes any work that is or may be performed by other competent operatives within the defined "live work zone"

Electricity supply infrastructure assets condition – sagging, swaying, ties, cross arms, poles, insulators, conductors, service wires, electrical apparatus/equipment, etc.

Safe approach distances zones/Safe Working Clearance

Other areas which may need to be taken into consideration are: work permit(s) and/or access authorisation permits, technical standards and Industry Guidelines, rural applications, inclement weather, ground configuration and access – undulations, uneven ground, soft ground, damp, road construction, pavements, etc, feeder route plans and the use of technology and mathematical calculations

Equipment and specialised tools for use in electrical environments and loading and slinging techniques

Vegetation control includes: site rehabilitation, horticultural vegetation cutting and pruning techniques to minimise regrowth - chemicals and physical cutting and pruning

tools/equipment, concerns for vegetation type/species and significance – heritage, significant, urban/rural; vegetation fire prone areas and areas of particular significance.

Safe operation and care of an Elevating Work Platform

Work permit(s) and/or access authorisation permits

Technical standards and Industry Guidelines

Loading and slinging techniques

Use of technology and mathematical calculations

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and Sustainable Energy Procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect

- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	Confirm operational knowledge associated with the cutting vegetation above ground outside Live Work Zone near live electrical apparatus using a platform in all of the following:	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage systems. Identification of Low Voltage Aerial Circuits. Identification of High Voltage Aerial Circuits. "Safe working zone" and "Ordinary person zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. System Control - Information required and function. Vicinity Permit - Information required and function. Sensitive Earth Fault (SEF) System Confirm environmental principals and procedures
B	Confirm safe practices associated with the cutting vegetation above ground outside Live Work Zone near live electrical apparatus using a platform in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue and height safety including platform aerial emergency rescue procedure Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Methods of identifying hazards. Risk assessment procedures for both worksite and pre-job checklist.

		Selection of the best position for monitoring and controlling work (cutting) Selection of correct line of site to the cutter Correct observation of the work from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and on-going weather conditions.
C	Confirm vegetation control associated with the cutting vegetation above ground outside Live Work Zone near live electrical apparatus using a platform in all of the following:	Identify tree types Confirm vegetation species and types Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans
D	Confirm the safe cutting/pruning of vegetation above ground outside Live Work Zone near live electrical apparatus using a platform in all of the following:	Use of cutting plans relevant to the vegetation type. Safe use of all relevant personnel protective equipment Safe operation of restraints, slings, lifting and loads Safe use of tools and equipment such as hand saws, chainsaws, specialised tools and equipment and or power pruners above ground on a platform. Safe use of chemical control and application above ground on a platform. Safe use of regulatory and/or approved industry cutting/pruning platforms Safe working aloft on a platform and undertaking cutting, pruning and tree trimming techniques near electrical apparatus Conduction of pre and post operational checks, inspection and minor maintenance.

		Safe deployment of equipment and tools in varying ground conditions and weather. Safe debris removal
E	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to safely undertake actual cutting/pruning of vegetation above ground up to the vegetation exclusion zone near live electrical apparatus using platforms.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

> Note:
> Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the following units:

UETTDRVC01A Cut vegetation above ground outside live work zone near live electrical apparatus (climbing)

UETTDRVC06A Cut vegetation at ground level outside 'vegetation exclusion zone' near live electrical apparatus

UETTDRVC08A Safe use of EWP near live electrical apparatus

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment **8.7)**

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC06A Cut vegetation at ground level outside 'vegetation exclusion zone' near live electrical apparatus

Unit Descriptor

1)

This Competency Standard Unit covers cutting and/or pruning vegetation at ground level and removal of vegetation obstructions up to the live work zone as defined for both Instructed and Authorised Persons in the industry guidelines associated with live electrical apparatus using the established cutting plan relevant to the vegetation type. It encompasses the safe use of appropriate/specialised tools and equipment according to requirements and established procedures. It includes safely accessing trees to install restraints/slings, removing small trees in a safe manner and, clearing debris from the felling site to eliminate the occurrence of electrical incidents. It DOES NOT include entry of persons, mobile plant, equipment, and/or specialised tools into to the safe approach distance (SAD) as defined.

Also included is the preparation of risk assessment control measures that encompass job safety assessment. All work is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body– Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus.

Prerequisite Unit(s)

2)

Competencies

2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

UETTDRVC07A	Monitor safety compliance for vegetation work near live electrical apparatus

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	2	Writing	2	Numeracy	2

Application of the Unit

3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice

3.1)

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field

4)

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to cut/prune vegetation at ground level up to vegetation exclusion zone near live electrical apparatus.	1.1 Work instructions and cutting plan are received and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the work to be performed in accord with the cutting are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.
	1.4 Suggestions to assist and/or improve meeting the cutting of vegetation at ground level outside of the live work zone near electrical apparatus outcomes are made to others involved in the work.
	1.5 Hazards are identified, OHS risks associated with working near live electrical apparatus are identified and reported according to established procedures.

		1.6	Scope of responsibility under the relevant work permit(s)/access authorisation(s) identified according to requirements and established procedures with relevant personnel.
		1.7	Resources including, vehicles, equipment, tools and personal protective equipment required for the job are obtained and, confirmed in working order according to established procedures.
		1.8	Relevant responsibility associated with First Aid and/or other related work safety procedures at the worksite are confirmed in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.
		1.9	Client issues including environmental values are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.
		1.10	Site is prepared to produce a quality outcome, follow sustainable energy principles and practices, and to minimise risk and damage to property, commerce, stock and individuals in accordance with established procedures.
		1.11	Road signs, barriers and warning devices are obtained and positioned in accordance with given instructions and requirements.
		1.12	Pre-operational checks are undertaken to confirm safe and correct operation of tools and equipment for safe use near live electrical apparatus according to requirements and established procedures.
		1.13	Work permit(s)/access authorisation(s) are confirmed and received, where applicable, for commencement of the work according to requirements and established procedures with relevant personnel.
2	Carry out the cutting/pruning of vegetation at ground level up to vegetation exclusion zone near live electrical apparatus.	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are followed in accordance with given instructions, requirements and/or established procedures.

	2.2	Lifting, climbing, working in confined spaces, and use of tools/equipment, techniques and practices are safely followed in accordance with given instructions and, according to requirements confirmed to eliminate the prospects of incidents.
	2.3	Operational knowledge for cutting vegetation species and types at ground level outside of the live work exclusion zone near electrical apparatus is confirmed to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements and established procedures.
	2.4	Cutting of vegetation at ground level outside of the live work zone near electrical apparatus is carried out in accordance with the cutting plan and work schedule, and given instructions and established procedures.
	2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported/referred to the immediate authorised personnel for directions according to established procedures.
	2.6	Non-routine events are referred to the immediate authorised personnel for directions according to established procedures.
	2.7	Problems associated with cutting vegetation at ground level outside of the vegetation exclusion zone near electrical apparatus are attended to using acquired known solutions and skills related to routine procedures to ensure work instructions and established procedures are met.
	2.8	On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.
	2.9	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are followed in accordance with given instructions, requirements and/or established procedures.
3 Complete the cutting/pruning of vegetation at ground level up to vegetation	3.1	Work undertaken is checked against cutting plan and work schedule, and anomalies reported to Authorised personnel in accordance with established procedures.

exclusion zone near live electrical apparatus.	3.2	Accidents and/or incidents are actioned and reported to authorised personnel in accordance with established procedures.
	3.3	Work site is rehabilitated, cleaned-up, sustainable energy principles and practices applied, and made safe in accordance with given instructions and established procedures or an agreed standard.
	3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.5	Appropriate personnel are notified of work completion according to established procedures.
	3.6	Post-operational checks, minor maintenance and/or relevant documentation of equipment and tools are conducted according to requirements.
	3.7	Requirements for returning work permit(s) and/or access authorisation permits are confirmed, where applicable.
	3.8	Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of cutting vegetation at ground level outside 'vegetation exclusion zone' near live electrical apparatus.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.18.1	Occupational Health and Safety principles
E2.18.2	Electrical safe working practices
T2.3.1	Powerline safety practices
T2.5.5	Powerline clearances and approach distances
T2.8.1	Enterprises specific - policies and procedure instructions
T2.8.2	Enterprises specific - OHS instructions

T2.8.12 Enterprise Specific - vegetation control equipment

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to cutting and/or pruning vegetation at ground level and removal of vegetation obstructions up to the live work zone as defined for both Authorised and Instructed Persons in the industry guidelines associated with live electrical apparatus.

Use of established cutting plan(s) relevant to the vegetation type

Safety practices includes; the safe use of appropriate/specialised tools and equipment and may include safely accessing trees to install restraints/slings, removing tree limbs in a safe manner, clearing debris from the felling site to eliminate the occurrence of electrical incidents and reparation of risk assessment control measures that encompass job safety assessment.

Excludes entry of persons, mobile plant, equipment, and/or specialised tools into to the safe approach distance (SAD) as defined.

Work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body– Guidelines/Codes of Practices or other related requirements for safe work and access near live electrical and mechanical Apparatus

Working safely up to the defined "safe working zone" near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker/ordinary persons.

Excludes any work that is or may be performed by other competent operatives within the defined "live work zone"

Electricity supply infrastructure assets condition – sagging, swaying, ties, cross arms, poles, insulators, conductors, service wires, electrical apparatus/equipment, etc.

Infrastructure constructions and excavations

Safe approach distances zones/Safe Working Clearance

Other areas which may need to be taken into consideration are: work permit(s) and/or access authorisation permits, technical standards and Industry Guidelines, rural applications, inclement weather, ground configuration and access – undulations, uneven ground, soft ground, damp, road construction, pavements, etc, feeder route plans and the use of technology and mathematical calculations

Plant, equipment and specialised tools for use in electrical environments

Vegetation control includes: site rehabilitation, horticultural vegetation cutting and pruning techniques to minimise regrowth - chemicals and physical cutting and pruning tools/equipment, concerns for vegetation type/species and significance – heritage, significant, urban/rural; vegetation fire prone areas and areas of particular significance.

Use of technology and mathematical calculations

The following constants and variables included in the Element/Performance Criteria in this

unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and Sustainable Energy Procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work

- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	Confirm operational knowledge associated with the cutting	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage

	vegetation at ground level near live electrical apparatus in all of the following:	systems. Identification of Low Voltage Aerial Circuits. Identification of High Voltage Aerial Circuits. "Safe working zone" and "Ordinary person zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. System Control - Information required and function. Vicinity Permit - Information required and function. Sensitive Earth Fault (SEF) System Confirm environmental principals and procedures
B	Confirm safe practices associated with the cutting vegetation at ground level near live electrical apparatus in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Methods of identifying hazards. Risk assessment procedures for both worksite and pre-job checklist. Selection of the best position for monitoring and controlling work (cutting) Selection of correct line of site to the cutter Correct observation of the work from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and

		on-going weather conditions.
C	Confirm vegetation control associated with the cutting vegetation at ground near live electrical apparatus in all of the following:	Identify tree types Confirm vegetation species and types Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans
D	Confirm the safe cutting of vegetation at ground near live electrical apparatus in all of the following:	Use of cutting plans relevant to the vegetation type. Safe use of all relevant personnel protective equipment Safe use of tools and equipment such as hand saws, chainsaws, specialised tools and equipment and or power pruners at ground level. Safe use of chemical control and application at ground level. Safe cutting, pruning and tree trimming techniques at ground near electrical apparatus Safe stump removal Conduction of pre and post operational checks, inspection and minor maintenance on tools and equipment. Safe deployment of equipment and tools in varying ground conditions and weather. Safe debris removal
E	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to safely undertake actual cutting of vegetation at ground level outside the 'vegetation exclusion zone' near live electrical apparatus

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

> Note:
> Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the following units:

UETTDRVC08A	Safe use of EWP near live electrical apparatus
UETTDRVC07A	Monitor safety compliance for vegetation work near live electrical apparatus
UETTDRVC01A	Cut vegetation above ground outside live work zone near live electrical apparatus (climbing)
UETTDRVC05A	Cut vegetation above ground outside live work zone near live electrical apparatus (platform)

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment **8.7)**

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC07A Monitor safety compliance for vegetation work near live electrical apparatus

Unit Descriptor

1)

This Competency Standard Unit covers the control and monitor of work associated with vegetation control near live electrical apparatus. This includes observing, spotting, rendering warnings to stop unsafe work activities, and/or encroachment of ordinary persons, public, personnel and mobile plant and equipment into the safe approach distance (SAD) as defined for persons and mobile plant and equipment. A person designated as a Safety Observer, solely dedicated to the role, normally carries out this work.

Also included is the preparation of risk assessment control measures that encompass job safety assessment. All work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for safe work and access near live electrical and mechanical apparatus.

Prerequisite Unit(s)

2)

Competencies

2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

UETTDRVC02A	Operate vegetation control plant, machinery and equipment near live electrical apparatus

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	2	Writing	2	Numeracy	2

Application of the Unit

3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice **3.1)**

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field **4)**

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to control safety compliance for vegetation work near live electrical apparatus	1.1 Work instructions are received and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the work to be performed are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.
	1.4 Suggestions to assist in meeting control of safety compliance for vegetation work near live electrical apparatus outcomes are made to others involved in the work.
	1.5 Hazards are identified, OHS risks associated with working near live electrical apparatus are identified and reported according to established procedures.
	1.6 Scope of responsibility under the relevant work permit(s)/access authorisation(s) are received and confirmed according to requirements and established procedures with relevant personnel.
	1.7 Resources including, equipment, tools and personal protective equipment required for the job are identified and, in working order according to established procedures.

		1.8	Relevant responsibility associated with First Aid, Pole Top and Aerial Rescue and/or other related work safety procedures at the worksite are confirmed in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.
		1.9	Client issues are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.
		1.10	Site preparation is in accord with given instructions and established procedures.
		1.11	Work schedule is prepared, to produce a quality outcome, follow sustainable energy principles and practices, and to minimise risk and damage to property, commerce, stock and individuals in accordance with established procedures.
		1.12	Road signs, barriers and warning devices are planned and positioned in accordance with given instructions, established procedures and requirements.
2	Carry out the control of safety compliance for vegetation work near live electrical apparatus.	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste/energy are followed in accordance with given instructions, requirements and/or established procedures.
		2.2	Lifting, climbing, working in confined spaces and/or aloft, and use of power tools/equipment, techniques and practices are observed in accordance with given instructions and, according to requirements to eliminate the prospects of incidents.
		2.3	Operational knowledge for controlling the safety compliance for vegetation work near live electrical apparatus is applied to the work to ensure safe systems of work are observed and completion is in an agreed timeframe and, to quality standards.
		2.4	Safety compliance is controlled and monitored for vegetation work near live electrical apparatus in accordance with given instructions, requirements and established procedures.
		2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported/referred to the immediate authorised personnel for directions according to established procedures.

		2.6	Non-routine events are responded and referred to the immediate authorised personnel for directions according to established procedures.
		2.7	Work is performed in accordance with the work schedule and to requirements.
		2.8	Problems associated with the control of safety compliance and monitoring for vegetation work near live electrical apparatus is responded to using acquired known solutions and skills related to routine procedures to ensure work instructions and established procedures are met.
		2.9	On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.
3	Complete the control of safety compliance for vegetation work near live electrical apparatus.	3.1	Work undertaken is checked against work schedule and anomalies reported to authorised personnel in accordance with established procedures.
		3.2	Accidents and/or incidents are actioned and reported to authorised personnel in accordance with established procedures.
		3.3	Work site is rehabilitated, cleaned-up, sustainable energy principles and practices applied, and made safe in accordance with given instructions and established procedures or an agreed standard.
		3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.5	Appropriate personnel are notified of work completion according to established procedures.
		3.6	Requirements for returning work permit(s) and/or access authorisation permits are confirmed.
		3.7	Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures within.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of monitoring safety compliance for vegetation work near live electrical apparatus.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.18.1	Occupational Health and Safety principles
E2.18.2	Electrical safe working practices
T2.3.1	Powerline safety practices
T2.5.5	Powerline clearances and approach distances
T2.5.14	Safety observer principles
T2.8.1	Enterprises specific - policies and procedure instructions
T2.8.2	Enterprises specific - OHS instructions

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to monitoring and controlling vegetation work near live electrical apparatus and/or including the following:

Voltages exceeding 240 V, 11/22/33 and/or 66 KV

Includes observing, spotting, rendering warnings to stop unsafe work activities, and/or encroachment of ordinary persons, public, personnel and mobile plant and equipment into the safe approach distance (SAD) as defined for persons and mobile plant and equipment. A person designated as a Safety Observer, solely dedicated to the role, normally carries out this work.

Work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body – Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus.

Working safely up to the defined “ordinary person zone” near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker/ordinary persons.

Risk assessment control measures that encompass job safety assessment.

Excludes any work that is or may be performed by other competent operatives within the defined "live work zone"

Electricity supply infrastructure assets and infrastructure constructions and excavations

Safe approach distances zones/Safe Working Clearance

It may also include other areas such as: Feeder route plans, infrastructure constructions and excavations, rural applications, road construction, pavements and inclement weather

Ground configuration – undulations, uneven ground, soft ground, damp, etc

Plant, machinery, equipment and tools for use in electrical environments

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and Sustainable Energy Procedures
- Environmental legislation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation

- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on**	**Item List**

	which skill is to be demonstrated	
A	Confirm operational knowledge associated with the monitoring safety compliance for vegetation work near live electrical apparatus in all of the following:	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage systems. Identification of Low Voltage Aerial Circuits. Identification of High Voltage Aerial Circuits. "Safe working zone" and "Ordinary person zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. Switching requirements for Authorised tree trimming work on voltage overhead lines. System Control - Information required and function. Vicinity Permit - Information required and function. Sensitive Earth Fault (SEF) System Confirm environmental principals and procedures
B	Confirm safe practices associated with the monitoring safety compliance for vegetation work near live electrical apparatus in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Selection of the best position for monitoring and controlling work (cutting) Selection of correct line of site to the cutter

		Correct observation of the work from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and on-going weather conditions
C	Confirm hazards and risk assessment procedures associated with the monitoring safety compliance for vegetation work near live electrical apparatus in all of the following:	Identifying hazards. Risk assessment procedures. Conducting work site hazard assessment Essential components of hazards assessment checks. Pre-job Hazard Assessment Check (HAC) Items Worksite hazard and risk assessment checklist Procedure for planned inspection
D	Confirm vegetation control associated with the monitoring safety compliance for vegetation work near live electrical apparatus in all of the following:	Identify tree types Confirm vegetation species and types Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans Conduct calculations related to loading and slinging
E	All of the following	Duties of Safety Observer's at the work site
F	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to safely undertake actual monitoring of safety compliance for vegetation work near live electrical apparatus.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

There are no concurrent assessment recommendations for this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2

How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application:

		1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC08A Safe use of Elevating Work Platform (EWP) near live electrical apparatus

Unit Descriptor 1)

This Competency Standard Unit covers the operation of the use of insulated Elevating Work Platform (EWP) near live electrical apparatus. It includes the identification of hazards and the correct procedures to follow to minimise risk to self and to others. It also encompasses periodical and pre-operational checks on the insulated EWP according to requirements and established procedures.

Also included is the preparation of risk assessment control measures that encompass job safety assessment. All work and zones is in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body– Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

UETTDRVC07A	Monitor safety compliance for vegetation work near live electrical apparatus

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	2	Writing	2	Numeracy	2

Application of the Unit 3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice **3.1)**

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field **4)**

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to use insulated Elevating Work Platform (EWP) safely near live electrical and mechanical apparatus	1.1 Work instructions are received and confirmed.
	1.2 Relevant requirements and established procedures to be followed for the work to be preformed are discussed with all personnel to establish and confirm the work schedule.
	1.3 OHS policies and procedures to be followed for the work to be performed are received and confirmed.
	1.4 Suggestions to assist and/or improve meeting safe use of insulated Elevating Work Platform (EWP) near live electrical apparatus are made to others involved in the work.
	1.5 Hazards are identified, OHS risks associated with working near live electrical apparatus are identified and reported according to established procedures.
	1.6 Scope of responsibility under the relevant work permit(s)/access authorisation(s) identified according to requirements and established procedures with relevant personnel.
	1.7 Resources including equipment, tools and personal protective equipment required for the job are obtained and, in working order according to established procedures.

		1.8	Relevant responsibility associated with First Aid, Emergency Lowering of EWP, Control Descent Device (CDD) and/or other related work safety procedures at the worksite are confirmed in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident.
		1.9	Client issues are identified and referred to appropriate personnel in accordance with industry/acceptable /community standards.
		1.10	Site is prepared to produce a quality outcome, follow sustainable energy principles and practices, and to minimise risk and damage to property, commerce, stock and individuals in accordance with established procedures.
		1.11	Pre-operational checks are undertaken to confirm safe and correct operation of insulated Elevating Work Platform (EWP) near live electrical apparatus according to requirements and established procedures, and where applicable insulation integrity is confirmed.
		1.12	Road signs, barriers and warning devices are obtained and positioned in accordance with given instructions and requirements.
		1.13	Work permit(s)/access authorisation(s) are confirmed and received, where applicable, for commencement of the work according to requirements and established procedures with relevant personnel.
2	Carry out the safe use of insulated Elevating Work Platform (EWP) near live electrical and mechanical apparatus.	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are followed in accordance with given instructions, requirements and/or established procedures.
		2.2	Requirements for working aloft, and use of tools/equipment, techniques and practices are observed and complied with in accordance with given instructions and, according to requirements confirmed to eliminate the prospects of incidents.

		2.3	Operational knowledge for the safe use of insulated Elevating Work Platform (EWP) safely near live Electrical and Mechanical Apparatus to be applied to the work is applied to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements and established procedures.
		2.4	Insulated Elevating Work Platform (EWP) is safely operated near live Electrical and Mechanical Apparatus in accordance with the work schedule, requirements, given instructions and established procedures.
		2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported/referred to the immediate authorised personnel for directions according to established procedures.
		2.6	Non-routine events are referred to the immediate authorised personnel for directions according to established procedures.
		2.7	Problems associated with the safe operation of insulated Elevating Work Platform (EWP) near live Electrical and Mechanical Apparatus are attended to, using acquired known solutions and skills related to routine procedures to ensure work established procedures are met.
		2.8	On going checks of quality of the work are undertaken in accordance with given instructions and established procedures.
3	Complete the safe use of insulated Elevating Work Platform (EWP) near live electrical and mechanical apparatus.	3.1	Operation of insulated Elevating Work Platform (EWP) near live Electrical and Mechanical Apparatus is checked against work schedule and anomalies reported to Authorised personnel in accordance with established procedures.
		3.2	Accidents and/or incidents are actioned and reported to authorised personnel in accordance with established procedures.
		3.3	Work site is rehabilitated, cleaned-up, sustainable energy principles and practices applied, and made safe in accordance with given instructions and established procedures or an agreed standard.
		3.4	Appropriate personnel are notified of work completion according to established procedures

3.5 Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.

3.6 Post-operational checks, minor maintenance and/or relevant documentation of the insulated Elevating Work Platform (EWP) are conducted according to requirements.

3.7 Requirements for returning work permit(s) and/or access authorisation permits are confirmed, where applicable.

3.8 Works completion records, report forms/data sheets are completed accurately in accordance with given instructions and established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safely using EWP near live electrical apparatus.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.18.1 Occupational Health and Safety principles

E2.18.2 Electrical safe working practices

T2.1.5 Elevating work platform operational principles

T2.3.1 Powerline safety practices

T2.5.5 Powerline clearances and approach distances

T2.8.1 Enterprises specific - policies and procedure instructions

T2.8.2 Enterprises specific - OHS instructions

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to the safe use of elevating work Platforms for the control of vegetation near electrical apparatus.

Operation of insulated Elevating Work Platforms (EWP) near live electrical apparatus.

Includes the identification of hazards and the correct procedures to follow to minimise risk to self and to others.

Included is the preparation of risk assessment control measures that encompass job safety assessment.

Work and zones are in compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body– Guidelines/Codes of Practices or other related requirements for safe work and access near live electrical and mechanical apparatus

Insulated elevating work platforms may include are not limited to appropriately rated equipment.

The elevating work platform to comply with relevant Australian Standards (AS.1418.10)

Prevailing Licensing Requirements

Risk assessment control measures that encompass job safety assessment.

Excludes any work that is or may be performed by other competent operatives within the defined "ordinary person zone"

Working near energised live electricity supply infrastructure assets

Emergency lowering

Includes periodical and pre-operational checks on the insulated Elevating Work Platform (EWP) and operational and maintenance checks and, associated documentation

Verification of insulation integrity

Safe approach distances zones/Safe Working Clearance

Work permit(s) and/or access authorisation permits

Technical standards and Industry Guidelines

It may also include other areas such as: Feeder route plans, infrastructure constructions and excavations, rural applications, road construction, pavements and inclement weather

Ground configuration – undulations, uneven ground, soft ground, damp, etc

Plant, equipment and tools for use in electrical environments

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities

- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and Sustainable Energy Procedures
- Environmental legislation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	Confirm operational knowledge associated with the safe operation of a Elevating Work Platform near live electrical	Principles of electricity, the three phase power system. Power system. Recognition of aerial voltage systems. Identification of Low Voltage Aerial Circuits.

	apparatus in all of the following:	Identification of High Voltage Aerial Circuits. "Safe working zone" and "Ordinary person zone" so defined by relevant authorities. Use of technical standards, acts, regulations, codes /guidelines and established/enterprise/asset owner's procedures. System Control - Information required and function. Vicinity Permit - Information required and function. Sensitive Earth Fault (SEF) System Confirm environmental principals and procedures
B	Confirm safe practices associated with the operation of a Elevating Work Platform near live electrical apparatus in all of the following:	OHS safety practices and procedures. Electric shock and resuscitation. Release and rescue Role of the Safety Observer Events constituting an incident. Procedures in the event of/responding to, incidents. Methods of identifying hazards. Risk assessment procedures for both worksite and pre-job checklist. Selection of the best position for monitoring and controlling work (cutting) Selection of correct line of site to the cutter Correct observation of the work from ground level Constant analysis and decision making relevant to the safety of the work, taking into account prevailing site conditions (lay of the land) and on-going weather conditions. Communication techniques from the EWP

C	Confirm vegetation control associated with the operation of a Elevating Work Platform near live electrical apparatus in all of the following:	Identify tree types Confirm vegetation species and types Confirm vegetation cutting techniques for different vegetation Confirm appropriate vegetation machinery and equipment to be used Use of feeder route plans Conduct calculations related to loading and slinging
D	Confirm the safe operation of a Elevating Work Platform near live electrical apparatus in all of the following:	Use of mathematical calculations related to weights, boom extension and height Insulation integrity verification and compliance Safe set-up near electrical apparatus Release and rescue procedures Emergency boom lowering procedures Working with Safety Observer Documentation and schedules Currency of licence Pre and post operational checks, inspection and minor maintenance Safe deployment in varying ground conditions and weather Safe operation of insulated elevating work platform near live electrical apparatus. Safe use of tools and equipment from an EWP.
E	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake safely use insulated Elevating Work Platform (EWP) near live electrical and mechanical apparatus.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the following units:

UETTDREL04A	Working safely near live electrical apparatus as non-electrical worker
UETTDREL03A	Comply with environmental and incidence response procedures
UETNEEE001A	Comply with workplace OHS procedures and practices
UETTDRVC05A	Cut vegetation above ground outside live work zone near live electrical apparatus (platform)
UETTDRVC01A	Cut vegetation above ground outside live work zone near live electrical apparatus (climbing)
UETTDRVC02A	Operate vegetation control plant, machinery and

equipment near live electrical apparatus

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling **8.7)**

Employment

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1, 3.7
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

UETTDRVC09A Control vegetation (linework)

Unit Descriptor 1)

This Competency Standard Unit covers the control of vegetation including tree trimming in accordance with enterprise practices with relevant and complimentary linework competencies. It includes working near live low voltage conductors, as specified in the relevant State/Territory legislation and the completion of inspection reports and the updating of records to enterprise requirements.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

UETTDRIS14A	Install and maintain overhead conductors and cables (poles and structures)

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

Application of the Unit 3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice 3.1)

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to Occupational Health and Safety and/or contracts of training where they apply.

Competency Field **4)**

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to control vegetation	1.1 Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are received, analysed and confirmed, if necessary, by site inspection.
	1.2 Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.
	1.3 OHS policies and procedures related to requirements and established procedures for the control of vegetation near live low voltage conductors are obtained and confirmed for the purposes of the work to be performed and communicated.
	1.4 Work is prioritised and sequenced following consultation with others for completion within acceptable timeframes and in accordance with established procedures.
	1.5 Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear according to established procedures.
	1.6 Relevant work permits are obtained to access and perform work according to requirements and/or established procedures.
	1.7 Resources including personnel, equipment, tools and personal protective equipment required for the job are obtained and confirmed in working order.
	1.8 Relevant personnel at worksite are confirmed current in First Aid, Pole Top Rescue and other related work procedures according to requirements.

		1.9	Liaison and communication issues with other/authorised personnel, authorities, clients and land owners are resolved to carry out work where necessary.
		1.10	Site is prepared according to the work schedule and to minimise risk and damage to property, commerce, and individuals in accordance with established procedures.
		1.11	Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities confirmed where applicable in accordance with established procedures.
		1.12	Road signs, barriers and warning devices are positioned in accordance with requirements.
2	Carry out vegetation control	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in accordance with requirements and/or established procedures.
		2.2	Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely followed and, currency according to requirements confirmed.
		2.3	Apply Essential Knowledge and Associated Skills for the safe control of vegetation near live low voltage conductors to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements.
		2.4	Vegetation control is carried out, in accordance with the work schedule and requirements/established procedures.
		2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
		2.6	Unplanned events in vegetation control are undertaken within the scope of established procedures.
		2.7	Known solutions to a variety of problems are applied using acquired Essential Knowledge and Associated Skills.

		2.8	On going checks of quality of the work are undertaken in accordance with instructions and established procedures.
3	Complete vegetation control	3.1	Work undertaken is checked against works schedule for conformance with requirements and anomalies reported in accordance with established procedures.
		3.2	Accidents and/or injuries are reported in accordance with requirements/established procedures, where applicable.
		3.3	Work site is rehabilitated, cleaned up and made safe in accordance with established procedures.
		3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.5	Relevant work permit(s) are signed off and, the site is returned to service in accordance with requirements.
		3.6	Works completion records, reports, as installed /modified drawing and/or documentation and information are finalised and processed and appropriate personnel notified.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of controlling vegetation (linework.)

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

T2.5.1	Ecological principles for vegetation control
T2.5.2	Vegetation control techniques

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to the control of vegetation including tree trimming with relevant and complimentary linework competencies and includes working near live low voltage conductors, as specified in the relevant State/Territory legislation.

Vegetation control measures may include hand clearing, growth retardants, machinery-assisted clearing and herbicidal clearing.

Work may be conducted from a ladder, an elevating work platform, a tree or on the ground under minimal supervision.

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and Sustainable Energy Procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification

- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will

contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	At least one of the following:	Non conductive ladder, EWP

		Ground level
B	At least two of the following:	Hand clearing Specialised tools and equipment Machinery assisted clearing Herbicidal clearing
C	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual control of vegetation.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

There are no concurrent assessment recommendations for this unit.

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.5, 2.6, 2.10, 3.1, 3.2, 3.3	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.3, 2.5, 2.6, 2.10, 3.4	3
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.2, 2.4, 2.6, 2.9	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.8, 2.9, 3.1	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	2

Skills Enabling Employment **8.7)**

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 2.10, 3.1
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1, 3.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8,3.1, 3.2

UETTDRVC10A Coordinate vegetation control work

Unit Descriptor 1)

This Competency Standard Unit covers the coordination and implementation of continuous vegetation control and takes into account, arboreal regeneration, environmental issues and liaison and consultation procedures with, appropriate government agencies, property owners and environmental groups. It also encompasses conducting and/or contributing to public education processes and legislation issues.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:.

	UETTDRIS22A	Implement and monitor the organisation's OHS policies, procedures and programs
and	UETTDRIS23A	Implement and monitor environmental and sustainable energy management policies and procedures

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	4	Writing	4	Numeracy	4

Application of the Unit 3)

This competency standards unit shall apply to Transmission, Distribution, Rail Traction, Telecommunications and Vegetation Management Control industry sectors.

License to practice 3.1)

The skills and knowledge described in this unit may only be practiced under the regulations pertaining to each State and Territory for the safe planning for the removal of vegetation around live powerlines up to the live work zone including near live electrical apparatus, and regulations that directly relate to

Occupational Health and Safety and/or contracts of training where they apply.

Competency Field **4)**

Vegetation Units

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare/plan to coordinate vegetation control work	1.1 Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are obtained, analysed, if necessary, by site inspection and the extent of the preparation of the work determined for planning and coordination.
	1.2 Work is prioritised and sequenced for the most efficient and effective outcome following consultation with others for completion within acceptable timeframes, to a quality standard and in accordance with established procedures.
	1.3 Risk control measures are identified, prioritised and evaluated against the work schedule.
	1.4 Relevant requirements and established procedures for the work are to all personnel and identified for all work sites.
	1.5 Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear, to ensure safe systems of work are followed and according to established procedures.
	1.6 Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures.
	1.7 Resources including personnel, equipment, tools and personal protective equipment required for the job are identified, scheduled and coordinated and confirmed in a safe and technical working order.
	1.8 Clients/Customers are provided with possible solutions and/or options within the scope, acceptable cost and requirements.

		1.9	Liaison and communication issues with other/authorised personnel, authorities, clients and land owners are resolved and activities coordinated to carry out work.
		1.10	Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities coordinated and authorised where applicable in accordance with established procedures.
		1.11	Site is prepared according to the work schedule and to minimise risk and damage to property, commerce, and individuals in accordance with established procedures.
		1.12	Positioning of road signs, barriers and warning devices is planned in accordance with requirements.
2	Carry out the coordination of vegetation control work	2.1	OHS and Sustainable Energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and actioned in accordance with requirements and/or established procedures.
		2.2	First Aid, Pole Top Rescue and other related work procedures are performed according to requirements and/or established procedures.
		2.3	Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely exercised according to requirements.
		2.4	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
		2.5	Remedial actions are taken to overcome any shortfalls encountered in the work schedule according to requirements and/or established procedures.
		2.6	Coordination of vegetation control work is carried out, in accordance with the work schedule and requirements and/or established procedures.

		2.7	Essential Knowledge and Associated Skills in the safe coordination of vegetation control work is applied to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements.
		2.8	Solutions to non-routine problems are identified and actioned using acquired Essential Knowledge and Associated Skills according to requirements.
		2.9	On going checks of quality of the work are undertaken in accordance with requirements and established procedures to ensure a quality like outcome is achieved for the client/customer and to a community/industry standard.
3	Complete the coordination of vegetation control work	3.1	Work undertaken is checked against works schedule for conformance with requirements, anomalies reported and solutions identified in accordance with established procedures.
		3.2	Accidents and/or injuries are reported and followed up in accordance with requirements/established procedures.
		3.3	Work site is rehabilitated, cleaned up and confirmed safe in accordance with established procedures.
		3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.5	Relevant work permit(s) are signed off and are returned to service and advised to client/customer in accordance with requirements.
		3.6	Works completion records, reports, as installed /modified drawing(s) and/or documentation and information are confirmed, processed and appropriate personnel notified.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of coordinating vegetation control work.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

T2.2.53	HV principles
T2.5.1	Ecological principles for vegetation control
T2.5.2	Vegetation control techniques
T2.5.3	Fundamentals for working safely near live electrical apparatus
T2.5.4	Coordinate vegetation control inspection programs

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to the coordination of vegetation control work and may include the following:

Coordinating vegetation control measures which may include hand clearing, growth retardants, machinery-assisted clearing and herbicidal clearing.

Coordinating work, which may be conducted from a ladder, an elevating work platform, a tree or on the ground under minimal supervision.

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency

- Environmental and Sustainable Energy Procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **8.1)**

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
    - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
    - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in this unit to such an

extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and

- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	At least three of the following	Hand clearing Machinery assisted clearing Growth retardants Fire clearing, Herbicidal clearing
B	At least two of the following:	Ladder EWP Tree Ground
C	All of the following	Personnel aspects Material aspects Financial aspects
D	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.

- Suitable work environment, facilities, equipment and materials to undertake actual coordination of vegetation control.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working at realistic heights above ground i.e. above 3 metres, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

8.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified Essential Knowledge and Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

8.5) Concurrency:

There are no concurrent assessment recommendations for this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this Competency Standard Unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.8, 1.9, 1.11, 2.7, 3.1, 3.2	3
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 3.1, 3.5, 3.6	3
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.5, 1.6, 1.7, 1.10, 1.12, 2.1, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3	3

How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 2.1, 2.2, 2.3, 2.5, 2.6, 3.4	3
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.1, 1.7, 2.4, 2.6	3
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.1, 2.4, 2.5, 3.1	3
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.7, 2.2, 2.5, 2.6, 3.6	3

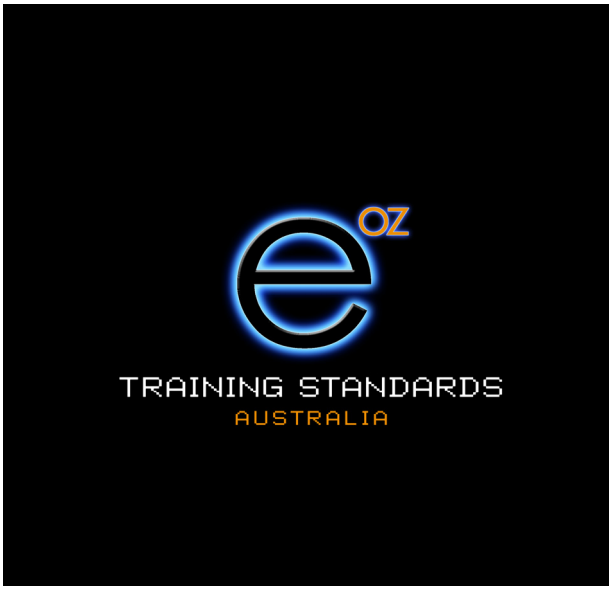
Skills Enabling Employment **8.7)**

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		**Example of Application**
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.11, 2.2, 3.1, 3.3
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.2, 1.4, 1.7, 1.10, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1, 2.5, 2.9, 3.1

4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2, 1.3, 1.4, 1.7, 1.8, 1.10, 2.1, 2.2, 2.4, 2.7, 2.8, 2.9, 3.1
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1, 1.2, 1.3, 1.4, 1.10, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.7, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2

Competency Standard Units
ED/EE/EG/EH



UET06
Electricity Supply Industry
Transmission, Distribution and Rail Sector
Training Package

Volume 2 — Part 2.1
Competency Standard Units
ED/EE/EG/EH –
Universal Electrotechnology Units

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Imported Units

UEUNEED002A Assemble, set-up and test personal computers

Unit Descriptor 1)

This unit covers assembly, setting-up and testing personal computers as directed in computer service manuals. It encompasses safe working practices, checking computer components, assembling components to form a basic personal computer, installing and testing basic operating system, drivers and application software, following written and oral instruction and applying customer relations procedures.

Note: This unit applies to all aspects of Electrotechnology — engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEUNEEE002A	Dismantle, assemble and fabricate electrotechnology components
UEUNEEE007A	Use drawings, diagrams, schedules and manuals

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

Application of the Unit 3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may be used to augment formally acquired competencies.

License to practice **3.1)**

The skills and knowledge described in this unit may require a licence to practice in the workplace subject to regulations for undertaking electrical work.. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field **4)**

Computer Systems

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Assemble personal computer.	1.1 OHS procedures for a given work area are obtained and understood through established routines and procedures.
	1.2 Established OHS risk control measures and procedures in relation to computer and keyboard use are followed.
	1.3 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.4 Computer, components, operating system and application software are obtained in accordance with established routines and checked as meeting requirements.
	1.5 Computer components are assembled and connected in accordance with manufacturers instructions.
	1.6 Routine quality checks are carried out in accordance with work instructions.
	1.7 Procedures for referring non-routine events to immediate supervisor for directions are followed.
2 Install operating system and application software.	2.1 Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Computer is started up and on-screen instructions for the installation of the operating system to default configuration are followed including drivers.

		2.3	Application software is installed to default configuration following on-screen installation instruction.
		2.4	Computer shutdown procedures are followed and computer switched off.
		2.5	Routine quality checks are carried out in accordance with work instructions.
		2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
3	Test computer operation.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Computer is switched on and start up procedures are followed and checked.
		3.3	Operating system and application programs are checked to be opening and operating correctly.
		3.4	Faults are identifies as being the result of either faulty hardware or software.
		3.5	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		3.6	Faults are rectified in accordance with computer hardware, operating system and application instructions.
		3.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		3.8	Computer shutdown procedures are followed and computer switched off.
		3.9	Work is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
4	Complete work and report.	4.1	OHS risk control work completion measures and procedures are followed.
		4.2	Work area is cleaned and made safe in accordance with established procedures.
		4.3	Work supervisor is notified of the completion of the work in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices, assembling, setting-up and testing personal computers.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.4.11	Personal computers, hardware structure
E2.4.12	Computer hardware sub-assemblies
E2.4.14	Personal computer operating systems, basics
E2.18.1	Occupational Health and Safety principles
E2.18.9	Electronic Safe working practices

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to assembling, setting-up, test and rectifying faults in a personal computer for single user operation and not intended to be connected to a network. Hardware faults rectification is confined to replacement of subassemblies and interconnections. Software faults rectification is confined to resetting default configuration.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work

environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling

employment; and

- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Assemble, set-up and test personal computers as described in 7) Range Statement and including:
    - A Correctly connecting computer, components and peripherals.
    - B Installing a basic operating system for single user operation.
    - C Installing application software to default configuration.
    - D Testing computer operation.
    - E Identifying and rectifying interconnection faults.
    - F Shutting down a computer correctly.
    - G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with Performance Criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific

resources for assessment, evidence should show demonstrated competency in assembling, setting-up and testing personal computers...

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with unit:

UEUNEEE002A	Dismantle, assemble and fabricate electrotechnology components
UEUNEEE007A	Use drawings, diagrams, schedules and manuals

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 4.3	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.3; 3.2; 3.3	1
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.4	1

How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.3	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: N/A	
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 3.4 to 3.6	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.2 to 2.4; 3.2 to 3.6	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.4; 4.3
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.5; 2.2 to 2.4; 3.2 to 3.6

5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.4
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.6; 3.7

UEUNEED004A Use engineering applications software

Unit Descriptor 1)

This competency standard unit covers the use of computers application relevant to engineering support work functions. The unit encompasses installing software, applying user preferences, using application menus and tools, entering and retrieve information, working with groups and transferring and printing files.

Note:

Examples of engineering application software are Visio, Electronic Work Bench, LabView and the like

Prerequisite Unit(s) 2)

Competencies 2.1)

There are no prerequisite competencies to this unit.

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	4	Writing	4	Numeracy	4

Application of the Unit 3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

License to practice 3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field 4)

Computer Systems

ELEMENT		PERFORMANCE CRITERIA	
5) Elements: 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.	
1	Prepare to use computer applications.	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.
		1.2	Established OHS risk control measures and procedures in relation to computer and keyboard use are followed.
		1.3	Application software and information required for its installation and use are obtained from appropriate sources.
		1.4	Application software is installed to default configuration following on-screen installation instruction.
		1.5	On screen instructions in relation to any anomaly such as a virus warning are followed.
		1.6	Help directory is used to resolve any straightforward start up or access issues or anomalies.
2	Use engineering application software.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Techniques that apply to a particular software package are used to produce appropriate files.
		2.3	Routine checks are made to ensure accuracy of information in accordance with quality requirements.
3	Output information from an application.	3.1	Completed files are stored appropriately in accordance with enterprise requirements.
		3.2	Files are printed for formal records and/or to forward to others.
		3.3	Files are sent via email in a readable format.
4	Shut down computer.	4.1	Files are named, arranged, saved and backed up in accordance with enterprise requirements.
		4.2	Computer shutdown procedures are followed and computer switched off.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices using engineering application software.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.4.16	Personal computers, engineering applications software basic
E2.18.1	Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to using at least two of the following types of engineering applications at a basic level.

- Apparatus set up and calibration
- Computer Aided Design
- Engineering data analysis software
- Engineering modelling
- Project management

Note:

Apparatus set-up applications are invariably vendor specific and include icon-based integration and control applications.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and

- Apply sustainable energy principles and practices as specified in the Performance Criteria and Range; Statement and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Use engineering applications software as described in 7) Range Statement and including:
    - A Correctly installing software.
    - B Dealing with anomalies appropriately.
    - C Following application instructions to input and output information.
    - D Storing information appropriately.
    - E Out putting information to a printer.
    - F Forwarding information via email in a readable format.
    - G Saving, storing and backing up files for effective retrieval by others.
    - H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

  Note:
  Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with Performance Criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in using engineering application software.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: N/A	
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.3; 3.1	2
How are activities planned and	Refer to the following Performance Criteria for examples of application:	

organised?	1.1 to 1.6	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: N/A	
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: N/A	
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.5 to 1.6	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 3.1 to 3.3	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.1 to 1.2
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 1.5 to 1.6
4	Interacting and understanding of	Refer to the following Performance Criteria for examples of application:

	the context of the work task	1.1 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 1.5

UEUNEED017A Install and configure internetworking systems

Unit Descriptor 1)

This competency standard unit covers the interconnection of networks using Open Systems Interconnection model (OSI) layer 2 and 3 devices. It encompasses safe working practice, basic installation and configuration of switches and routers and documenting installation and configuration activities.

Note:
This unit applies to all aspects of Electrotechnology — engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Prerequisite Unit(s) 2)

Competencies 2.1)

There are no prerequisite competencies to this unit.

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Application of the Unit 3)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

License to practice 3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field 4)

Computer Systems

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to install and configure internetworking systems.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of internetworking to be installed and configured is determined from internetworking performance specifications and in consultations with relevant persons.
	1.4	Media and software required for internetworking is selected in accordance with organisation's established procedures.
	1.5	Network cabling test reports are obtained and reviewed to determine whether it complies with the required regulatory and performance standard.
	1.6	Appropriately competent/qualified person(s) are engaged to rectify non-compliance cabling.
	1.7	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.8	Appropriate development tools and software are selected based on specified requirements and performance standard.
	1.9	Strategies are implemented to ensure network development is carried out efficiently.
2 Install and configure internetworking systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of internetworking arrangements and basic protocols are applied to installing and configuring routers and TCP/IP addresses.
	2.3	Access lists affording security of the network are created in compliance with industry standards and requirements specified for internetworking.

		2.4	Common routing, TCP/IP and access malfunctions are identified and rectified using known solutions drawing knowledge of basic internetworking arrangements and protocol.
		2.5	Approaches to issues/problems are analysed to provide most effective solutions.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3	Report install and configuring of internetworking systems.	3.1	Written justification is made for internetworking installation and configuring activities and appropriate person/s notified in accordance with established procedures.
		3.2	Network services records are maintained in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and configuring networking systems.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.1.7.1	Performance (copper) data cable installation and terminations
E2.1.7.2	Coaxial cable installation and terminations
E2.1.7.3	Optical fibre cabling installation and terminations
E2.4.3.2	Networking fundamentals
E2.4.39	Internet, network basics
E2.2.40	Internet, network routing
E2.5.7	Technical standards, regulations and codes for telecommunications cabling
E2.18.1	Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to installing and configuring internetworking systems between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Install and configure networking systems as described in 7) Range Statement and including:
    - A Establishing the extent of internetworking installation.
    - B Selecting appropriate internetworking media and software.
    - C Determining whether network cabling is compliant.
    - D Installing and configuring basic routing and TCP/IP protocols.
    - E Creating access list in compliance with industry standards and requirements specified for internetworking.
    - F Identifying common routing, TCP/IP and access malfunctions.

G Applying known solutions to common routing, TCP/IP and access malfunctions.

H Documenting internetworking installation and configuration activities.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in installing and configuring networking systems.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.1; 3.2	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.3; 1.4; 1.5; 2.4	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.9	3
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.6; 1.7	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: N/A	
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.5; 1.6; 1.9; 2.4	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.2 to 2.4	3

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 1.3; 1.7 to 1.9; 3.1; 3.2
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.4 to 1.6; 2.2 to 2.4
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.9
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5

UEUNEED027A Develop structured programs for control sub systems to access external devices

Unit Descriptor

1)

This competency standard unit covers programming of microprocessor/microcontroller devices to access external devices. The unit encompasses working safely, applying knowledge of control applications, and analogue and digital input/output signals, programming fundamentals, writing and testing program and documenting programming activities.

Prerequisite Unit(s)

2)

Competencies

2.1)

There are no prerequisite competencies to this unit.

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Application of the Unit

3)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field

4)

Computer Systems

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to develop structured programs for control sub systems.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of structure programming to be developed is determined from job performance specifications and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.5	Appropriate development kit and software are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure programming is carried out efficiently.
2 Develop structured programs for control sub systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of computer functions and features are applied to developing structure program.
	2.3	Correct structure and syntax is applied to developing structure program.
	2.4	Key features of the programming language are applied to develop and test solutions. (Note)
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3 Test and document structured program for control subsystems.	3.1	Testing procedures are developed to test developed program.
	3.2	Problems and bugs in program are rectified to ensure specification the creation of the code is met.

3.3 Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person or persons.

Note:
Although programming in 'C' is preferred any other structured language in current use by industry may be used.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing structured programs for control sub systems to access external devices.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.3.19 Control programming fundamentals

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to developing structured programs for control sub systems to access external devices including at least three of the following:

- Macros
- Global and local variables,
- Auto and static variables
- Intrinsic functions used in control
- Linking in external functions to control hardware

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and

- Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Develop structured programs for control sub systems to access external devices as described in 7) Range Statement and including:

    A Using all key features of an appropriate programming language.

    B Developing testing procedures.

    C Identifying problem and bugs in program.

    D Rectifying problem and bugs in program.

    E Writing and presenting work reports to an acceptable standard.

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with Performance Criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal

learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in develop structured programs for control sub systems to access external devices.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no prerequisite competencies to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.3; 3.1	2
How are activities planned and	Refer to the following Performance Criteria for examples of application:	

organised?	1.1 to 1.6	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4; 1.6	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.2 to 2.7	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 3.1; 3.2	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.1 to 3.2	3

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6; 3.3
4	Interacting and understanding of	Refer to the following Performance Criteria for examples of application:

	the context of the work task	1.3; 2.2 to 2.7; 3.1
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5; 3.2

UEUNEED028A Develop and test basic specification for microcontroller equipped devices

Unit Descriptor

1)

This competency standard unit covers structured programming instructions for micro devices at a fundamental level. The unit encompasses working safely, applying knowledge device architecture and programming fundamentals, writing and testing specified instructions and documenting development activities.

Note.
In this unit the term 'micro' refers to microcontrollers however competency in the unit can be achieved using microprocessors.

Prerequisite Unit(s)

2)

Competencies

2.1)

There are no prerequisite competencies to this unit.

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Application of the Unit

3)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field

4)

Computer Systems

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to develop and test basic specifications.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of specifications to be developed is determined from job performance requirements and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.5	Appropriate development kit and software are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure programming is carried out efficiently.
2 Develop basic specification.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of micro controller functions and features are applied to developing specifications.
	2.3	Correct structure and syntax is applied to developing program specification for target micro controller function.
	2.4	Key features of the assembler programming language are applied to develop and test solutions.
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test and document the basic specification.	3.1	Testing procedures are developed to analyse code developed.
	3.2	Problems and bugs are rectified to ensure specification the creation of the code is met.

3.3 Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person or persons.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and test basic specification for microcontroller equipped devices.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.3.20 Microcontroller programming basics

E2.9.5.1 Microprocessor fundamentals

E2.9.5.2 Microcontroller fundamentals

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to developing and testing basic specification for micro equipped devices including at least three of the following:

- Selecting an appropriate micro for a given task
- Setting up and using basic input/output functions
- Using assembler/simulator software packages to debug program
- Finding system faults.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and

- Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Develop and test basic specification for microcontroller equipped devices as described in 7) Range Statement and including:
    - A Using all key features of an appropriate assembler language.
    - B Developing testing procedures.
    - C Identifying problem and bugs in program.
    - D Rectifying problem and bugs in program.
    - E Writing and presenting work reports to an acceptable standard.
    - F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in develop and test basic specification for microcontroller equipped devices.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no prerequisite competencies to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.3; 3.1	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4; 1.6	2

How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.2 to 2.6	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 3.1; 3.2	2
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.1 to 3.2	3

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6; 3.3
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.3; 2.2 to 2.6; 3.1
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6

6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5; 3.2

UEUNEEE001A Apply OHS practices in the work place

Unit Descriptor 1)

This competency standard unit specifies the mandatory requirements of occupational health and safety and how they apply to the various electrotechnology work functions. It encompasses responsibilities for health and safety, risk management processes at all operative levels and adherence to safety practices as part of the normal way of doing work.

Note:
Components of this unit are included in the critical aspects of evidence of each applicable unit to ensure that OHS practices are demonstrated as they apply to specific work functions and situation.

Prerequisite Unit(s) 2)

Competencies 2.1)

There are no prerequisite competencies to this unit.

Note:
1. Competency in this unit shall be assessed concurrently with other units in a qualification.
2. Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired.

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit 3)

This unit addresses information, processes and techniques for the application of general occupational health and safety requirements in workplaces and is essential for employees without managerial or supervisory responsibilities. The unit is based on Generic Competency A in the National Guidelines for Integrating OHS Competencies into National Industry Competency Standards [NOHSC: 7025 (1998) 2nd Edition].

Note:

All States, Territories and the Commonwealth have enacted legislation that establishes a general duty of care for workplace parties to ensure healthy and safe working conditions. In most workplaces, the final responsibility for providing a healthy and safe working environment, as far as practicable, rests with the employer. Employees also have a duty of care in relation to OHS that ensures their health and safety and that of others in the workplace. The relevant jurisdictional OHS legislation

should always be consulted to ascertain the exact duties set down for employers and employees.

License to practice **3.1)**

The competency described in this unit does not directly require a license to practice but is subject to regulations for occupational health and safe and contracts of training where they apply.

Note
Some workplace equipment require an operative to hold a current user permit e.g. scaffolding and elevated platforms above certain heights, excavation equipment and the like. Competencies for receipt of such permits are not included in this unit.

Competency Field **4)**

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to enter a work area	1.1 Instruction in hazards and risk control measures for specific work functions and work areas is obtained.
	1.2 Work area access permits are obtained from appropriate personnel according to established procedures.
	1.3. Preparations for electrical and non-electrical isolation are made to prevent creation of hazards from loss of machine/system/process control according to established procedures.
	1.4 Tools and equipment needed for the work are checked for safety and correct functionality according to established procedures and regulatory requirements.
2 Apply safe working practices.	2.1 Workplace procedures and work instructions for controlling risk are followed accurately.
	2.2 Workplace procedures for dealing with accidents, fires and emergencies are followed according to work procedures and scope of responsibility and competencies.

3. Follow work place procedures for hazard identification and risk control	3.1	Participates actively in the consultation process with employer and other employees to identify hazards and implement and monitor control measures.
	3.2	Hazards in the work area are recognised and reported to appropriate personnel according to established procedures.
	3.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures.
	3.4	Workplace instructions and training are followed accurately within established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying OHS practices in the work place

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to:

(a) Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards present in the industry and particular workplace, and

(b) Accepted industry work procedures and the specific safety procedures and work instructions for particular workplace.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range encompassing the following items;

A Preparing to enter the workplace including, the use of work permits and clearances and isolation permissions.

B Applying work procedures and instructions as they apply to risk control measures.

C Dealing with accidents and emergencies within the scope of responsibility.

D Participation in consultation processes, identifying hazards and implementing and monitoring control measures.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items, and

- Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items above.
  - Applying OHS practices in the work place as described in 7) Range Statement and including the above items.

    Note:
    Ability to implement these Occupation Health and Safety measures shall be demonstrated on all occasions safety issues arise.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal

learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in applying OHS practices in the work place.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

This unit shall be assessed as it relates to other units undertaken in a qualification. Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.1; 3.2	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 2.1; 3.3	1
How are activities planned and	Refer to the following Performance Criteria for examples of application:	

organised?	1.3; 1.4	
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 3.1	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: N/A	
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: N/A	
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: N/A	

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.1; 3.4
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.1; 3.2
4	Interacting and understanding of	Refer to the following Performance Criteria for examples of application:

	the context of the work task	2.1; 2.2
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.3; 1.4
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 3.2

UEUNEEE002A Dismantle, assemble and fabricate electrotechnology components

Unit Descriptor

1)

This competency standard unit covers basic fitting and fabrication techniques as they apply in the various electrotechnology work functions. It encompasses the safe use of hand and fixed and portable power tools, cutting, shaping joining and fixing using metallic and non-metallic materials, dismantling and assembling equipment, basic mechanical measurement and marking-out and reading diagrams.

Prerequisite Unit(s)

2)

Competencies

2.1)

There are no prerequisite competency standard units to this unit.

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit

3)

This unit shall apply to persons entering work in electrotechnology and may be used in school based vocational programs.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships and the like.

Competency Field

4)

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare for dismantling, assembling and fabrication work.	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazard not previously identified are reported and advice on risk control measures are sought from the work supervisor.
	1.4	The nature of the work is obtained from documentation and from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.6	Materials required for the work are obtained in accordance with established routines and procedures.
	1.7	Tools, equipment and measuring devices needed to carry out the work are obtained and checked for correct operation and safety.
	1.8	Cutting tools such as drills and chisels are sharpened to suit the material on which they are to be used.
2 Dismantle and assemble electrotechnology apparatus.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Appropriate tools are selected and used correctly and safely in dismantling and assembling apparatus.
	2.4	Apparatus manufacturer's dismantling and assembling guides are used where applicable.
	2.5	Components are marked or tagged during the dismantling to help ensure correct and efficient reassembly.

		2.6	Dismantled components and parts are stored to protect them against loss or damage.
		2.7	Apparatus is dismantled and assembled efficiently without unnecessary waste of materials and energy and unnecessary damage to apparatus, and the surrounding environment or services.
		2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		2.9	Routine quality checks are carried out in accordance with work instructions.
3	Fabricate electrotechnology components.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		3.3	Appropriate tools are selected and used correctly and safely in fabricating components.
		3.4	Drawings and instruction for the fabrication of components are followed.
		3.5	Component dimensions are determined directly or by calculation from information given in job drawings and instructions.
		3.6	Components are fabricated efficiently without unnecessary waste of materials and energy and unnecessary damage to the surrounding environment or services.
		3.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		3.8	Routine quality checks are carried out in accordance with work instructions.
4	Complete work and report.	4.1	OHS risk control work completion measures and procedures are followed.
		4.2	Work site is cleaned and made safe in accordance with established procedures.
		4.3	Work supervisor is notified of the completion of the work in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and dismantling, assembling and fabricating electrotechnology components.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.11.1 Hand tools

E2.11.2 1 Power tools

E2.11.4 Dismantling and assembling techniques

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to installation, fault finding, maintenance or development work functions in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Dismantle, assemble and fabricate electrotechnology components as described in 7) Range Statement and including:
    - A Dismantle and assemble an apparatus relevant to the discipline in which competency is sought and that requires selection and safe use of a variety dismantling/assembling tools.
    - B Sharpening a drill bit for at least two different types of material.
    - C Fabricating a component that requires the selection and safe use of a variety of fabrication tools.
    - D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with

the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

> Note:
> Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in dismantling, assembling and fabricating electrotechnology components.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

> Note:
> Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the following units.

UEUNEEE005A Fix and secure equipment

UEUNEEE007A Use drawings, diagrams, schedules and manuals

The critical aspects of Occupational Health and Safety covered in UEUNEEE001A and other discipline specific Occupational Health and Safety unit(s) shall be reassessed in relation to this unit.

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.3	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.4; 1.5	1
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.8	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.5	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 3.5	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: N/A	
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.3; 3.3	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.1
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.8
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.4
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.8
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.8; 3.7

UEUNEEE003A Solve problems in extra-low voltage single path circuits

Unit Descriptor

1)

This competency standard unit covers providing known solutions to predictable problems in single path circuits operated at extra-low voltage as they apply to various electrotechnology work functions. It encompasses working safely, problem solving procedures, including the use of basic voltage, current and resistance measuring devices, providing known solutions to predictable circuit problems.

Prerequisite Unit(s)

2)

Competencies

2.1)

There are no prerequisite competencies to this unit.

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit

3)

This unit shall apply to persons entering work in electrotechnology and may be used in school based vocational programs.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the work place. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships and the like.

Competency Field

4)

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to work on extra-low voltage single path electrical circuits.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve problem in extra-low voltage single path electrical circuits.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established routines are used to solve circuit problems using measured and calculated values as they apply to single path, single source circuits.
	2.5	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established routine procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in extra-low voltage single path circuits.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.8.1.2	Fundamental electrical principles
E2.11.1	Hand tools
E2.18.1	Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to:

- Single source single path circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following disciplines:
    - Computers
    - Data Communications
    - Electrical
    - Electronics
    - Fire protection
    - Instrumentation
    - Refrigeration and Air Conditioning,
    - Renewable and sustainable energy systems, and

- Security technology

- In relation to at least three of the following types of circuit problems and on at least two occasions:
    - Determining the operating parameters of an existing circuit
    - Identifying and locating open-circuits
    - Identifying and locating short-circuits
    - Identifying loss of supply

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or

less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solve problems in extra-low voltage single path circuits as described in 7) Range Statement and including:
    - A Determining the operating parameters of an existing circuit.
    - B Altering an existing circuit to comply with specified operating parameters.
    - C Developing circuits to comply with a specified function and operating parameters.
    - D Identifying loss of supply.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solve problems in extra-low voltage single path circuits.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of Occupational Health and Safety covered in UEUNEEE001A and other discipline specific Occupational Health and Safety unit(s) shall be reassessed in relation to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved

within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.1	1
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.6	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: N/A

UEUNEEE004A Solve problems in multiple path d.c. circuits

Unit Descriptor 1)

This competency standard unit covers determining correct operation of single source d.c. parallel and series-parallel circuits and providing solutions as they apply to various electrotechnology work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in multiple path circuit.

Prerequisite Unit(s) 2)

Competencies 2.1)

Competency in this unit may be assessed with or only after the following competency has been acquired.

UEUNEEE003A	Solve problems in extra-low voltage single path circuits

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit 3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

License to practice 3.1)

The skills and knowledge described in this unit requires a licence to practice in the workplace where plant and equipment is directly connected to installation wiring that operates at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and

the like.

Competency Field **4)**

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to work on multiple path d.c. electrical circuits.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 OHS risk control work preparation measures and procedures are followed.
	1.3 The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve multiple path d.c. circuit problems.	2.1 OHS risk control work measures and procedures are followed.
\	2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3 Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4 Established methods are used to solving d.c. circuit problems from measure and calculated values as they apply to multiple path electrical circuit.
	2.5 Unexpected situations are dealt with safely and with the approval of an authorised person.

		2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in multiple path d.c. circuits.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

2.8.2.1	Direct current circuit principles
2.11.1	Hand tools
2.18.1	Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to:

- Single source parallel and series-parallel d.c. circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following disciplines:
    - Computers
    - Data Communications
    - Electrical
    - Electronics
    - Fire protection
    - Instrumentation

- Refrigeration and Air Conditioning, and

- In relation to at least two of the following types of circuit problems and on at least two occasions:

  - Determining the operating parameters of an existing circuit
  - Alternating an existing circuit to comply with specified operating parameters
  - Developing circuits to comply with a specified function and operating parameters

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or

less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solving problems in multiple path d.c. circuits as described in 7) Range Statement and including:
    - A Determining the operating parameters of an existing circuit.
    - B Alternating an existing circuit to comply with specified operating parameters.
    - C Developing circuits to comply with a specified function and operating parameters.
    - D Dealing with unplanned events by drawing on

essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solving problems in multiple path d.c. circuits.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in UEUNEEE001A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.4	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5

UEUNEEE005A Fix and secure equipment

Unit Descriptor 1)

This competency standard unit covers fixing, securing and mounting techniques as apply in the various electrotechnology work functions. It encompasses the safe use of hand and portable power tools, safe lifting techniques, safe use of ladders and elevated platforms and the selection and safe application of fixing devices and supporting accessories/equipment.

Prerequisite Unit(s) 2)

Competencies 2.1)

There are no prerequisites to this unit.

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit 3)

This unit shall apply to persons entering work in electrotechnology and may be used in school based vocational programs.

License to practice 3.1)

The skills and knowledge described in this unit may require a licence to practice in the workplace where they are applied to electrical work intended for voltage above 50 V a.c. or 120 V d.c. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

Competency Field **4)**

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to fix and secure equipment.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 OHS risk control work preparation measures and procedures are followed.
	1.3 The scope of work to be undertaken is obtained from documentation or from work supervisor.
	1.4 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6 Fixing devices are selected for their suitable ability for the environment, the load they are to support and substratum's into which they are to be installed.
	1.7 Supporting accessories/equipment is selected for suitability for the environment and ability to support and protect from damage that which they are intended to support.
	1.8 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Install fixing and support devices.	2.1 Electrical isolation is arranged where work is within arms reach of exposed conductive parts, plant or machinery in strict accordance OHS requirements and procedures.
	2.2 Other OHS risk control measures relevant to the work site are followed.
	2.3 Fixing devices are installed in accordance with manufacturers instructions.

		2.4	Support accessories/equipment is install accurately and to comply with technical standards and job specifications.
		2.5	Work is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3	Complete fixing and support work.	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Work site is tidied and tools and equipment cleaned and securely stored.
		3.3	Appropriate personnel are notified of the work completion.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fixing and securing equipment.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.11.1 Hand tools

E2.11.2.1 Power tools

E2.11.3.1 Fixing and support devices and techniques

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to installation, fault finding, maintenance or development work functions in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines

- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing

assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Fix and secure equipment as described in 7) Range Statement and including:
    - A Selecting fixing for loads of < 5 kg, < 20 kg and < 50 kg and suitable for the environment in which they are to be installed.
    - B Fixing to a hollow wall, brick, concrete and steel.
    - C Fixing support accessories/equipment relevant the discipline in which competency is sought.
    - D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with

the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

> Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in fixing and securing equipment.

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

> Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units covering other installation competencies.

The critical aspects of Occupational Health and Safety covered in UEUNEEE001A and other discipline specific Occupational Health and Safety unit(s) shall be reassessed in relation to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.3; 1.4	1
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.8	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: N/A	
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.3; 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 1.7; 1.8; 3.3
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.3; 1.4
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.8
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: N/A

UEUNEEE006A Apply methods to maintain currency of industry developments

Unit Descriptor 1)

This unit covers methods for keeping up-to-date with developments in electrotechnology-adopted technologies, standards and safety that affect the currency of competencies held. It encompasses accessing relevant information and skills and using formal and informal ways of acquiring this information and skills.

Prerequisite Unit(s) 2)

Competencies 2.1)

There are no prerequisite competencies to this unit.

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	4	Writing	4	Numeracy	4

Application of the Unit 3)

This unit is intended to augment other Competency Standard Units and is suitable for programs independent of a qualification.

License to practice 3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field 4)

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to apply methods to maintain currency of industry developments	1.1	Areas of work activity that may be effected by outdated methods and knowledge are identified.
	1.2	Information and advice is sought on the effects of current legislated requirements on work outcomes.
	1.3	Sources of information related to technical and regulatory developments are investigated.
2 Apply methods to maintain currency of industry developments	2.1	Methods are used to ensure the application of OHS policies comply with current regulations, codes and practices.
	2.2	Methods are used to ensure technical aspects of work undertaken are aligned to current practices and comply with current regulations.
	2.3	Methods are used to ensure managerial aspects of work undertaken are aligned to current practices and comply with current regulations.
	2.4	Formally recognised methods for maintaining currency of industry developments are identified and applied.
	2.5	Maintenance of current knowledge and practices for the work undertaken is documented in accordance with formally recognised processes.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying methods to maintain currency of industry developments.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.2.44	Requirements and methods for maintaining currency in industry developments
E2.18.1	Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to applying methods to maintain currency of industry developments in any electrotechnology discipline in which work is undertaken.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing

assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Apply methods to maintain currency of industry developments in 7) Range Statement and including:
    - A Identifying areas of work affected by outdated methods and knowledge.
    - B Using methods to ensure current OHS practices are applied.
    - C Using methods to ensure technical aspects of work are aligned to current practices and comply with current regulations.
    - D Using methods to ensure managerial aspects of work undertaken are aligned to current practices and

comply with current regulations.

E Applying formally recognised methods to maintain currency of industry developments.

F Documenting maintenance of current knowledge and practices for the work undertaken appropriately.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in applying methods to maintain currency of industry developments.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with unit:

UEUNEEE018A Establish, maintain and evaluate OHS systems

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 2.5	3
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.3	3
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.3	3
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: N/A	
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.2	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.1 to 2.4	3
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: All	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.5
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: All
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.3
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: N/A

UEUNEEE007A Use drawings, diagrams, schedules and manuals

Unit Descriptor 1)

This competency standard unit covers the use of drawings, diagrams, equipment and cable schedules and manuals as they apply to the various electrotechnology work functions. It encompasses the rudiments for communicating with schematic, wiring and mechanical diagrams and equipment and cable/connection schedules, manuals, site and architectural drawings and plans showing the location of services, apparatus, plant and machinery.

Prerequisite Unit(s) 2)

Competencies 2.1)

There are no prerequisite competencies to this unit.

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit 3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

License to practice 3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field 4)

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to use drawings, diagrams, schedules and manuals.	1.1	Established OHS risk control measures and procedures are followed.
	1.2	The need for drawings, diagrams, schedules or manual is determined from the nature of the work to be undertaken.
	1.3	Established routines and procedures are followed to obtain drawings, diagrams, schedules or manuals required for the work to be undertaken.
2 Use drawings, diagrams, schedules and manuals to obtain job information.	2.1	Drawings, diagrams, schedules and/or manuals are selected, appropriate to the work being undertaken.
	2.2	Drawings, diagrams and schedules are interpreted using knowledge of drawing layouts, conventions and symbols.
	2.3	Dimensions are extracted from drawings and diagrams for application to work undertaken.
	2.4	Location of equipment is determined from equipment schedules and location diagrams.
	2.5	Manuals are reviewed to ascertain their format and where information relevant to the work to be undertaken is located.
	2.6	Information given in manuals is interpreted in relation to the work to be undertaken.
3 Use drawings, diagrams, schedules and manuals to convey information and ideas.	3.1	Drawing conventions are used in neat freehand drawings to convey information and ideas to others involved in the work to be undertaken.
	3.2	Drawing conventions are used to neatly correct freehand original job drawing to show final 'as-installed' arrangement.
	3.3	Corrected drawings are forwarded to appropriate person(s) in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using drawings, diagrams, schedules and manuals.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.5.1.2 Drawings and diagrams

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to assembly, installation, fault finding, maintenance or development work functions in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and

- Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Use drawings, diagrams, schedules and manuals as described in Clause 7) Range and including:
    - A Identifying drawings, diagrams, schedules and manuals relevant to the work to be undertaken.
    - B Interpreting drawings, diagrams, schedules and manuals correctly.
    - C Using correct conventions in freehand drawings.
    - D Giving correct information in freehand drawings.
    - E Dealing with unplanned events and drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in using drawings, diagrams, schedules and manuals.

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit should be assessed concurrently with units in which the use of drawings, diagrams, schedules or manuals is required.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.1 to 3.3	2
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.2	1
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.3	1
How is team work used within this	Refer to the following Performance Criteria for examples of application:	1

competency?	3.1	
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.3	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.1 to 3.1	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: N/A	

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 1.2; 2.1; 3.1; 3.2
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2; 2.2 to 2.6
5	Planning and organising the	Refer to the following Performance Criteria for examples of application:

	meaningful work task	1.1 to 1.3
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: N/A

UEUNEEE008A Lay wiring/cabling and terminate accessories for extra-low voltage circuits

Unit Descriptor

1)

This unit covers the laying of wiring/cabling, connection of accessories and continuity and insulation resistance testing of circuits intended to operate at extra-low voltage. Typically this includes circuits and accessories for ELV powered devices, security, controls, integrated systems, audio/video systems and the like. It encompasses the principles of single source, single load power circuits, control circuits and communications circuits, safe working practices and following work processes that satisfy electrical principles for safety and functionality.

Prerequisite Unit(s)

2)

Competencies

2.1)

Competency in this unit may be assessed with or only after the following competency has been acquired.

UEUNEEE002A	Dismantle, assemble and fabricate electrotechnology components
UEUNEEE005A	Fix and secure equipment
UEUNEEE007A	Use drawings, diagrams, schedules and manuals

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit

3)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to

occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note: 1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

Competency Field **4)**

Electrotechnology

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to lay wiring/cabling and connect accessories for extra-low voltage circuits.	1.1 OHS procedures for a given work area are obtained and understood through established routines.
	1.2 Established OHS risk control measures in preparation for the work are followed.
	1.3 Safety hazards not previously been identified are reported and advice on risk control measures are sought from the work supervisor.
	1.4 The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5 Advice is sought from the work supervisor or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6 Sources of materials that may be required for the work are established in accordance with established routines.
	1.7 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Lay wiring/cabling and connect accessories for extra-low voltage circuits.	2.1 Established OHS risk control measures for carrying out the work are followed.
	2.2 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

		2.3	Wiring and accessories are installed to comply standards and job specifications with sufficient excess to affect terminations.
		2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
		2.5	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements.
		2.6	Cables installed for future service and marked in accordance with the cable identification scheme and terminated incompliance with regulatory requirements.
		2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		2.8	Cable installation and termination is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3	Complete and report work activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Work supervisor is notified of the completion of the installation work in accordance with established routines.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and laying wiring/cabling and terminate accessories for extra-low voltage circuits.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.1.1	Cable protection and support
E2.1.2	Cable types and applications
E2.1.3	Cables in buildings, structures and premises
E2.1.4	Basic cable and conductor terminations
E2.5.5	Technical standards, regulations and codes for

	extra-low voltage work
E2.5.11	Environmental and heritage awareness
E2.18.1	Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to laying wiring/cabling and connecting accessories for extra-low voltage power and control cabling systems circuits using:

- At least one of the following wiring/cabling systems:
  - Unenclosed thermoplastic sheathed (TPS) cable
  - Enclosed thermoplastic insulated (TPI) or sheathed cables, and
- At least three of the following wiring/cabling systems:
  - single cable,
  - flexible cable,
  - flexible cord,
  - shielded cable,
  - armoured cable,
  - ribbon cable,
  - other similar and like cable

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**8.1)** Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships.

However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and

- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Lay wiring/cabling and terminate accessories for extra-low voltage in power and control circuits as described in 7) Range Statement and including:

    A Understanding the nature of the work.

    B Selecting appropriate tools, cables and accessories.

    C Following appropriate cable routes.

    D Installing cable and accessories to requirements.

    E Terminating cables and accessories to manufacture's specifications and requirements.

    F Cleaning worksite.

    G Notifying completion of work using established procedures.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in laying wiring/cabling and terminate accessories for extra-low voltage circuits.

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3

"Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units:

UEUNEEE002A	Dismantle, assemble and fabricate electrotechnology components
UEUNEEE005A	Fix and secure equipment
UEUNEEE007A	Use drawings, diagrams, schedules and manuals

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 1.1; 1.2	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.3	1
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.5	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas	Refer to the following Performance Criteria for examples of application:	

and techniques used?	2.5	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.7	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.1 to 2.5	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		**Example of Application**
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: 1.1; 2.7
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.4 to 1.5
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.5
6	Performing the work task in non-	Refer to the following Performance Criteria for examples of application:

	routine or contingent situations	2.7

UEUNEEG001A Solve problems in electromagnetic circuits

Unit Descriptor 1)

This unit covers determining correct operation of electromagnetic circuits and providing solutions as they apply to electrical installations and equipment. It encompasses working safely, power circuit problems solving processes, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in multiple path circuit.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEUNEEE004A	Solve problems in multiple path d.c. circuits

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	4	Writing	4	Numeracy	4

Application of the Unit 3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

License to practice 3.1)

The skills and knowledge described in this unit require a licence to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field **4)**

Electrical

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to work on electromagnetic circuits.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve multiple path electrical circuit problems.	2.1	OHS risk control work measures and procedures are followed.
\	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solving circuit problems from measure and calculated values as they apply to multiple path electrical circuit.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.

		2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in electromagnetic circuits.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.8.6	Electromagnetic principles
E2.11.1	Hand tools
E2.18.1	Occupational health and safety principles
E2.18.2	Electrical safe working practice

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

Single source parallel and series-parallel circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in the following discipline:

- Electrical, and

In relation to at least two of the following types of circuit problems and on at least two occasions:

- Determining the operating parameters of an existing circuit
- Alternating an existing circuit to comply with specified operating

parameters

- Developing circuits to comply with a specified function and operating parameters

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solve problems in electromagnetic circuits as described as described in 7) Range Statement and including:
    - A Determining the operating parameters of an existing circuit.
    - B Alternating an existing circuit to comply with specified operating parameters.
    - C Developing circuits to comply with a specified function and operating parameters.
    - D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solve problems in electromagnetic circuits.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.4	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5

UEUNEEG002A Solve problems in single and three phase low voltage circuits

Unit Descriptor 1)

This unit covers ascertaining correct operation of single and three phase circuits and solving circuit problems as they apply to servicing, fault finding, installation and compliance work functions. It encompasses safe working practices, multiphase circuit arrangements, issues related to protection, power factor and MEN systems and solutions to circuit problems derived from calculated and measured parameters.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEUNEEG001A	Solve problems in electromagnetic circuits

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	4	Writing	4	Numeracy	4

Application of the Unit 3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

License to practice 3.1)

The skills and knowledge described in this unit require a licence to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note: 1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some

work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measure and the like.

Competency Field **4)**

Electrical

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to solve single and three phase low voltage circuit problems.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3 Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4 The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.6 Sources of materials that may be required for the work are established in accordance with established procedures.
	1.7 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve single and three phase low voltage circuit problems..	2.1 OHS risk control measures and procedures for carrying out the work are followed.
\	2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

		2.4	Established methods are used to solve circuit problems from measure and calculated values as they apply to single and three-phase low voltage circuit.
		2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in electromagnetic circuits.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.8.2.2	Alternating current principles - power
E2.18.1	Occupational health and safety principles
E2.18.2	Electrical safe working practice

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any four of the following problems for both single and three-phase circuit.

- Determining the operating parameters of existing circuits
- Alternating an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters

  Note: Operating parameters include voltage, current, impedance, power and power factor
- Determining the cause of low power factor in an existing circuit.
- Determining conditions causing an existing circuit to be unsafe.

  Note: Examples of unsafe circuits include electric shock hazard from indirect contract with conductive parts, insufficiently low impedance of a fault current path and inadequate fault protection

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most

effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

- Solve problems in electromagnetic circuits as described as described in 7) Range Statement and including:

  A Determining the operating parameters of existing circuits.

  B Alternating an existing circuit to comply with specified operating parameters.

  C Developing circuits to comply with a specified function and operating parameters.

  D Determining the cause of low power factor in an existing circuit.

  E Determining conditions causing an existing circuit to be unsafe.

  F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solve problems in electromagnetic circuits.

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEUNEEE001A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.4	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.7	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	2
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	2

How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.7
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.7
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5; 2.6

UEUNEEG047A Provide computational solutions to power engineering problems

Unit Descriptor 1)

This unit covers the application of computational processes to solving problems encountered in power engineering. It encompasses working safely, applying problem solving techniques, using a range of mathematical processes, providing solutions to power engineering problems and justifying such solutions.

Note: Typical engineering problems are those encountered in meeting requirements in a design brief, meeting performance requirements and compliance standards, revising a systems operating parameters and dealing with system malfunctions.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEUNEEG002A	Solve problems in single and three phase low voltage circuits

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Application of the Unit 3)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

License to practice 3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field **4)**

Electrical

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Provide computational solutions to engineering problems	1.1 OHS procedures for a given work area are obtained and understood
	1.2 The nature of the problems are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.3 Power engineering problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
	1.4 Known constants and variable related to the problem are obtained from measured values or problem documentation.
	1.5 Alternative methods for resolving the problem are considered and where necessary discussed with appropriate person(s).
	1.6 Problems are solved using appropriate mathematical processes and within the realistic accuracy.
2 Complete work and document problem solving activities	2.1 Justification for solutions used to solve engineering problems is documented for inclusion in work/project development records in accordance with professional standards.
	2.2 Work completion is documented and an appropriate person or persons notified.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing computational solutions to power engineering problems. The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.8.11 Power engineering computations

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to problems that apply to power engineering diagnosis and development work functions in any of the following disciplines:

- Electrical
- Electronics
- Renewable energy
- Control

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Provide computational solutions to power engineering problems as described in 7) Range Statement and including:
    - A Clearly stating problems in written and diagrammatic form.

B Obtaining known constants and variable from an appropriate source.

C Solving problems using appropriate mathematical processes.

D Documenting justification of solutions provided in accordance with professional standards.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in providing computational solutions to power engineering problems.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units:

UEUNEEG002A	Solve problems in single and three phase low voltage circuits

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the

following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 2.1; 2.2	3
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.4	3
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3	3
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.5	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6	3
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6	3
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6	3

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1; 2.2
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.2; 1.3
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: N/A

UEUNEEG048A Solve problems in complex multiple path power circuits

Unit Descriptor

1)

This unit covers the determining correct operation of complex series-parallel power circuits and providing solutions as they apply to electrical power engineering work functions. It encompasses working safely, problem solving procedures, including electrical measuring devices, applying appropriate circuit theorems and providing solutions derive from measurements and calculations and providing justification for such solutions.

Note: Typical engineering problems are those encountered in meeting requirements in a design brief, meeting performance requirements and compliance standards, revising a systems operating parameters and dealing with system malfunctions.

Prerequisite Unit(s)

2)

Competencies

2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEUNEEG047A	Provide computational solutions to power engineering problems

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Application of the Unit

3)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Competency Field	**4)**
	Electrical

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Provide computational solutions to engineering problems	1.1	OHS procedures for a given work area are obtained and understood
	1.2	The nature of the problems are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.3	Power engineering problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
	1.4	Known constants and variable related to the problem are obtained from measured values or problem documentation.
	1.5	Alternative methods for resolving the problem are considered and where necessary discussed with appropriate person(s).
	1.6	Problems are solved using appropriate mathematical processes and within the realistic accuracy.
2 Complete work and document problem solving activities	2.1	Justification for solutions used to solve engineering problems is documented for inclusion in work/project development records in accordance with professional standards.
	2.2	Work completion is documented and an appropriate person or persons notified.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in complex multiple path power circuits. The extent of the essential knowledge and skills required is given Volume 2 Part 2, Section 2 Clauses:

E2.8.9.2 Electrical power circuit analysis

E2.18.1 Occupational Health and Safety principles

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to problems that apply to power engineering diagnosis and development work functions in any of the following disciplines:.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to

consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solve problems in complex multiple path power circuits as described in 7) Range Statement and including:
    - A Clearly stating problems in written and diagrammatic form.
    - B Obtaining known constants and variable from an appropriate source.
    - C Solving problems using appropriate mathematical processes.
    - D Documenting justification of solutions provided in accordance with professional standards.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solving problems in complex multiple path power circuits..

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units:

UEUNEEG002A	Solve problems in single and three phase low voltage circuits

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 2.1; 2.2	3
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.4	3
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3	3
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.5	2
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6	3
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6	3
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 1.3 to 1.6	3

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 2.1; 2.2
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.2; 1.3
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: N/A

UEUNEEG049A Solve problems in complex polyphase power circuits

Unit Descriptor 1)

This unit covers determining correct operation of complex polyphase power circuits and providing solutions as they apply to electrical power engineering work functions. It encompasses working safely, problem solving procedures, including using electrical measuring devices, applying appropriate circuit theorems and providing solutions derived from measurements and calculations and justification for such solutions.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEUNEEG048A	Solve problems in complex multiple path power circuits

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Application of the Unit 3)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

License to practice 3.1)

The skills and knowledge described in this unit require a licence to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable to contracts of training such as apprenticeships.

Competency Field **4)**

Electrical

ELEMENT	PERFORMANCE CRITERIA	
5) Elements: 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.	
1 Prepare to solve problems in complex polyphase power circuits.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve problems in complex polyphase power circuits. \	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solving circuit problems from measure and calculated values as they apply to complex multiple path circuit.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.

	2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in complex polyphase power circuits. The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.8.9.3	Polyphase power circuit analysis
E2.18.1	Occupational Health and Safety principles
E2.18.2	Electrical Safe working practices

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to complex polyphase power circuits as they apply to problems related to electrical power engineering diagnosis and development work functions in any of the following types of circuit problems:

- Determining the operating parameters of an existing circuit
- Alternating an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solve problems in complex polyphase power circuits as described in 7) Range Statement and including:
    - A Determining the operating parameters of existing circuit.
    - B Using established problem solving methods.
    - C Taking relevant measurements accurately.
    - D Interpreting measured values appropriately.
    - E Providing effective solutions to circuit problems from measurements and calculations.
    - F Giving written justification of solutions provided.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solving problems in complex polyphase power circuits.

Method of assessment

8.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.4	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within	Refer to the following Performance Criteria for examples of application:

	a real workplace	All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5

UEUNEEH011A Solve problems in d.c. power supplies with single phase input

Unit Descriptor

1)

This unit covers determining correct operation of independent power supplies and power supply sections of electronic apparatus. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in d.c. power supplies with single phases input.

Prerequisite Unit(s)

2)

Competencies

2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH002A	Carry out basic repairs to electronic apparatus by replacement of components
UEENEEH014A	Solve problems in frequency dependent circuits
OR	
UEUNEEG002A	Solve problems in single and three phase low voltage circuits
OR	
UEENEEG012A	Solve fundamental problems in electrical systems

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

Application of the Unit

3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may also used to augment formally

acquired competencies.

License to practice **3.1)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States and Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note: 1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measure and the like.

Competency Field **4)**

Electronics

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to work on d.c. power supplies.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 OHS risk control work preparation measures and procedures are followed.
	1.3 The nature of the power supply problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established procedures.

		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve d.c. power supply problems.	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solve problems from measure and calculated values as they apply to d.c. power supplies with single phase input.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in d.c. power supplies with single phase input. The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.9.12 Electronic fault finding

E2.9.63 Direct current power supplies

E2.11.7.2 Advanced electronic testing and measuring devices and techniques

E2.18.1 Occupational Health and Safety principles

E2.18.9 Electronic Safe working practices

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to solving problems in d.c. power supplies with single phase input on the rectification section and filtering section of a half wave bridge rectifier and a full wave bridge rectifier.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence

need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solve problems in d.c. power supplies with single phase input as described in 7) Range Statement and including:
    - A Using methodical problem solving methods.
    - B Taking measurements correctly and accurately.

C Calculating parameters correctly and accurately.

D Providing solution to power supply problems, and

E Providing written justification for the solutions to problems.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note: Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with Performance Criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solving problems in d.c. power supplies with single phase input

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEUNEEE001A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Key competencies **8.6)**

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.4	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5

UEUNEEH012A Solve problems in digital components of electronic apparatus

Unit Descriptor

1)

This unit covers determining correct operation of digital components of electronic apparatus. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in digital components circuits.

Prerequisite Unit(s)

2)

Competencies

2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH002A	Carry out basic repairs to electronic apparatus by replacement of components

OR

UEUNEEE070A	Terminate and connect components , conductors, wiring and cables for electronic circuits

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit

3)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some

States and Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note: 1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measure and the like.

Competency Field **4)**

Electronics

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to work on digital component.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 OHS risk control work preparation measures and procedures are followed.
	1.3 The nature of the digital component/circuit problems is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve digital components problems.	2.1 OHS risk control work measures and procedures are followed.

		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solve problems from measure and calculated values as they apply to digital components in an electronic apparatus.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in d.c. power supplies with single phase input. The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.9.4.1	Digital electronic fundamentals
E2.9.12	Electronic fault finding
E2.11.7.1	Electronic testing and measuring devices and techniques
E2.18.1	Occupational Health and Safety principles
E2.18.9	Electronic Safe working practices

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to solving at least two of the following types basic digital component/ circuit problems.

- Determining the operating parameters of a digital component of an existing circuit
- Alternating an existing digital component to comply with specified operating parameters
- Developing a basic digital component to comply with a specified function and operating parameters
- Finding and repairing a fault in a digital component of an existing circuit

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solve problems in d.c. power supplies with single phase input as described in 7) Range Statement and including:
    - A Using methodical problem solving methods.

B Taking measurements correctly and accurately.

C Calculating parameters correctly and accurately.

D Providing solution to digital component/circuit problems.

E Providing written justification for the solutions to problems.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with Performance Criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solving problems in d.c. power supplies with single phase input

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with unit:

UEUNEEH002A	Carry out basic repairs to electronic equipment
UEUNEEH012A	Find and repair faults in the digital components in electronic apparatus
UEUNEEH015A	Solve problems in microprocessor based hardware and firmware
UEUNEEH016A	Find and repair faults in the microwave amplifier sections in electronic apparatus
UEUNEEH039A	Solve problems in basic amplifier circuits

The critical aspects of occupational health and safety covered in Unit UEUNEEE001A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.4	2

How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	1
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All

2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5

UEUNEEH039A Solve problems in basic amplifier circuits

Unit Descriptor 1)

This unit covers determining correct operation of basic amplifier circuits. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in basic amplifier circuits.

Prerequisite Unit(s) 2)

Competencies 2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEUNEEH002A	Carry out basic repairs to electronic apparatus by replacement of components

OR

UEUNEEH070A	Terminate and connect components, conductors, wiring and cables for electronic circuits

AND

UEENEEH014A	Solve problems in frequency dependent circuits

OR

UEUNEEG002A	Solve problems in single and three phase low voltage circuits

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Application of the Unit 3)

This unit is intended for competency development entry-level employment based programs incorporated in approved

contracts of training. It may also used to augment formally acquired competencies.

License to practice **3.1)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States and Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measure and the like.

Competency Field **4)**

Electronics

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to work on basic amplifier circuits.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 OHS risk control work preparation measures and procedures are followed.
	1.3 The natures of the amplifier circuit problems are obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established procedures.

		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve basic amplifier circuit problems.	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solve problems from measure and calculated values as they apply to basic amplifier circuits.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in basic amplifier circuits. The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.9.8 Amplifier Fundamentals

E2.9.12 Electronic fault finding

E2.11.7.1 Electronic testing and measuring devices and techniques

E2.18.1 Occupational Health and Safety principles

E2.18.9 Electronic Safe working practices

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to solving at least two of the following types basic amplifier circuit problems:

- Determining the operating parameters of an amplifier existing circuit
- Alternating an existing amplifier circuit to comply with specified operating parameters
- Developing an amplifier circuits to comply with a specified function and operating parameters

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most

effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

- Solve problems in basic amplifier circuits as described in 7) Range Statement and including:

  A Using methodical problem solving methods.

  B Taking measurements correctly and accurately.

  C Calculating parameters correctly and accurately.

  D Providing solution to amplifier circuit problems.

  E Providing written justification for the solutions to problems.

  F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with Performance Criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in solving problems in basic amplifier circuits.

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEUNEEE001A and other discipline specific occupational health and safety units(s) shall be reassured in relation to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 3.3; 3.4	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.1; 1.3; 1.4; 2.4	2
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6	1
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.4	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.4	1

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.3; 3.4
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 1.2 to 1.6
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.6
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.5

UEUNEEH070A Terminate and connect components, conductors, wiring and cables for electronic circuits

Unit Descriptor

1)

This unit covers the implementation, performance and evaluation of component connections and terminations of conductors, wiring, cables, and other recognised mediums. It encompasses implementing reliable termination and connection processes, working to specifications, safe use of connection and termination tools, safe use of termination and/or soldering devices, selection and placement of components, termination and connection preparation, termination and connection techniques, and evaluating termination and connection work.

Prerequisite Unit(s)

2)

Competencies

2.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEUNEEE002A	Dismantle, assemble and fabricate electro technology components
UEUNEEE007A	Use drawings, schedules and service manuals

AND

UEUNEEG047A	Provide computational solutions to power engineering problems

OR

UEUNEEG049A	Solve problems in complex polyphase power circuits

Literacy and numeracy skills

2.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

Application of the Unit

3)

This unit shall apply to persons entering work in electro technology and may be used in school based vocational programs.

License to practice

3.1)

The skills and knowledge described in this unit do not require a licence to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships and the like.

Note: 1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measure and the like

Competency Field

4)

Electronics

ELEMENT	PERFORMANCE CRITERIA
5) Elements: 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.
1 Prepare to implement connection/termination processes that include components, conductors, wiring and cables for electronic circuits.	1.1 OHS procedures for a given work area are obtained and understood through established routines and procedures.
	1.2 Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3 Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4 The scope and nature of work to be undertaken is determined from documentation and instructions from work supervisor.

		1.5	An implementation and work plan is developed to ensure the work is co-ordinated effectively with others.
		1.6	Materials required for the work are obtained in accordance with established routines and procedures.
		1.7	Tools, equipment, measuring and termination and connection devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Connect/terminate components, conductors, wiring and cables.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Components and connection/termination methods and devices are selected in accordance with their specified type and rating. (See Note 1)
		2.3	Components and conductors are placed in accordance with specification/drawing and correct polarity.
		2.4	Terminations and connections are prepared in accordance to ensure reliability of connections in accordance with industry standards. (See Note 2)
		2.5	Termination and connections are made using devices and techniques that comply with manufacturer's requirements and industry standards.
		2.6	Procedures for identifying and responding to non-routine events including defects are coordinated and actioned in accordance with established procedures.
		2.7	Connection/termination activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Evaluate completed connections and terminations of components, conductors, wiring and cables.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Defects in component placement, connections and terminations are identified by visual inspection and recorded.
		3.3	Solutions to non-compliant work are developed and responded to in accordance with established procedures and requirements

		3.4	Connections and terminations are performance tested for compliance with the specified Standard and non-compliance performance characteristics identified and recorded.
		3.5	Rework is carried out to rectify defects and non-compliant performance characteristics to manufacturer's requirements and industry standards. (See Note 3)
		3.6	Connections and terminations are confirmed compliant with established procedures and requirements
4	Complete and document connections and terminations activities.	4.1	OHS risk control work completion measures and procedures are followed.
		4.2	Work site is cleaned and made safe in accordance with established procedures.
		4.3	Evaluation documentation confirming compliance of the connections and terminations is verified in accordance with established procedures and requirements
		4.4	Inspection, testing, and rectification work is documented in accordance with established procedures.

Notes:
1. Connections methods include crimping, soldering and use of vendor specific devices.
2. Preparation includes sheath and insulation stripping and approved cleaning methods.
3. Rework may include the application of de-soldering techniques.

REQUIRED SKILLS AND KNOWLEDGE

6) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and terminating and connecting components, conductors, wiring and cables for electronic circuits. The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

E2.1.4	Basic cable and conductor terminations
E2.1.8	Electronic cable and conductor terminations
E2.9.1.1	Electronic component basics
E2.11.5	Basic electrical testing and measuring devices and techniques
E2.11.11.1	Electronic soldering equipment and techniques

E2.18.1 Occupational Health and Safety principles

E2.18.9 Electronic safe working practices

RANGE STATEMENT

7) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to implementation, performance, and evaluation of component connections and terminations of conductors, wiring, cables, and other recognised mediums for electronic circuits. This shall include:

- Implementing reliable termination and connection processes
- Selection and placement of at least five different types of electronic components
- Connection of electronic components by soldering
- Termination and connection of a coaxial cable
- Termination and connection of a high performance copper cable
- Termination of an insulated cable by using a crimped connection
- Evaluating reliability of termination and connection work and providing solutions

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

8) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most

effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEU06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Terminate and connect components, conductors, wiring and cables for electronic circuits as described in 7) Range Statement and including:

A Developing implementation and work plan

B Selecting components ad termination and connection devices in accordance with their specified type and ratings.

C Placing components correctly.

D Preparing terminations and connections correctly.

E Making reliable terminations and connections in accordance with industry standards.

F Identifying defects and non-compliant performance

G Rectifying defects and non-compliant performance characteristics to requirements.

H Evaluating reliability of termination and connection work

I Providing solutions for non-compliant work

J Documenting termination and termination activities accurately

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note: Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in terminating and connecting components, conductors, wiring and cables for electronic circuits.

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note: Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the following units:

UEUNEEE002A	Dismantle, assemble and fabricate electro technology components
UEUNEEE007A	Use drawings, schedules and service manuals
AND	
UEUNEEG012A	Solve fundamental problems in electrical systems
OR	
UEUNEEG049A	Solve problems in complex polyphase power circuits

The critical aspects of occupational health and safety covered in UEUNEEE001A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this competency standard unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following Performance Criteria for examples of application: 4.3	1
How can information be collected, analysed and organised?	Refer to the following Performance Criteria for examples of application: 1.4 to 1.7	1
How are activities planned and organised?	Refer to the following Performance Criteria for examples of application: 1.1 to 1.7	2
How is team work used within this competency?	Refer to the following Performance Criteria for examples of application: 1.5	1
How are mathematical ideas and techniques used?	Refer to the following Performance Criteria for examples of application: 2.3; 2.4	1
How are problem solving skills applied?	Refer to the following Performance Criteria for examples of application: NA	
How is use of technology applied?	Refer to the following Performance Criteria for examples of application: 2.5; 3.3; 3.4	1

Skills Enabling Employment

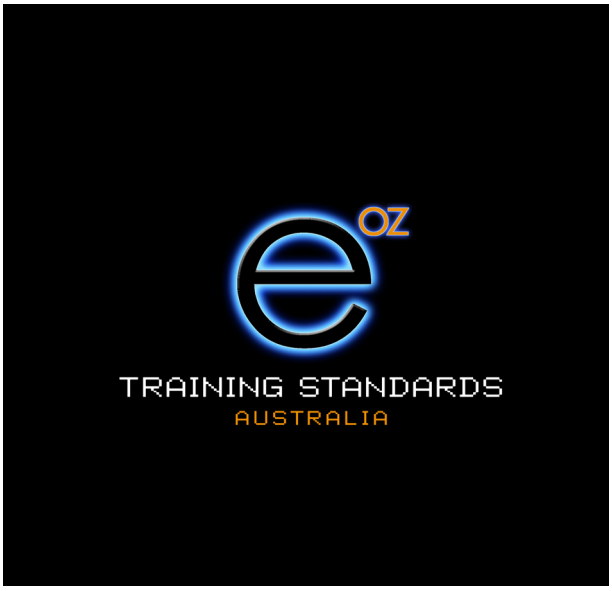
8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment	Example of Application

1	Developing and using skills within a real workplace	Refer to the following Performance Criteria for examples of application: All
2	Learning to learn in the workplace	Refer to the following Performance Criteria for examples of application: All
3	Reflecting on the outcome and process of work task	Refer to the following Performance Criteria for examples of application: 3.2; 3.3; 4.3
4	Interacting and understanding of the context of the work task	Refer to the following Performance Criteria for examples of application: 2.2 to 3.4
5	Planning and organising the meaningful work task	Refer to the following Performance Criteria for examples of application: 1.1 to 1.7
6	Performing the work task in non-routine or contingent situations	Refer to the following Performance Criteria for examples of application: 2.6

Competency Standard Units IU
Imported Units



UET06
Electricity Supply Industry
Transmission, Distribution and Rail Sector
Training Package

Volume 2 — Part 2.1
Competency Standard Units
IU – Imported Units

Volume 2 of 2

Table of Contents

Imported Units

BSBMGT507A Manage environmental performance

Unit Descriptor 1)

This unit covers the development, maintenance and evaluation of the organisation's environmental policies and procedures in regard to environmental sustainability as an integral part of business planning.

All those who have a management responsibility would be advised to take this unit. It is also very useful for small businesses.

This unit is related to BSBMGT505A Ensure a safe workplace, BSBMGT609A Manage risk and BSBMGT610A Manage environmental management systems.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM303B Contribute to effective workplace relationships

Unit Descriptor

1)

This unit replaces BSBFLM303A Contribute to effective workplace relationships. Frontline management has a key role in developing efficient and effective work teams within the context of the organisation. 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 the team members. At this level, work will normally be carried out within known routines, methods and procedures which require the exercise of some discretion and judgement.

This unit is related to BSBFLM403B Implement effective workplace relationships

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BSBFLM305B Support operational plan

Unit Descriptor 1)

This unit replaces BSBFLM305A Support operational plan.

Frontline management is actively engaged in planning activities to achieve the team/organisation's measurable, stated objectives. This key role is carried out to provide safe, efficient and effective products and services to customer satisfaction within the organisation's productivity and profitability plans. At this level, work will normally be carried out within known routines, methods and procedures with some complex or non-routine activities which require the exercise of some discretion and judgement.

This unit is related to BSBFLM405B Implement operational plan. Consider co-assessment with BSBFLM303B Contribute to effective workplace relationships, BSBFLM306B Provide workplace information and resourcing plans, BSBFLM312A Promote team work within the work team, BSBCMN311A Maintain workplace safety and BSBFLM309B Support continuous improvement systems and processes.

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BSBFLM306B Provide workplace information and resourcing plans

Unit Descriptor

1)

This unit replaces BSBFLM306A Provide workplace information and resourcing plans

The competency of frontline management in identifying, acquiring, analysing and using appropriate information plays a significant part in the organisation's effectiveness. At this level, work will normally be carried out within known routines, methods and procedures with some complex or non-routine activities which require the exercise of some discretion and judgement. This unit is related to BSBFLM406B Implement workplace information system. Consider co-assessment with BSBFLM305B Support operational plan, BSBFLM312A Promote team work within the work team BSBCMN310A Deliver and monitor a service to customers, BSBCMN311A Maintain workplace safety, BSBFLM309B Support continuous improvement systems and processes.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM309B Support continuous improvement systems and processes

Unit Descriptor

1)

This unit replaces BSBFLM309A Support continuous improvement systems and processes.

Frontline managers have an active role in managing the continuous improvement process in achieving the organisation's objectives. Their position closely associated with the creation and delivery of products and services, means that they have an important responsibility in influencing the on-going development of the organisation. At this level, work will normally be carried out within known routines, methods and procedures with some complex or non-routine activities, which require the exercise of some discretion and judgement. This unit is related to BSBFLM409B Implement continuous improvement. Consider co-assessment with BSBFLM305B Support operational plan, BSBFLM312A Promote team work within the work team, BSBCMN310A Deliver and monitor a service to customers, BSBCMN311A Maintain workplace safety, BSBCMN312A Support innovation and change, and BSBFLM311B Support a workplace learning environment.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM311B Support a workplace learning environment

Unit Descriptor

1)

This unit replaces BSBFLM311A Support a workplace learning environment.

Frontline management has a prominent role in encouraging and supporting the development of a learning environment in which work and learning come together. At this level, work will normally be carried out within known routines, methods and procedures with some complex or non-routine activities, which require the exercise of some discretion and judgement. This unit is related to BSBCMN404A Develop teams and individuals. Consider co-assessment with BSBCMN302A Organise personal work priorities, BSBFLM312A Promote team work within the work team, BSBFLM305B Support operational plan, BSBCMN310A Deliver and monitor a service to customers, and BSBCMN311A Maintain workplace safety.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM312A Contribute to team effectiveness

Unit Descriptor

1)

This unit replaces BSBFLM302A Support leadership in the workplace and BSBFLM304A Participate in work teams, which have been combined to create this unit. Frontline management has a key role in developing efficient and effective work teams within the context of the organisation. 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 the team members.

At this level, work will normally be carried out within known routines, methods and procedures which require the exercise of some discretion and judgement. This unit is related to BSBFLM412B Promote team effectiveness.

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BSBFLM403B Implement effective workplace relationships

Unit Descriptor

1)

This unit replaces BSBFLM403A Manage effective workplace relationships.

Frontline management plays an important role in developing and maintaining positive relationships in internal and external environments so that customers, suppliers and the organisation achieve planned outputs/outcomes. At this level, work will normally be carried out within routine and non-routine methods and procedures which require planning and evaluation, leadership and guidance with responsibility for others. This unit builds on BSBFLM303B Contribute to effective workplace relationships. Consider co-assessment with BSBFLM412B Promote team effectiveness

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM405B Implement operational plan

Unit Descriptor

1)

This unit replaces BSBFLM405A Implement operational plan.

Frontline management is actively engaged in planning activities to achieve the team/organisation's measurable, stated objectives. This key role is carried out to provide safe, efficient and effective products and services to customer satisfaction within the organisation's productivity and profitability plans. At this level, work will normally be carried out within routine and non-routine methods and procedures which require planning and evaluation, leadership and guidance with responsibility for others This unit builds on BSBFLM305B Support operational plan. Consider co-assessment with BSBFLM412A Promote team effectiveness, BSBFLM406B Implement workplace information system, BSBCMN411A Monitor a safe workplace, and BSBFLM409B Implement continuous improvement.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM406B Implement workplace information system

Unit Descriptor 1)

This unit replaces BSBFML406A Implement workplace information system.

The competency of frontline management in identifying, acquiring, analysing and using appropriate information plays a significant part in the organisation's effectiveness. At this level, work will normally be carried out within routine and non-routine methods and procedures which require planning and evaluation, leadership and guidance with responsibility for others

At this level, work will normally be carried out within routine and non-routine methods and procedures that require the exercise of some discretion and judgement. This unit builds on BSBFLM306B Provide workplace information and resourcing plans**.** Consider co-assessment with BSBFLM405B Implement operational plan, BSBFLM409B Implement continuous improvement, BSBFLM412B Promote team effectiveness, BSBCMN410A Coordinate implementation of customer service strategies and BSBCMN411A Monitor a safe workplace.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM409B Implement continuous improvement

Unit Descriptor

1)

This unit replaces BSBFLM409A Implement continuous improvement.

Frontline managers have an active role in managing the continuous improvement process in achieving the organisation's objectives. Their position closely associated with the creation and delivery of products and services, means that they have an important responsibility in influencing the on-going development of the organisation. At this level, work will normally be carried out within routine and non-routine methods and procedures which require planning and evaluation, leadership and guidance with responsibility for others. This unit builds on BSBFLM309A Support continuous improvement systems and processes. Consider co-assessment with BSBFLM405B Implement operational plan, BSBCMN411A Monitor a safe workplace, BSBCMN412A Promote innovation and change and BSBFLM412 Promote team effectiveness.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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Important

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BSBFLM412A Promote team effectiveness

Unit Descriptor 1)

This unit replaces BSBFLM402A Show leadership in the workplace and BSBFLM404A Lead work teams, which have been combined to create this unit. Frontline management has an important leadership role in the development of efficient and effective work teams. They play a prominent part in team planning, supervising the performance of the team and developing team cohesion through providing leadership for the team and forming the bridge between the management of the organisation and the team members. At this level, work will normally be carried out within both routine and non-routine methods and procedures which require planning and evaluation, leadership and guidance with responsibility for others. This unit builds on BSBFLM312A Contribute to team effectiveness

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM501B Manage personal work priorities and professional development

Unit Descriptor

1)

This unit replaces BSBFLM501A Manage personal work priorities and professional development.

Frontline management is responsible for managing their own performance and professional development. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBCMN402A Develop work priorities. Consider co-assessment with BSBFLM506B Manage workplace information systems, BSBFLM511B Develop a workplace learning environment and BSBFLM512A Ensure team effectiveness.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM503B Manage effective workplace relationships

Unit Descriptor 1)

This unit replaces BSBFLM503A Establish effective workplace relationships.

Frontline management plays an important role in developing and maintaining positive relationships in internal and external environments so that employees, customers, suppliers and the organisation achieve planned outputs/outcomes. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBFLM403B Implement effective workplace relationships. Consider co-assessment with BSBFLM512A Ensure team effectiveness.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM505B Manage operational plan

Unit Descriptor

1)

This unit replaces BSBFLM505A Manage operational plan.

Frontline management has a key role managing individuals within work teams/groups. They play an important part in managing the performance of people who report to them directly. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBFLM405B Implement operational plan. Consider co-assessment with BSBFLM503B Manage effective workplace relationships, BSBFLM506B Manage workplace information system, BSBMGT505A Ensure a safe workplace, BSBFLM509B Promote continuous improvement and BSBFLM512A Ensure team effectiveness.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM506B Manage workplace information systems

Unit Descriptor 1)

This unit replaces BSBFLM506A Manage workplace information systems.

The competency of frontline management in identifying, acquiring, analysing and using appropriate information plays a significant part in the organisation's effectiveness. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBFLM406B Implement workplace information system**.** Consider co-assessment with BSBFLM505B Manage operational plan, BSBFLM507B Manage quality customer service, BSBMGT505A Ensure a safe workplace, BSBFLM509B Promote continuous improvement and BSBFLM512A Ensure team effectiveness.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM507B Manage quality customer service

Unit Descriptor

1)

This unit replaces BSBFLM507A Manage quality customer service.

Frontline management is involved in ensuring that products and services are delivered and maintained to standards agreed by the organisation and the customer. This will be carried out in the context of the organisation's policies and practices as well as legislation, conventions and codes of practice. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBCMN410A Coordinate implementation of customer service strategies. Consider co-assessment with BSBFLM512A Ensure team effectiveness, BSBFLM506A Manage workplace information system, BSBMGT505A Ensure a safe workplace, and BSBFLM509A Promote continuous improvement.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM509B Facilitate continuous improvement

Unit Descriptor 1)

This unit replaces BSBFLM509A Promote continuous improvement.

Frontline managers have an active role in managing the continuous improvement process in achieving the organisation's objectives. Their position closely associated with the creation and delivery of products and services, means that they play an important part in influencing the on-going development of the organisation. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBFLM409A Implement continuous improvement. Consider co-assessment with BSBFLM512B Ensure team effectiveness, BSBFLM505B Manage operational plan, BSBFLM507B Manage quality customer service, BSBMGT505A Ensure a safe workplace, BSBFLM510B Facilitate and capitalise on change and innovation, and BSBFLM511B Develop a workplace learning environment.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM510B Facilitate and capitalise on change and innovation

Unit Descriptor

1)

This unit replaces BSBFLM510A Facilitate and capitalise on change and innovation.

Frontline management has an active role in fostering change and acting as a catalyst in the implementation of change and innovation. They have a creative role in ensuring that individuals, the team and the organisation gain from change; and that the customer benefits through improved products and services. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBCMN412A Promote innovation and change. Consider co-assessment with BSBFLM512A Ensure team effectiveness, BSBFLM505B Manage operational plan, and BSBFLM509B Promote continuous improvement.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM511B Develop a workplace learning environment

Unit Descriptor

1)

This unit is equivalent to the original unit BSBFLM511A Develop a workplace learning environment.

Frontline management has a prominent role in encouraging and supporting the development of a learning environment in which work and learning come together. At this level, work will normally be carried out within known routines, methods and procedures and require planning and initiating new approaches and the exercise of judgement concerning their work and that of others. This unit builds on BSBCMN404A.Develop teams and individuals. Consider co-assessment with BSBFLM501B Manage personal work priorities and professional development, BSBFLM512A Ensure team effectiveness, BSBFLM505B Manage operational plan, BSBFLM507B Manage quality customer service, and BSBMGT505A Ensure a safe workplace.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM512A Ensure team effectiveness

Unit Descriptor 1)

This unit replaces BSBFLM502A Provide leadership in the workplace and BSBFLM504A Facilitate work teams, which have been combined to create this unit. Frontline management has an important facilitative role in the development and empowerment of work teams. This will be evident in the way Frontline managers work with teams and individuals, work across teams and the initiative they take in strengthening the links between teams and the organisations management. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies. This unit builds on BSBFLM412A Promote team effectiveness.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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BSBFLM513A Manage finances within the work team

Unit Descriptor

1)

Frontline management has a key role in implementing financial processes within the work team/groups within the context of the organisation. They play a prominent part in ensuring that costs are controlled, expenditure is within established budgets and legislative and financial compliance requirements are met. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies.

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BSBFLM514A Manage people

Unit Descriptor 1)

Frontline management has a key role in managing individuals within work teams/groups. They play a prominent part in managing the performance of people who report to them directly. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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ICTTC013C Perform an accurate cable system test

Unit Descriptor

1)

This unit applies to all contexts for indoor and outdoor installation within a customer premises and applies to both customer premises cabling and customer premises equipment.

This unit applies to all communications applications whether digital or analogue including telephony, data, video including digital broadcasting, computer networks including LANs and WANs, and multi media.

This unit may be applied to domestic, commercial or industrial installations.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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2. This Competency Standard Unit is drawn from the Telecommunications national Training Package (ICT02).
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ICTTC064C Haul underground cable

Unit Descriptor 1)

This unit applies to both installation and recovery of small size cables e.g. up to 100 pairs. This unit follows on from the work described in ICTTC133A Construct underground enclosure.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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ICTTC065C Splice optic fibre cable

Unit Descriptor

1)

This unit applies to all telecommunications applications including telephony, data, video and multi media.

This unit should be applied with units dealing with specific cable types and installation environments.

This unit may be applied to domestic, commercial or industrial installations.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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ICTTC066C Joint and terminate co-axial cable

Unit Descriptor 1)

This unit applies to all telecommunications applications including telephony, data, video and multi media.

This unit should be applied with units dealing with specific cable types and installation environments.

This unit may be applied to domestic, commercial or industrial installations

The most likely type of coaxial cable used in the CAN environment today is either 'hard line' or 'flexible' coaxial cables used in the delivery of CATV services.

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ICTTC068C Install telecommunications service to a building

Unit Descriptor

1)

This unit relates to bringing a telecommunications service from the broader network to a customer's premises.

Installation of cabling within a building and installation of telecommunications connections within a building are dealt with in the Telecommunications Cabling National Competency Standards.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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ICTTC069C Install network cable equipment

Unit Descriptor

1)

This unit applies to all telecommunications applications including telephony, data, video and multi media.

This unit should be applied with units dealing with specific cable types and installation environments.

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ICTTC104C Maintain an electronic system

Unit Descriptor

1)

This unit applies to all telecommunications applications including telephony, data, video and multi media.

This unit relates to the periodic testing of systems and equipment on-site (not at the depot) and from remote locations.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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ICTTC127C Supervise worksite activities

Unit Descriptor 1)

This unit applies to all telecommunications applications including telephony, data, video and multi media.

This unit relates to the supervision of small-scale projects with a limited range of technical skills, not general management of people and processes.

IMPORTANT NOTES: Notes for the use of this imported Competency Standard Unit within this national Training Package:

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ICTTC131B Install an above ground equipment enclosure

Unit Descriptor

1)

This unit applies to installation of enclosures such as pillars, cabinets, Remote Integrated Multiplexers (RIMs) and mobile equipment enclosures.

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ICTTC133B Construct underground enclosure

Unit Descriptor 1)

This unit refers to enclosures such as pits, pipes, conduits, manholes (prefabricated). It does not include constructed on site manholes and tunnels.

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ICTTC134B Fix aerial cable

Unit Descriptor

1)

This unit applies to all telecommunications applications including vision, voice and data.

This unit applies to all aerial cable installation types. This unit may apply to either a new cable or a cable in need of repair. This unit follows on from the work described in unit ICTTC132B Erect cable supports. This unit should be read in conjunction with the relevant jointing units.

This unit relates to aerial cable in the Access Network.

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ICTTC135B Joint metallic cable

Unit Descriptor

1)

This unit relates to the jointing of non-working metallic cable for both installation and repair.

This unit applies to all telecommunications applications - vision, voice and data - and for both digital and analogue transmission.

Jointed cable is tested and commissioned in ICTTC013C Perform an accurate cable system test.

This unit is a requisite for ICTTC067C Rearrange and cut over cable.

This unit - relates to cable in the Access Network.

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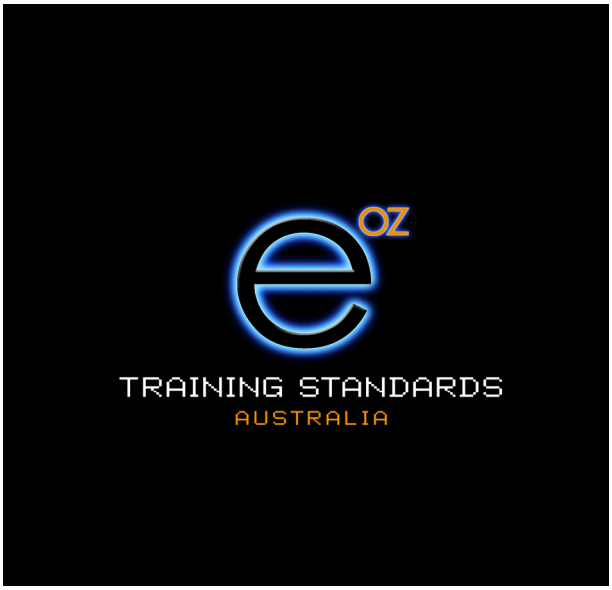
Essential Knowledge and
Associated Skills (EKAS)



UET06
Electricity Supply Industry
Transmission, Distribution and Rail Sector
Training Package

Volume 2 — Part 2.2
Essential Knowledge and Associated Skills (EKAS)

Volume 2 of 2

EKAS Clause List

Essential Knowledge and Associated Skills (EKAS) – TD&R

The following section of the Electricity Supply Industry (ESI) – Transmission, Distribution and Rail Training Package is the Transmission, Distribution and Rail Essential Knowledge and Associated Skills. The reference of these is found in each ESI – Transmission, Distribution and Rail Competency Standard Unit in section 6. The references in this section are expanded in this section of the Training Package. Users of the Training Package are to include the full array of the Essential Knowledge and Associated Skills clauses content contained herein when developing learning specifications and support materials to assure the content of theory and associated skills training aspect of the respective competency standard unit is met.

The Electricity Supply Industry (ESI) – Transmission, Distribution and Rail Training Package Essential Knowledge and Associated Skills section of this Training Package is likely to change from time to time. Changes are periodically made to reflect the latest industry practices. In relation to this section, users are advised to check for any changes that may have been made to the aligned EKAS clauses and content by:

- checking the version identifier code of the version you currently have with the latest Training Package
- accessing the relevant National Training Package Developer website (www.ee-oz.com.au

Contextualisation

In the competency standard units, "notes" have been placed against respective aspects that include scope, Performance Criteria, Range Statement and essential knowledge and associated skills and other related sections. The insertion of these "notes" is primarily to provide users and support material developers with examples of the form and type related to technical content principles, technology, equipment, or processes that may be used to cover the outcomes. The examples should be treated as information that adds clarity for the purposes of assisting in guidance of the depth and breadth that is to be covered.

As the type, form, process, or technique of technology and equipment may change it is therefore expected and encumbered on RTOs to continue to be current in the content of their delivery arrangements.

It is therefore appropriate for RTOs to use the notes in relation to technology and equipment references as advisory information. In these instances RTOs should aim to accommodate the adoption of improved and new technologies in the scope/range and essential knowledge and associated skills of the competency standard units by varying the context examples given in the referenced 'Notes:' to the Performance criteria, Range statement and Essential knowledge and associated skills. However, the contextualisation must not be such that the outcome of the competency standard units is altered in any way.

Where contextualisation of the notes varies the outcome of the competency standard units and its related content, RTOs should consult with EE-Oz Training Standards to explore options for incorporating and/or covering the new arrangements, so that currency of the Training package is maintained.

It should be noted that any need to alter the competency standard units from its intended outcome requires a new or varied competency standard unit. Such changes are to be undertaken through the continuous improvement processes required of Training Packages, which in relation to this Training Package is managed by EE-Oz Training Standards.

T2.1 Engineering Applications

T2.1.1 Engineering applications of mathematical principles

Evidence shall show an understanding of mathematics techniques to an extent indicated by the following aspects,

- Calculations involving fractions, decimals, ratios, proportions
- Calculations involving area, volume, mass and density
- Calculations involving transposition and substitution of formulae
- Calculations involving simple trigonometric problems

T2.1.2 Engineering applications of mechanical principles

Evidence shall show an understanding of engineering mechanics to an extent indicated by the following aspects:

- Identification of basic concepts, principles and applications
  Note: Application of velocity, acceleration, force, density, torque, and pressure
- Applications of the SI units
- The relationship between work, power and energy
- Behaviour of object under force
  Note: Examples include using a block and tackle under load, concept of mechanical advantage, determination of resultant forces and determining the sag in a catenary conductor and the force applied at each end
- Fundamentals of the basic laws of fluid mechanics

T2.1.3 Engineering applications of material properties

Evidence shall show an understanding of materials properties to an extent indicated by the following aspects:

- Identification and classification of engineering materials encompassing:
  Material properties
- Types and applications
  Note: Examples include properties of tensile strength, effects of temperature on the expansion of metals, ductibility, malleability, work hardening and annealing and the conditions that lead to corrosion and the properties of timbers

T2.1.4 Basic rigging techniques

Evidence shall show an understanding of basic rigging techniques to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with rigging including the operation of cranes, hoists and winches and relevant certification and licensing (if required)
- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
- Safe use of rigging equipment, tools and associated equipment encompassing:
  Types, techniques and application
  Site inspection procedures encompassing:

Identifying hazards, assessing and controlling risks
Appropriate sequence of loading and unloading

- Determining the mass and dimensions of load
- Selection and inspection procedures encompassing:
  Rigging equipment, materials and tools
  Note: Examples include natural and synthetic fibre ropes and chains, fittings, winch and capstan
  Ratings of wire ropes and slings
  Removing, repairing and replacing of damage parts
- Techniques for assembling and erecting power winches and capstans
- Checking the integrity of support structure; visual inspection of load connections
- Techniques in moving, lifting, shifting, managing and placing loads encompassing:
  Use of appropriate communication and signalling methods
  Codes of practice/compliance
  Enterprise and Commonwealth, State/Territory legislative requirements
  Weather conditions
  Erection of safety nets and lines
  Methods of fixing and anchoring loads
  Load stability

T2.1.5 Elevating work platform operational principles

Evidence shall show an understanding of the operation of elevating work platform (EWP) to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with EWP including relevant certification and licensing encompassing:
  Safe working clearances
  Safe operation procedures and the mandatory wearing of harness/attachment requirements
  Safety observers
  Inspection and testing procedures prior to use
  Set-up, operate and shut down procedures for an EWP
- Emergency procedures for an EWP encompassing:
  Escape procedures for an EWP
  Rescuing procedures
  Mechanical failure procedures
- Types of EWPs insulated/uninsulated

T2.1.6 Hydraulic and pneumatic portable equipment

Evidence shall show an understanding of the operation and maintenance of mobile plant, tools and equipment to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with portable hydraulic equipment and portable pneumatic equipment, including relevant certification and licensing encompassing:
  Safe working clearances
  Safe operation procedures
  Safety observers
- Inspection and testing procedures prior to use
- Set-up, operate and shut down procedures
- Permit to work systems and isolation procedures

T2.1.7 Enterprise vehicles

Evidence shall show an understanding of the requirements for the use of enterprise vehicles such as, trucks and four wheel drives to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with safe use of enterprise vehicles including relevant certification and licensing such as encompassing:
  Motor cars
  Light and heavy commercial trucks
  Heavy truck/trailer combination
  Four wheel drive vehicles
- Compliance with regulations associated with the securing of loads prior for transportation

T2.1.8 Chain saw principles

Evidence shall show an understanding of the requirements for the use of chain saws including relevant certification and licensing (if required) to an extent indicated by the following aspects:

- Safety precautions, requirements and responsibilities
- Selection and use of appropriate personal protective equipment
- Chain saw operation encompassing:
  Parts and function of components and ancillary equipment
  Pre-operational checks
  Starting procedures
  Safe use of chain saw under load
  Safe transporting and storage procedures

T2.1.9 Stores procedures

Evidence shall show an understanding of the procedure in providing store support to an extent indicated by the following aspects:

- Classification and identification of equipment, components and tools
- Procedures for purchasing/ordering items, removing/dispatching items, stocktaking, security, bookkeeping/record keeping
- Material handling encompassing:
  Warehouse/depot storage techniques
  Handling equipment
  Pallet lift trucks
  Forklifts
  Cable drum handling equipment
- Safety procedures encompassing:
  Storage and care of safety equipment
  Handling hazardous materials
  Storage of hazardous substances and dangerous goods
  Depot safety procedures
  Manufacturers and suppliers information including material safety date sheets (MSDS)

T2.1.10 Filtering and sampling of insulating oil

Evidence shall show an understanding of the requirements for the filtering and sampling of insulating oil to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with filtering and sampling such as encompassing:
  - Safe handling procedures
  - Personal hygiene
  - Storage and disposal procedures
  - Occupational Health and Safety hazards and precautions including use of appropriate personal protective equipment
  - Environmental procedures
  - Effects of contaminates
- Properties of insulating oil encompassing:
  - Dielectric strength
  - Moisture content
  - Acidity
  - Sludge
- Locations where insulating oil is used
  - Note: Examples include transformer, switchgear and oil filled cable
- Filtering equipment encompassing:
  - Types
  - Cleaning procedures
  - Method of use
- Techniques in filtering and sampling insulating oil encompassing:
  - Methods of sampling
  - Methods of filtering
  - Testing procedures on site
  - Analysing oil effectiveness
  - Frequency of testing

T2.1.11 Testing of insulating oil

Evidence shall show an understanding of the requirements for the testing of insulating oil to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with testing such as encompassing:
  - Precautions during testing
  - Types of testing equipment
- Techniques in testing insulating oil encompassing:
  - Electric strength
  - Water content
  - Dielectric dissipation
  - Resistivity
  - Acidity
- Brief introduction to DGA (Dissolved Gas Analysis)

T2.2 Power Systems

T2.2.1 Generation power systems

Evidence shall show an understanding of generation systems to an extent indicated by the following aspects:

- Methods of generating electricity

  Note: Examples include types of power stations and reasons for their location, layout of thermal and hydroelectric power stations
- Relationship between power control and load requirements

  Note: Examples include operating speeds for thermal and hydroelectric generating sets, typical generator voltage levels and output ratings
- The purpose and features of typical types of co-generation systems

T2.2.2 Transmission, distribution and rail power systems

Evidence shall show an understanding of transmission, distribution and rail systems to an extent indicated by the following aspects:

- Relationship between the transmission, distribution and rail system within an overall power system

  Note: Examples include different organisations responsible for generation, transmission, distribution and rail and, how they correlate and their functions
- Characteristics of a transmission, a distribution and a rail system

  Note: Examples include principal components, typical voltage levels and methods of transmission and distribution including grid type transmission systems, radial, parallel and ring main feeders
- Relationship between an overhead and underground supply systems within an overall power system

  Note: Examples include advantages/disadvantages, applications and the basic steps for planning and installing an overhead and underground distribution system
- Single line drawings and layouts

  Note: Examples of drawings and layouts of transmission and distribution systems including, radial, parallel and ring main feeders and the HV equipment associated with substations

T2.2.3 Substations, power transformers and reactors

Evidence shall show an understanding of substations and power transformers to an extent indicated by the following aspects:

- Relationship between the substations within an overall power system

  Note: Examples include purpose, location in relation to load centres, layout of HV equipment within the substation and auxiliary equipment
- Characteristics of a power transformer

  Note: Examples include basic construction of distribution transformers, operation under load/no load conditions, types and basic operation of tap changing switches including solid state types, efficiency and cooling
- Auxiliary equipment used on transformers encompassing:

  Function and basic operation
- Maintenance of a power transformer

  Note: Examples include basic connections, restrictions to parallel operation, problems and remedies associated with harmonics, testing and fault finding procedures
- Characteristics of a reactors encompassing:

  Description and purpose

T2.2.4 Powerline distribution installation

Evidence shall show an understanding of the installation of overhead distribution conductors to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to installing conductors and associated equipment
- Requirements for the use of overhead line construction manuals, system diagrams/plans and drawings, encompassing:
  - Material lists
  - Conductor size, type and route length
- Constructions types and structures for distribution and sub transmission lines
- Types, sizes and characterises of overhead conductors
- Resources for the stringing and maintenance of conductors, encompassing:
  - Types of low and high voltage overhead electrical conductor connections
  - Causes and affects of poor electrical connections
  - Reasons for and methods used to maintain standard phase sequencing
  - Removing, repairing and replacing of damage conductors
  - Minimum clearances between overhead conductors and low and high voltage structures
- Techniques for conductor installation encompassing:
  - Types and application of tools, equipment and hardware
  - Methods of stringing, tensioning and termination of low and high voltage conductors

T2.2.5 Powerline installation safety

Evidence shall show an understanding of the safe working practices and procedures for the installation of overhead distribution conductors to an extent indicated by the following aspects:

- Limits of approach for personnel, vehicles, mobile plant and elevating work platforms (EWP)
- Requirements of persons prior to making bare hand contact with dead low voltage mains and apparatus
- Requirements of relevant electrical access permits necessary to allow work to be performed on low and high voltage apparatus
- Safe working practices encompassing:
  - Requirements to enable safe working on conductive poles
  - Procedure to attach an “on-site” earthing device to de-energised low and high voltage overhead circuit

T2.2.6 Pole and hardware installation and maintenance

Evidence shall show an understanding of the installation of poles and or structures and hardware to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to installing poles and associated hardware
- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings, encompassing:
  - Characteristics and applications of different types of poles and associated hardware

- Techniques for installing poles and associated hardware encompassing:
  Types of installation equipment/tools
  Excavation methods
  Types of footings/foundations
  Types of attachments
  Earthing systems
  Clearances between conductors
  Safe methods of erecting and stabling poles and or structures and cross arms
- Techniques for maintenance of poles and associated hardware encompassing:
  Stabilisation techniques for unstable poles
  Methods of strengthen poles
  Maintenance and replacement of high voltage insulators and cross arms

T2.2.7 Low voltage electrical service installation

Evidence shall show an understanding of the installation of low voltage electrical services to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements
- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings, encompassing:
  Types of low voltage overhead services
  Methods of construction and installation
  Minimum clearances for overhead services to assets and structures
  Types of installation equipment/tools
- Characteristics and applications of different types of cables encompassing:
  Cable cross-sectional area of conductors
  Current rating and fuse type
- Techniques for maintenance of service installations encompassing:
  Diagnosis and repair of faults
- Jointing and terminating methods encompassing:
  Polymeric heat shrink materials
  Polymeric tape materials
  Energised and de-energised cables
  Connections to fuse boxes and pole tope boxes
- Testing and commissioning procedures encompassing:
  Inspection
  Polarity, voltage and phase sequence tests
- Construction types and structures for distribution and sub transmission lines
- Types, sizes and characteristics of overhead conductors
- Resources for the stringing and maintenance of conductors, encompassing:
  Types of low and high voltage overhead electrical conductor connections
  Causes and affects of poor electrical connections
  Reasons for and methods used to maintain standard phase sequencing
  Removing, repairing and replacing of damage conductors
  Minimum clearances between overhead conductors and low and high voltage structures
- Techniques for conductor installation encompassing:
  Types and application of tools, equipment and hardware
  Methods of stringing, tensioning and termination of low and high voltage conductors

T2.2.8 Poles and structures inspection principles

Evidence shall show an understanding of the inspection of poles and overhead lines to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements
- Characteristics of wood used for structures within the electrical distribution system encompassing:
  - Relationship between timber and water
  - Faults that occur that influence the integrity of the structure
  - Affects of fungal activity
  - Affects of termite and borer activity
  - Affects of dry rot
- Chemical treatment principles encompassing:
  - Types of chemical used to treat timber
  - Regulations and procedures in handling and transporting chemicals safely
  - Application procedures of chemicals to wood
- Deterioration prevention techniques encompassing:
  - Relationship between steel, concrete and wood
  - Inspection procedures for deterioration
  - Deterioration prevention procedures in steel, concrete and wood
  - Procedures for the repair of deterioration in steel, concrete and wood

T2.2.9 Powerline inspection principles

Evidence shall show an understanding of the inspection of poles and overhead lines to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements
- Ground line inspection procedures of electrical distribution structures encompassing:
  - Requirements for pole inspection on electrical distribution structures
  - Use of specific equipment and testing devices during testing/inspection
  - Methods of recording data
- Overhead line inspection procedures of electrical distribution structures encompassing:
  - Methods and requirements for overhead line inspection on electrical distribution structures
  - Clearances for overhead conductors, cables and structures
  - Use of specific equipment and testing devices during testing/inspection
  - Methods of recording data
- Underground cable inspection procedures in the electrical distribution system encompassing:
  - State industry policy and regulations
  - Methods and requirements for line inspection on underground cable terminations

T2.2.10 Transmission structures and hardware

Evidence shall show an understanding of transmission structures and hardware to an extent indicated by the following aspects:

- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
- Types of structures
- Types and function of associated hardware/equipment and insulators
- Types of conductors
- Location of transmissions structures
- Other equipment used on transmission structures, e.g. aircraft warning devices
- Voltages on transmission structures

T2.2.11 Routine maintenance on transmission structures

Evidence shall show an understanding of procedures for routine maintenance on transmission structures and hardware to an extent indicated by the following aspects:

- Procedures for gaining access permits
- Reasons for gaining access
- Types of maintenance procedures on transmission structures encompassing:
  Procedure to follow for inspection/patrols according to the Transmission Supply Authority
- Erecting and removing of transmission equipment and hardware from a tower encompassing:
  Climbing procedures
  Square rigging principles
  Calculation of forces at work within a given square rigging system
  Construction of a square rigging system
- Procedures for changing insulators
  Note: Examples include vertical angle suspension, strain insulator, post insulator (horizontal or vertical) and bridge insulator, calculation of conductor forces
- Installation of temporary work platforms encompassing:
  Types and function of installation tools and equipment
  Precautions and work methods to follow
  Procedures for installations of temporary work platforms
- Installation of conductor protective hardware encompassing:
  Types and selection of common dampers, tools and equipment
  Control of Aeolian vibration
  Procedures for the installation of dampers onto conductors
- Dead line insulator washing encompassing:
  Supply Authority regulations
  Procedure for washing de-energised transmission lines

T2.2.12 Underground cable installation

Evidence shall show an understanding of the installation of underground cable to an extent indicated by the following aspects:

- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
- Safety precautions specific to the installation of underground cable encompassing:
  Excavation and trench safety regulations
  Gas detection procedures
  Working in confined spaces
  Personal protective equipment

Hazards for the use of LPG equipment for jointing of underground cable
Gas bottle testing procedures
Permit to work systems and isolation procedures

- Trench excavation and reinstatement procedures
- Installation of underground cable procedures encompassing:
  Types of tools and equipment
  Methods of installing conduits
  Methods of installing cables and sealing cable ends
  Note: Examples include direct buried, ducts cleated and racked
  Procedures for the safe use of LPG equipment for cable jointing

T2.2.13 Low voltage - energised working practices for substations

Evidence shall show an understanding of the safe working on energised low voltage equipment to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements
- Safety precautions specific to working on or near energised low voltage conductors encompassing::
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment
- Work on or near energised LV conductors encompassing:
  Types and function of specialised tools
  Safe working practices when using specialised tools
  Methods of using specialised tools
  Safe procedures for work on panels and in cubicles on or near energised LV conductors
- Release and rescue procedures for work on or near exposed energised LV conductors

T2.2.14 Cable fault locations principles

Evidence shall show an understanding of the location of cable faults in underground power cables to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements
- Types of faults
- Methods of locating faults
  Note: Examples include the Murray loop test, Fisher connection of Murray loop, modified Fisher connection, Varley loop test, time domain reflectometer (TDR), differential TDR radar, digital arc reflection, differential digital arc reflection, current impulse test, differential current impulse, decay, differential decay, pool of potential in earth (POPIE), radio detection, capacitance inductance test; pending faults (thermography and cable/joint temperature measurement); cable location devices/equipment and methods (signal generator/receiver, phasing methods using ‘megger’, current injection, cable stabbing techniques);cable identification
- Low voltage energised working practices: encompassing:
  Regulations
  Working methods
  Insulating glove
  Bare hand
  Work procedures

Specialist equipment

- Safety precautions specific to working near conductors encompassing:
  Safe working practices and procedures
  Working in confined spaces
  Permit to work systems and isolation procedures

T2.2.15 Metering installations

Evidence shall show an understanding of the installation of metering and control equipment to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the installation and maintenance of energy meters and associated equipment
- Types of meters
  Note: Examples include kilowatt-hour meters single and polyphase, demand meters, recording meters and electronic recording metering systems summators
- Installation and removal methods encompassing:
  Direct connection and plug in method
  Enterprise specific
- Types of associated equipment and accessories
  Note: Examples include meter boards, service fuse, links, contactors, time switch, audio frequency injection relay
- Testing procedures encompassing:
  Safety testing
  Polarity testing

T2.2.16 Fundamentals of jointing LV polymeric cable

Evidence shall show an understanding of the types of cables, tools and equipment used in the jointing and termination of LV polymeric cable to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the jointing of LV polymeric cables
- Types of cables
  Note: Examples include single core, multi core and XLPE insulation
- Methods of cable handling encompassing:
  Direct laid cables
  Duct laid cables
  Solid laid cables
  Cables supported in cleats or hangers
  Corrosion protection
  Minimum bending radius of cables
- Methods of cable sealing encompassing:
  Shorting of cables cores
  Core of unterminated cables
  Methods of protection from corrosion
  Polymeric sheathed cables sealing with mastic lined
  Heat shrink caps buried sealed ends
- Types of jointing tools
  Note: Examples include general hand tools, compression tools
- Techniques in the use of LPG encompassing:

Safety precautions
Personal protective equipment
General maintenance and repair

- Safety precautions when cable jointing encompassing:
  Working in confined spaces
  Permit to work systems and isolation procedures
  Emergency rescue/response including First Aid

T2.2.17 LV polymeric cable jointing principles

Evidence shall show an understanding of the jointing and termination of LV polymeric cable to an extent indicated by the following aspects:

- Techniques in jointing LV XLPE cables encompassing:
  Straight through joint
  Jointing different types of cable
  Service and street light cable joints
- Techniques in terminating LV XLPE encompassing:
  Pole top terminations
  Substation terminations
  Distribution pillar/column/cubicle terminations
  Service and street light cable terminations
- Techniques in repairing LV XLPE cable encompassing:
  Different types of damage
  Repairs to sheath
  Repairs to cores
- Methods of testing cable after jointing

T2.2.18 HV polymeric underground cable jointing principles

Evidence shall show an understanding of the jointing and termination of HV polymeric cable to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the jointing of HV underground polymeric cables
- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings, encompassing:
  Characteristics of different types of cables and components
  Purpose of stress control
- Applications of various tools and equipment for HV jointing
- Procedure for isolating high voltage underground cables encompassing:
  Method for proving safe to work
- Earthing procedures
- Techniques in jointing HV underground polymeric cable, encompassing:
  Short circuit cores and seal cable
  Straight through
  Trifurcating
- Techniques in HV terminations encompassing:
  Pole top termination
  Substation/switchgear termination
  ABC termination
  Telcon termination

- Procedures for repairing HV underground cables encompassing:
  Location of faults
  Types of damage
  Techniques to repairs to sheath
  Techniques to repairs to core

T2.2.19 LV Paper lead cable jointing principles

Evidence shall show an understanding of the jointing LV paper lead/lead type cables to an extent indicated by the following aspects:

- Requirements for the use of enterprise manuals, system diagrams/plans and drawings
- Types of tools and equipment
- Types of LV cables
- Structure of LV PLY cables
- Techniques for lead wiping
- Technique for preparing and jointing LV lead sheathed paper insulated cables
- Installation methods of LV straight joint
- Inspection and repair procedures to outer sheath of lead sheathed LV cable
- Techniques in terminating LV lead sheathed paper insulated cables
- Methods of testing cable after jointing

T2.2.20 HV paper lead cable jointing principles

Evidence shall show an understanding of the jointing HV paper lead/lead type cables to an extent indicated by the following aspects:

- Requirements for the use of enterprise manuals, system diagrams/plans and drawings
- Types of tools, equipment
- Types of HV cables
- Structure of HV cables
- Technique for the installation of transition joint between XLPE and lead sheathed, paper insulated cables
- Technique for the jointing, terminating and repairing of HV paper lead insulated cables
- Methods of testing cable after jointing

T2.2.21 Installation and maintenance on transmission lines and associated equipment

Evidence shall show an understanding of procedures for installation and maintenance on transmission lines, structures and hardware to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the installation and maintenance of transmission lines and associated equipment
- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings, encompassing:
  Minimum construction clearances for transmission lines
  Sag/tension requirements

- Construction types and structures used in transmission lines
- Types, sizes and characteristics of transmission conductors
  Note: Examples include aluminium conductors steel reinforced and earthing conductors
- Types, sizes and characteristics of transmission conductors
  Note: Examples include aluminium conductors steel reinforced and earthing conductors
- Types of electrical connections used to connect transmission conductors
  Note: Examples include compression termination and bolted termination
- Causes and effects of poor electrical connections
- Types and application of specialised tools, equipment and hardware for the stringing of transmission conductors
- Techniques for stringing, tensioning and terminating transmission conductors
- Techniques for installation of associated hardware used on transmission towers
- Techniques for maintenance of damage transmission conductors encompassing:
  Repair and replacement

T2.2.22 Installation and maintenance of public lighting and associated equipment

Evidence shall show an understanding of procedures for installation and maintenance on public lighting structures and associated equipment to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations, local government and or enterprise requirements pertaining to the installation and maintenance of public lighting systems and associated equipment
- Safety precautions specific to working on street lighting encompassing:
  Safe working practices and procedures
  Safe clearances from LV and HV mains
  Working at heights
  Working in confined spaces
  Permit to work systems and isolation procedures
  Emergency response and rescue including First Aid etc
- Basic public lighting principles encompassing:
  Electromagnetic spectrum
  Principles of colour
  Behaviour of light
  Factors that affect illumination
- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings, encompassing:
  Street lighting circuits
  Earthing system
- Types of tools and equipment used for installation and maintenance
- Types and function of lanterns/Luminaires/lamps, control equipment, poles and associated hardware used for street lighting
  Note: Examples include hp mercury vapour, LP and HP sodium vapour, fluorescent, quartz-halogen, wood, concrete, steel, composite, choke boxes, photo-electric cells, time switches, contactor boxes
- Types of lighting systems encompassing:
  Overhead and underground street lighting systems
  Controlling and switching of lighting systems
- Techniques for the installation of street lighting systems
- Techniques for the maintenance of street lighting systems
  Note: Examples include diagnosing of faults, removing, repairing, replacement and cleaning of

public lighting and associated hardware

- Application of specific testing equipment

  Note: Examples include voltage detectors, insulation resistance testers, clamp-on ammeters, continuity testers, fault indictors
- Techniques for the inspection, testing and commissioning of street lighting systems

T2.2.23 Underground cable construction

Evidence shall show an understanding of the construction and types of underground cables to an extent indicated by the following aspects:

- Safety precautions specific to handling underground cables
- Requirements for the use of enterprise manuals, system diagrams/plans and drawings
- Types and applications of UC
- Construction types and structures of underground cables
- Characteristics of different types of underground cables
- Ratings

T2.2.24 Aluminium and lead cable sheathed — jointing procedures

Evidence shall show an understanding of the construction and types of underground cables to an extent indicated by the following aspects:

- Safety precautions specific to handling and jointing underground aluminium and lead cable including provision of OHS information such as material safety data sheets (MSDS)
- Requirements for the use of enterprise manuals, system diagrams/plans and drawings
- Construction and structure(s) of aluminium and lead cable underground cables
- Characteristics of aluminium and lead cable
- Ratings
- Techniques in the jointing of aluminium and lead sheathed cable
- Methods of testing cable after jointing

T2.2.25 Operation principles of a portable generator

Evidence shall show an understanding of the operating principles of portable generators to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the operation of a portable generator encompassing:

  Pre-operational checks

  Precautions during operation

  Shut down procedures
- Safety precautions specific to the operation of a portable generator

T2.2.26 Installation of a mobile generator LV

Evidence shall show an understanding of the installation of a mobile generation to an extent indicated by the following aspects:

- Safety precautions specific to installing mobile generators encompassing:

Safe working practices and procedures
Techniques in connecting, operating and disconnecting generators
Types of tools and equipment
Safe use of tools and equipment

- Techniques in the installation of gensets encompassing:
  The connection of generator onto and off the network without interruption to supply
  Estimation of LV load
  Assessing the appropriateness of the generator

T2.2.27 Generator control systems — LV

Evidence shall show an understanding of the control of generator systems for synchronisation of a LV genset to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the operation of a portable generator encompassing:
- Safety precautions specific to the synchronisation of gensets encompassing:
  Safe working practices and procedures
  Synchronising procedures
- Techniques in the installation of gensets control systems encompassing:
  The synchronising of generator control systems onto and off the network without interruption to supply
  Estimation of LV load
  Assessing the appropriateness of the generator
- Operating a generator in parallel to a single LV job encompassing:
- Overhead systems
- Indoor systems
- Customer Installations
- Kiosk Substations
- LV genset and control system to LV Distribution assets

T2.2.28 Towers and structures inspection principles

Evidence shall show an understanding of the inspection of towers and structures used for transmission lines to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements
- Characteristics of materials used for towers structures within the electrical transmission system encompassing:
  Faults that occur that influence the integrity of the structure
- Deterioration prevention techniques encompassing:
  Relationship between steel, and other materials
  Inspection procedures for deterioration
  Deterioration prevention procedures in steel
  Procedures for the repair of deterioration in steel

T2.2.29 Transmission powerline inspection principles

Evidence shall show an understanding of the inspection of transmission lines to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements
- Clearances and safety procedures
- Ground line inspection procedures of electrical transmission lines encompassing:
  Requirements for inspection of transmission lines and insulators
  Use of specific equipment and testing devices during testing/inspection
  Techniques in transmission line inspection
  Methods of recording data
- Overhead line inspection procedures of electrical transmission lines encompassing:
  Methods and requirements for overhead line inspection on electrical structures
  Clearances for overhead conductors, cables and structures
  Techniques used to obtain close inspection of transmission lines
  Use of specific equipment and testing devices during testing/inspection
  Methods of recording data

T2.2.30 Powerline transmission installation safety

Evidence shall show an understanding of the safe working practices and procedures for the installation of overhead transmission conductors to an extent indicated by the following aspects:

- Limits of approach for personnel, vehicles, mobile plant and elevating work platforms (EWP)
- Requirements of persons prior to making bare hand contact with dead low voltage mains and apparatus
- Requirements of relevant electrical access permits necessary to allow work to be performed on low and high voltage apparatus
- Safe working practices encompassing:
  Requirements to enable safe working on conductive poles
  Procedure to attach an "on-site" earthing device to de-energised low and high voltage overhead circuit
  Safe working practices when working with associated hardware/equipment and insulators
  Precautions of voltages on transmission structures
  Dangers when working at heights
  Identification of hazards, assessing and controlling risks
  Types, selection, maintenance and uses of personnel protective equipment
  Permit to work systems and isolation procedures
  Safe working practices when using specialised equipment
  Emergency response and rescue including First Aid etc

T2.2.31 Distribution overhead line component fundamentals

Evidence shall show an understanding of the different types and function of distribution components to an extent indicated by the following aspects:

- Commonwealth/State/Territory and local government legislation, Standards, codes, Commonwealth, State/Territory and local government legislation, supply authority regulations and or enterprise requirements applicable to the use and application of distribution components
- Requirements for the use of overhead line construction manuals, system diagrams/plans and drawings
- Types, function and characteristics of distribution components

- Safety policies and procedures precautions related to the handling and installing distribution components

T2.2.32 Stringing transmission overhead conductors and cables

Evidence shall show an understanding of stringing installation overhead transmission conductors and cables to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to stringing conductors and cables
- Requirements for the use of overhead line construction manuals, system diagrams/plans and drawings, encompassing:
  Material lists
  Conductor size, type and route length
- Constructions types and structures for transmission lines
- Types, sizes and characterises of overhead conductors
- Resources for the stringing of conductors, encompassing:
  Personal protective equipment
  Plant, tools and equipment
- Techniques in stringing conductors encompassing:
  Safe working practices
  Method of conductor support
  Consideration for the environment
  Location/positioning of the conductor/cable
  Types and application of tools, equipment and hardware
  Methods of stringing conductors

T2.2.33 Installation of a mobile generator – HV

Evidence shall show an understanding of the installation of a HV mobile generation to an extent indicated by the following aspects:

- Safety precautions specific to installing mobile generators encompassing:
  Safe working policies, practices and procedures
  Techniques in connecting, operating and disconnecting generators
  Types of tools and equipment
  Safe use of tools and equipment
- Techniques in the installation of generator sets encompassing:
  The connection of generator onto and off the network without interruption to supply
  Estimation of HV load
  Assessing the appropriateness of the generator

T2.2.34 Generator control systems — HV

Evidence shall show an understanding of HV generator control systems to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the operation of a portable generator encompassing:
- Safety precautions specific to the synchronisation of generator sets encompassing:
  Safe working policies, practices and procedures
  Synchronising procedures

- Techniques in the installation of generator sets control systems encompassing:
  The synchronising of generator control systems onto and off the network without interruption to supply
  Estimation of HV load
  Assessing the appropriateness of the generator
- Operating a generator in parallel to a single HV job encompassing:
  Overhead systems
  Indoor systems
  Customer Installations
  Kiosk Substations
  HV generator set and control system to HV Distribution assets

T2.2.35 Live line working up to 132kV with hotstick

Evidence shall show an understanding of working on energised lines to 132 kV (poles) using live line hotstick techniques to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with working on energised lines to 132 kV (poles) using live line hotstick techniques
- Calculation of conductor loads
- Safety precautions working on energised lines to 132 kV (poles) using live line hotstick techniques encompassing:
  Live line minimum approach distances for person and plant
  Occupational Health and Safety hazards and precautions
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment
  Live line access authority/permit system
  Disabling auto-reclosing function
  Ensuring functioning of fault current protective devices
  Checking integrity of insulation prior to work commencement
  Types and function of specialised live line working equipment and tools inspection prior to use
  Safe working policies, procedures and practices when using and operating specialised equipment and tools
  Methods of using specialised equipment and tools
  Work team communication
  Use of safety observers
  Emergency response and rescue including First Aid etc
- Policies and procedures dealing with general work practices encompassing:
  Definitions of terms used
  Responsibilities of personnel
  Types of structures from which hotstick methods can be performed
  Types of equipment and specialised tools, and their compliance with relevant standards
- Techniques for using hotsticks encompassing:
  Installing and/or replacing HV insulators
  Note: Examples include intermediate insulators, angle insulators, bridging insulators, strain insulators and suspension insulators
  Erecting and/or replacing HV cross-arms
  Note: Examples include intermediate and angle
  Connecting and/or disconnecting HV bridges connections
  Note: Examples include strain/"Tee" bridges, bypass bridges/connections, HV A. B. C. HV and

similar/dissimilar metals

- Techniques in the installation and/or maintenance of electrical equipment

  Note: Examples include air break switches, gas switches, fuse assemblies, isolators, bird covers, surge diverters and fault indicators
- Techniques in the erection and/or replace poles
- Techniques in repairing and/or replacing HV armour rods and/or line guards
- Conversion methods of intermediate construction to strain construction
- Techniques in insulator washing encompassing:

  High pressure washing from an elevated work platform

T2.2.36 Live line work for voltages greater than 132kV and up to 500kV with hotstick

Evidence shall show an understanding of working on energised lines to 500 kV (poles) using live line hotstick techniques to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with working on energised lines to 500 kV (poles) using live line hotstick techniques
- Safety precautions working on energised lines to 500 kV structures using live line hotstick techniques encompassing:

  Live line minimum approach distances persons and plant

  Occupational Health and Safety hazards and precautions

  Identification of OHS hazards, assessing and controlling risks

  Types, selection, maintenance, storage and uses of personnel protective equipment

  Live line access authority/permit system

  Disabling auto-reclosing function

  Ensuring functioning of fault current protective devices

  Checking integrity of insulation prior to work commencement

  Types and function of specialised live line working equipment and tools inspection prior to use

  Safe working policies, procedures and practices when using and operating specialised equipment and tools

  Methods of using specialised equipment and tools

  Work team communication

  Use of safety observers

  Emergency response and rescue including First Aid etc
- Policies and procedures dealing with general work practices encompassing:

  Definitions of terms used

  Responsibilities of personnel

  Types of structures from which hotstick methods can be performed

  Types of equipment and their compliance with relevant standards
- Calculation of load supported by live line tools
- Techniques for using hotsticks encompassing:

  Installing and/or replacing HV insulators

  Note: Examples include intermediate insulators, angle insulators, bridging insulators, strain insulators and suspension insulators

  Erecting and/or replacing HV cross-arms

  Note: Examples include intermediate and angle

  Connecting and/or disconnecting HV bridges connections

  Note: Examples include strain/"Tee" bridges, bypass bridges/connections, high voltage A. B. C and similar/dissimilar metals

- Techniques in the installation and/or maintenance of electrical equipment
  Note: Examples include air break switches, gas switches, isolators, bird covers, surge diverters and fault indicators
- Techniques in the erection and/or replace poles
- Techniques in installing and/or replacing armour grip suspension unit
- Techniques in installing and/or replacing Ontario Vibration Recorders
- Techniques in installing and/or replacing vibration dampers
- Techniques in installing and/or replacing performed repair rods
- Techniques in insulator washing encompassing:
  High pressure washing from an elevated work platform

T2.2.37 Live line working up to 33kV with glove and barrier

Evidence shall show an understanding of working on energised lines to 33 kV using live line glove and barrier techniques to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with working on energised lines to 33 kV (poles) using live line glove and barrier techniques
- Safety precautions working on energised lines to 33 kV using live line HV rubber gloving techniques encompassing:
  Live line minimum approach distances persons and plant
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment
  Live line access authority/permit system
  Disabling auto-reclosing function
  Ensuring functioning of fault current protective devices
  Checking integrity of insulation prior to work commencement
  Types and function of specialised live line working equipment and tools inspection before use
  Safe working policies, procedures and practices when using/operating specialised equipment and tools
  Methods of using specialised equipment and tools
  Work team communication
  Use of safety observers
  Emergency response and rescue including First Aid etc
- Policies and procedures dealing with general work practices encompassing:
  Definitions of terms used
  Responsibilities of personnel
  Types of structures from which glove and barrier methods can be performed
  Types of equipment and their compliance with relevant standards
- Relationship between combined glove and barrier and stick methods encompassing:
  Conditions under which they can be practiced
- Techniques in installing and/or replacing HV insulators when working live line glove and barrier;
  Note: Examples include intermediate insulators, angle insulators, bridging insulators, strain insulators and suspension insulators
- Techniques in erecting and/or replacing HV cross-arms when working live line glove and barrier;
  Note: Examples include intermediate, angle, strain, termination and suspension
- Techniques in connecting and/or disconnecting HV bridges connections when

working live line glove and barrier;

Note: Examples include strain/"Tee" bridges, bypass bridges/connections, HV A. B. C. and similar/dissimilar metals

- Techniques in the installation and/or maintenance of electrical equipment;

  Note: Examples include air break switches, gas switches, fuse assemblies, isolators, bird covers, surge diverters and fault indicators
- Techniques in erecting and/or removing temporary midspan switching devices
- Techniques using live line glove and barrier to erect and/or replace of poles

  Note: Examples of poles include, intermediate, angle, strain
- Techniques using live line glove and barrier for the repair and or replacing of HV conductors/cables
- Techniques in repairing and/or replacing HV armour rods and/or line guards
- Conversion methods using live line glove and barrier, of intermediate construction to strain construction

T2.2.38 Working on live lines up to 33kV with glove and barrier/hotstick combined

Evidence shall show an understanding of working on energised lines to 33 kV (poles) using live line glove and barrier/hotstick combined to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, supply authority regulations and or enterprise requirements associated with working on energised lines to 33 kV (poles) using live line glove and barrier/hotstick combined
- Safety precautions working on energised lines to 33 kV using live line glove and barrier/hotstick combined encompassing:
  - Live line minimum approach distances persons and plant
  - Occupational Health and Safety hazards and precautions
  - Identification of OHS hazards, assessing and controlling risks
  - Types, selection, maintenance, storage and uses of personnel protective equipment
  - Live line access authority/permit system
  - Disabling auto-reclosing function
  - Ensuring functioning of fault current protective devices
  - Checking integrity of insulation prior to work commencement
  - Types and function of specialised live line working equipment and tools inspection before use
  - Safe working policies, procedures and practices when using/operating specialised equipment and tools
  - Methods of using specialised equipment
  - Work team communication
  - Use of safety observers
  - Emergency response and rescue including First Aid etc
- Policies and procedures dealing with general work practices for both glove and barrier/ hotstick combined, encompassing:
  - Definitions of terms used
  - Responsibilities of personnel
  - Types of structures from which glove and barrier methods can be performed
  - Types of equipment and their compliance with relevant standards
- Relationship between combined glove and barrier and stick methods encompassing:
  - Conditions under which they can be practiced
- Techniques for installing and/or replacing HV insulators using glove and

barrier/hotstick combined

Note: Examples include intermediate insulators, angle insulators, bridging insulators, strain insulators and suspension insulators

- Techniques for erecting and/or replacing HV cross-arms using glove and barrier/hotstick combined

  Note: Examples include intermediate and angle

- Techniques for connecting and/or disconnecting HV bridges connections using glove and barrier/hotstick combined

  Note: Examples include strain/"Tee" bridges, bypass bridges/connections, HV A. B. C, HV and similar/dissimilar metals

- Techniques in the installation and/or maintenance of electrical equipment using hotstick;

  Note: Examples include air break switches, gas switches, fuse assemblies, isolators, bird covers, surge diverters and fault indicators

- Techniques in the erection and/or replacement of poles;

  Note: Examples include intermediate/suspension, angle, strain and termination

- Techniques in repairing and/or replacing HV armour rods and/or line guards and/or conversion methods of intermediate construction to strain in construction
- Techniques in the repairing and replacing HV conductors/cables and the identification of equipment used
- Techniques in installing and/or maintaining switching devices using glove and barrier

T2.2.39 Plant, equipment and tools used for HV live line work

Evidence shall show an understanding of plant, equipment and tools used for HV live line work to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with plant, equipment and tools used for HV live line work
- Safety precautions when working on plant, equipment and tools using hotstick combined encompassing:
  - Safe working clearances
  - Occupational Health and Safety hazards and precautions
  - Identification of OHS hazards, assessing and controlling risks
  - Types, selection, maintenance, storage and uses of personnel protective equipment
  - Authorisation to work systems
- Identification of plant, equipment and tools used for HV live line work encompassing:
  - Types
  - Applications
  - Construction
  - Characteristics
  - Limitations
  - Safe working load
- Serviceability of plant, equipment and tools used for HV live line work encompassing:
  - Inspection procedures
  - Testing procedures
  - Maintenance procedures
  - Storage procedures

- Relationship of live line work access authority/permit, disabling auto-reclose function and ensuring correct functioning of fault current protective devices prior to live line work
- Live line access authorities, disabling auto-reclose function and ensuring fault current protective devices prior to live line work
- Conductor supports encompassing:
  Methods
  Types of equipment
  Construction
  Characteristics
  Limitations
- Techniques in selecting appropriate conductor support method in accordance with requirements
- Calculation of loads and wind loading on conductors
- Effects of resultant forces when transferring conductor loads
- Rigging procedures for conductor support equipment

T2.2.40 Jointing and terminating oil and gas filled specialised underground cables

Evidence shall show an understanding of the jointing and termination of oil or gas filled specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the working with oil or gas filled specialised underground cables
- Safety precautions of working with oil or gas filled specialised underground cables encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Dangers of working in confined spaces
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment
  Authorisation to work systems and isolation procedures
  Safe working policies, procedures and practices when using/operating specialised equipment
  Emergency response and rescue including First Aid etc
- Types, function and serviceability of tools and equipment used for the jointing and terminating of oil or gas filled specialised underground cables
- Techniques in the safe jointing and terminating oil or gas filled specialised underground cables
- Techniques in the safe testing of the oil or gas filled specialised underground cables to ensure successful jointing and/or termination has occurred

T2.2.41 Polymeric specialised underground cable principles

Evidence shall show an understanding of construction and characteristics, of polymeric specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the working with polymeric specialised underground cables
- Types of polymeric specialised underground cables encompassing:

Construction
Characteristics and capabilities of the polymeric specialised cable
Pressure/Volume characteristics of oil and gas
Precautions when handling

- Types and functions of tools and equipment used on polymeric specialised underground cables
- Techniques when handling polymeric specialised underground cables

T2.2.42 Jointing and terminating specialised polymeric underground cables

Evidence shall show an understanding of the jointing and termination of polymeric specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the working with polymeric specialised underground cables
- Safety precautions of working with polymeric specialised underground cables encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Dangers of working in confined spaces
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment
  Authorisation to work systems and isolation procedures
  Safe working policies, procedures and practices when using/operating specialised equipment
  Emergency response and rescue including First Aid etc
- Types, function and serviceability of tools and equipment used for the jointing and terminating of polymeric specialised underground cables
- Techniques in the safe jointing and terminating polymeric specialised underground cables
- Techniques in the safe testing of the polymeric specialised underground cables to ensure successful jointing and/or termination has occurred

T2.2.43 Installing oil and gas filled specialised underground cables

Evidence shall show an understanding of the installation of oil or gas filled specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the installation of oil or gas filled specialised underground cables
- Safety precautions of working with oil or gas filled specialised underground cables encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Dangers of working in confined spaces
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment including intrinsically safe equipment for use in confined and hazardous environments
  Permit/Authorisation to work systems and isolation procedures
  Safe working policies, procedures and practices when using/operating specialised equipment

Emergency response and rescue including First Aid etc

- Types, function and serviceability of tools and equipment used for the installation of oil or gas filled specialised underground cables
- Techniques in the safe installation of oil or gas filled specialised underground cables
- Techniques in the safe testing/inspection of the oil or gas filled specialised underground cables to ensure successful installation has occurred

T2.2.44 Installing and maintaining polymeric specialised underground cables

Evidence shall show an understanding of the installation and maintenance of polymeric specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the installation and maintenance of polymeric specialised underground cables
- Safety precautions of working with polymeric specialised underground cables encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Dangers of working in confined spaces
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment including intrinsically safe equipment for use in confined and hazardous environments
  Authorisation to work systems and isolation procedures
  Safe working policies, procedures and practices when using/operating specialised equipment
  Emergency response and rescue including First Aid etc
- Types, function and serviceability of tools and equipment used for the installation of polymeric specialised underground cables
- Techniques in the safe installation of polymeric specialised underground cables
- Techniques in the safe maintenance of polymeric specialised underground cables
- Techniques in the safe testing/inspection of the polymeric specialised underground cables to ensure successful installation and/or maintenance has occurred

T2.2.45 Maintaining oil and gas filled specialised underground cables

Evidence shall show an understanding of the maintenance of oil or gas filled specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the maintenance of oil or gas filled specialised underground cables
- Safety precautions of working with oil or gas filled specialised underground cables encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Dangers of working in confined spaces
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment including intrinsically safe equipment for use in confined and hazardous environments
  Permit/Authorisation to work systems and isolation procedures
  Safe working policies, procedures and practices when using/operating specialised

equipment
Emergency response and rescue including First Aid etc

- Safe storage and disposal of oil or gas filled specialised underground cables and associated equipment and components; Types, function and serviceability of tools and equipment used for the maintenance of oil or gas filled specialised underground cables
- Techniques in the safe maintenance of oil or gas filled specialised underground cables
- Techniques in the safe testing/inspection of the oil or gas filled specialised underground cables to ensure successful maintenance has occurred

T2.2.46 Install and maintain oil and gas pressurised systems

Evidence shall show an understanding of the installation and maintenance of oil and gas pressurised systems for specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the installation and maintenance of oil and gas pressurised systems
- Safety precautions when installing and/or maintaining of oil and gas pressurised systems encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Dangers of working in confined spaces
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment including intrinsically safe equipment for use in confined and hazardous environments
  Authorisation to work systems and isolation procedures
  Safe working policies, procedures and practices when using/operating specialised equipment
  Emergency response and rescue including First Aid etc
- Safe storage and disposal of oil or gas pressurised equipment and associated components; Requirements for the use of manuals, system diagrams/plans, drawings, charts and layouts encompassing:
- Characteristics, application and care of hand and specialised tools
- Techniques in determining route profiles and access locations
- Pressure system characteristics for oil filled and gas filled cables
- Pressure/Volume characteristics of oil and gas
- Techniques in the safe installation of oil and gas pressurised systems
- Techniques in the safe maintenance of oil and gas pressurised systems
- Techniques in the safe use of tools and equipment in the process of installation and maintenance of oil and gas pressurised systems

  Note: Examples include gas analyser/detector, manometers, flow boards, cable freezing equipment, accessory impregnation equipment, oil degasification plant, manometers, flowboards, vacuum pumps, site bottles, gas cylinders, pressure/vacuum meters, oil evacuation pumps, RGP equipment, oil sampling equipment, gas control cubicles, oil control cubicles, cable joints and terminations, oil degasification units and oil pressure tanks

T2.2.47 Oil and gas filled specialised underground cable principles

Evidence shall show an understanding of construction and characteristics, of oil or gas filled specialised underground cables to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the working with oil or gas filled specialised underground cables
- Types of oil or gas filled specialised underground cables encompassing:
  Properties of paper insulation, oil and nitrogen gas
  Construction
  Reasons for gas and or oil filled
  Characteristics and capabilities of the cable
  Pressure/Volume characteristics of oil and gas
  Precautions when handling
- Types and functions of tools and equipment used on oil or gas filled specialised underground cables
- Techniques when handling, storing and disposing of oil or gas filled specialised underground cables

T2.2.48 Electrical equipment — HV and LV powerline

Evidence shall show an understanding of electrical equipment fundamentals used in the powerline industry to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the use and care of electrical equipment
  Note: Examples of electrical equipment will vary according to the enterprise but encompass both HV and LV equipment
- Characteristics, capabilities and application of powerline electrical equipment
- Safety precautions with regards to using electrical equipment
- Techniques in pre-use inspection on the serviceability of electrical equipment
- Techniques in the general maintenance, and care and storage of electrical equipment
- Identifying hazards, assessing and controlling risks associated with their the use of electrical equipment

T2.2.49 Co-ordinating permit access authority procedures

Evidence shall show an understanding of co-ordinating access authority procedures to an extent indicated by the following aspects:

- Specific enterprise processes, policies and procedures to be followed
- Processes of consultation, negotiation and co-ordination encompassing:
  Clear and concise instructions and information
  Methods for the encouragement of feedback and contributions of information and ideas
  Responsibilities of members of the team
- Techniques in analysing, planning, co-ordination and organising work for a safe outcome and according to statutory requirements and regulations
- Techniques in the effective utilisation of available resources
- Techniques in the development of an access authority/permit and/or access authority/permit issuing procedures
- Techniques in facilitating and co-ordinating the delivery and issuing of access authorities
- Techniques in gathering, collating and confirming data on different worksites
  Note: Examples include electrical network diagrams for the specific work site, earth access authorities, safe working area, work to be carried out in confined space or in hazardous

environment, specific outsourcing procedures, specific hazard identification, risk classification and management procedures, regulatory requirements such as Occupational Health and Safety and electrical safety

- Techniques in the receiving and co-ordinating the cancellation of access authorities in readiness for restoration
- Methods of conducting audits on correct access authority procedures
- Process of issuing of other access authorities for work permits

  Note: Examples include working in confined space, if required, co-ordination of access authorities, engaging and briefing contractors on electrical and other work
- Issue and receipt of operating agreements

T2.2.50 Extra High Voltage — Bare hand live line principles

Evidence shall show an understanding of safe practice and effective working practice in the application of bare-hand live line work at voltages of 132 kV and above to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, supply authority regulations and or enterprise requirements associated with plant, equipment and tools used for live line bare-hands work
- Safety precautions when working on plant, equipment and tools using bare-hand combined encompassing:
  - Live line minimum approach distances
  - Occupational Health and Safety hazards and precautions
  - Identification of OHS hazards, assessing and controlling risks
  - Types, selection, maintenance, storage and uses of personnel protective equipment
  - Live line access authority/permit systems
  - Disabling auto-reclosing function
  - Ensuring functioning of fault current protective devices
  - Checking integrity of insulation prior to work commencement
  - Types and function of specialised live working equipment and tools inspection before use
  - Safe working policies, procedures and practices when using/operating specialised equipment and tools
  - Methods of using specialised equipment and tools
  - Work team communication
  - Use of safety observers
  - Emergency response and rescue including First Aid etc
- Identification of ropes used for bare-hand live work encompassing:
  - Types — insulating, live line and rescue rope
  - Characteristics
  - Application
  - Restrictions
- Precautions for the storage of ropes used for bare-hand live linework
- Type of storage facility needed
- Cleaning and caring of ropes used for bare-hand live linework
- Labelling of ropes
- Testing of ropes for bare-hand live linework encompassing:
  - LV tests
  - HV tests
  - Recording frequency of tests
- Techniques in splicing, preparing an eye and preparing the ends of insulating rope
- Techniques for preparation and usage of tools employed in bare-hand work on

energised lines encompassing:

Live line insulator tester, Live line insulating rope test set and Ladder leakage monitor

- Methods of determining suitability of the rope for continued use for bare-hand live linework by the monitoring of the leakage current along the live line ladder
- Techniques for the positioning, connecting and rigging of equipment such as a live line ladder
- Methods of monitoring of ladder leakage current
- Techniques for undertaking the preparation sequence when bonding on to a transmission line conductor encompassing:

  Means of communication to the safety observer

  Process of safely moving out onto the live line ladder

  Process of safely moving towards the transmission line conductor

  Process for connecting the bare-hand conductive suit bonding wand to the transmission line conductor
- Procedure for the carrying out of bonding off from a transmission line conductor

T2.2.51 Extra High Voltage — Bare hand live line procedures

Evidence shall show an understanding of working on energised lines at or above 132 kV using live line bare-hand techniques to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, supply authority regulations and or enterprise requirements associated with plant, equipment and tools used for live line bare-hands work associated with extra high voltage (EHV)
- Safety precautions when working on plant, equipment and tools using bare-hand combined encompassing:

  Live line minimum approach distances

  Occupational Health and Safety hazards and precautions

  Identification of OHS hazards, assessing and controlling risks

  Types, selection, maintenance, storage and uses of personnel protective equipment

  Live line access authority/permit systems

  Disabling auto-reclosing function

  Ensuring functioning of fault current protective devices

  Checking integrity of insulation prior to work commencement

  Types and function of specialised live working equipment and tools inspection before use

  Safe working policies, procedures and practices when using/operating specialised equipment and tools

  Methods of using specialised equipment and tools

  Work team communication

  Use of safety observers

  Emergency response and rescue including First Aid etc
- Techniques for undertaking the preparation sequence to replace insulator string on an outer and centre phase
- Techniques for erecting insulated ladder
- Techniques for connecting and rigging equipment
- Techniques for bonding on and off; procedures
- Techniques for disc insulator string replacement on the outer phase and centre phase

T2.2.52 Extra High Voltage — Bare hand live line work using a helicopter

Evidence shall show an understanding of working on energised lines at or above 132 kV using live line bare-hand techniques from a helicopter platform to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, Commonwealth/State/Territory legislation, supply and aviation authority regulations and or enterprise requirements associated with extra high voltage (EHV) live line bare-hands work form a helicopter platform
- Safety precautions when working on helicopters encompassing:
  - Live line minimum approach distances including safe approach for selected helicopter type(s)
  - Occupational Health and Safety hazards and precautions
  - Determination of helicopter platform for task and working environment (i.e. network and relevant aircraft authority)
  - Identification of OHS hazards, assessing and controlling risks
  - Types, selection, maintenance, storage and uses of personnel protective equipment
  - Live line access authority/permit systems
  - Disabling auto-reclosing function
  - Ensuring functioning of fault current protective devices
  - Checking integrity of insulation prior to work commencement
  - Types and function of specialised live working equipment and tools
  - Safe working policies, procedures and practices when using/operating specialised equipment and tools
  - Methods of using specialised equipment and tools
  - Work team communication
  - Use of safety observers
  - Pilot briefing requirements
  - Emergency response and rescue including First Aid etc
  - Techniques for working bare-hands on live line extra high voltage from a helicopter platform
  - Aircraft operations induction including flight plan clearances, systems, equipment and communication requirements
  - Types and functions of aerial attachment equipment including appropriate testing, rating and certification
  - Aircrew familiarisation with live-line systems operations and equipment requirements

T2.2.53 HV principles

Evidence shall show an understanding of the principles of high voltage to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with working on or near High Voltage
- Electrical and electrostatic principles related to high voltage lines encompassing:
  - Relationship of current, voltage and resistance as related to transmission lines
  - Relationship of phase voltage and respective line voltages
  - Production of an electric field encompassing:
  - Units
  - Effect of distance
  - Potential of an object within the field and the effect of distances to the potential
- HV insulators encompassing:
  - Construction of a disc insulator
  - Construction of a polymeric insulator

Effects of an electrical field on disc insulators
Identification of the number of disc insulators needed for a single line voltage
Performance of a failed disc insulator on the line and the system
Determining the minimum allowable number of discs per string for each line voltage in the system before bare-hand work is to proceed
Techniques in detecting a failed disc in a string
Techniques in using appropriate tools and equipment to test a string
Methods of recording data

- Effects of electrostatic induction on the human body encompassing:
  Relationship of the resistance of a human body to different levels of current and voltage
  Relationship of a human body to an electric field
  Effects of electrostatic induction on bare-hand work
- Application of Faraday's cage encompassing:
  Effects of a body
  Advantages
  Description of the Faraday's cage used by bare-hand live-line workers
- Safety precautions working on or near High Voltage electrical apparatus
  Safe approach distances from live line
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment
  Permit to work systems and isolation procedures
  Types and function of specialised live working equipment
  Safe working policies, procedures and practices when using and operating specialised equipment
  Methods of using specialised equipment
  Emergency response and rescue including First Aid etc
- Effects of lighting and switching surges on performance off string insulators encompassing:
  Health effects to workers
  Methods used to alleviate surges on transmission lines
- Magnetic field encompassing:
  Difference between magnetic fields and electrostatic fields
  Source of magnetic field
  Techniques in locating, measuring and analysing known sources of magnetic fields
  Reasons for monitoring magnetic field exposure
  Techniques used to monitor magnetic fields

T2.3 Powerline safety and protection

T2.3.1 Powerline safety practices

Evidence shall show an understanding of powerline safety practices to an extent indicated by the following aspects:

- Protective apparatus and apparel for linework

  Note: Examples include responsibilities for the selection, use, maintenance and storage of protective apparatus and apparel and the types of protective apparatus and apparel used for the line worker
- Requirements for the use of ladders

  Note: Examples include practical demonstration of carrying, erecting, collapsing and lowering different types of extension ladder against a standing pole, maintenance checks on different types of ladders, renewal of extension ropes and the safety issues relating to clearances from overhead conductors
- Requirements for climbing and working aloft

  Note: Examples include methods used to identify a pole is safe to climb, methods used to inspect a line worker's body belt, application of knots and hitches appropriate to the requirements of a line worker, height safety principles including personal fall protection, prevention and related requirements, and the practical procedure of climbing an overhead structure and fitting a pole chair
- Traffic management

  Note: Examples include purpose of traffic management and a line worker's responsibilities in accordance with relevant statutory requirements and electricity supply industry requirements, demonstration of the procedure used to provide an effective traffic management scheme and the use of a two-way radio
- Control of small fires

  Note: Examples include the identification, selection and operation of the appropriate extinguishing mediums for various types of fires, general fire prevention methods and the precautions for personal protection when fighting small fires
- Rescue victims from heights and confined spaces

  Note: Examples include planning, identifying, the procedures, and establishing responses, developing techniques, involvement of external emergency services and practical demonstration/rehearsals of rescuing a person from heights and from confined spaces and emergency procedures for the rescue of an electric shock victim including CPR
- Requirements for aerial linework

  Note: Examples include planning, establishing and implementing relevant aviation authority clearances, determining system requirements, aircrew familiarisation with network operations and equipment, requirements for effective communications operations for aerial work

T2.3.2 Powerline safety — implementation and monitoring

Evidence shall show an understanding of the implementation and monitoring requirements for powerline safety to an extent indicated by the following aspects:

- Identification of relevant legislation, codes and government guidelines for the implementation and monitoring of OHS in the workplace

  Note: Examples include Commonwealth/State/Territory legislation relevant to the workplace and the meaning of general duty of care under OHS legislation and common law
- Workplace OHS enterprise plan

  Note: Examples include responsibilities of each member of the work team, review process for changing/improving OHS safety plan/standing instructions for the systematic management of OHS in the workplace
- Relationship between the OHS committee and employees

  Note: Examples include methods used to collate and distribute/disseminate OHS information, staff development activities and legislation requirements with regards to OHS training, methods of addressing barriers such as literacy and cultural differences and provisions relating to OHS issue resolution

- Hazards associated with Powerline industry

  Note: Examples include identification of hazards in the workplace, processes used and contributing factors to a hazardous situation assessment of risks and control of OHS risks (risk management), the hierarchy of control and monitoring of risk control measures

- Risk assessment and its management in Powerline industry

  Note: Examples include principles and purposes of risk management, processes for conducting risk assessment including, risk analysis and risk evaluation activities for selecting and implementing appropriate options for eliminating or minimising risk

- Maintenance strategies for OHS programs

  Note: Examples include developing processes for promoting, maintaining and improving OHS in the workplace and identify techniques for the evaluating and reviewing OHS education and training programs and elements of an effective OHS management system, OHS consultation and accident/incident investigations

T2.3.3 Statutory and safety considerations

Evidence shall show an understanding of the principles of Statutory and safety considerations to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, standards, codes, supply authority regulations and or enterprise requirements associated with working on High Voltage
- Particular reference to State and Territory regulations regarding:
  Working near energised conductors
  Electrical access
  Heights
  Confined space
  Testing procedures
  Licensing rules

T2.3.4 Electrical equipment — protection and control schemes

Evidence shall show an understanding of the electrical equipment associated with protection and control schemes to an extent indicated by the following aspects:

- Types and applications of electrical equipment encompassing::
  Characteristics
  Capabilities

  Note: Examples include the following schemes, overcurrent, frame leakage, cooling, buchholz, DC supplies, restricted earth, sensitive earth fault, CB fail, reclose, DC frame leakage, CEL Fail, under frequency load shed and earth fault

T2.3.5 Discrete protection schemes — isolation and tagging procedures

Evidence shall show an understanding of the principles of isolation and tagging procedures associated with protection testing to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the installation, maintenance, isolation and tagging procedures
- Requirements for the use of, isolation and tagging, manuals, system diagrams/plans and drawings
- Techniques in documenting isolations
- Techniques in appropriate isolation and tagging procedures as per Commonwealth/State/Territory legislation, supply authority regulations and enterprise standards

- Techniques in the installation and maintenance procedures protection devices as per Commonwealth/State/Territory legislation, supply authority regulations and enterprise standards

T2.3.6 Protection devices — maintenance and commissioning principles

Evidence shall show an understanding of the maintenance and commissioning procedures associated with discrete protection schemes to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the maintenance and commissioning procedures
- Requirements for the use of maintenance and commissioning manuals, system diagrams/plans and drawings
- Techniques in maintenance and commissioning procedures encompassing:
  Planning
  Policy
  Testing techniques
  Close out requirements

T2.3.7 Protection devices — manufacturer requirements

Evidence shall show an understanding of relay manufacturer specifications to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory and local government legislation, supply authority regulations and or enterprise requirements applicable to the use and application of relay manufacturer specifications
- Requirements for the use of relay manufacturer manuals, system diagrams/plans and drawings
- Types, function and characteristics of specific relays encompassing:
  Differences between specific relays used for the same functionality

T2.3.8 Safe design principles

Evidence shall show an understanding of the principles of safe design to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, standards, codes, supply authority regulations and or enterprise requirements associated with safe design principles
- Particular reference to state and territory regulations regarding:
  Working near energised conductors
  Electrical access
  Heights
  Confined space
  Testing procedures
  Licensing rules
- Application of safe design principles encompassing::
  Safe design duty related information
  Safe design process related information
  Safe design evaluations

T2.4 Switching

T2.4.1 Switchgear installation

Evidence shall show an understanding of the installation of switchgear and associated equipment to an extent indicated by the following aspects:

- Types and function of various switchgear

  Note: Examples include isolators, air-break switches, gas-filled switches, vacuum type, links, fuses, oil disconnectors, fuse switches, circuit breakers, operating characteristics, advantages and disadvantages of different types switchgear, installation procedures, earthing, requirements and techniques
- Types of equipment

  Note: Examples include transformers, reactors, regulators, capacitors, relays, surge arrestors, fault indicators and mobile generators
- Installation procedures for switchgear and equipment encompassing:

  Standards, codes, legislation, supply authority regulations and or enterprise requirements

  Assembly and erecting procedures

  Earthing requirements and techniques

  Pole mounted locations
- Maintenance procedures for switchgear and equipment encompassing:

  Diagnosing and rectifying faults according to electricity supply industry standards and procedures
- Testing and commissioning encompassing:

  Electricity supply industry standards and procedures

T2.4.2 Low voltage switching principles

Evidence shall show an understanding of low voltage switching principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching of low voltage to a given schedule
- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:

  Types, characteristics and capabilities of electrical apparatus

  Use, characteristics and capabilities of specialised tools and testing equipment

  LV network interconnectors source of possible backfeed
- Low voltage switching techniques encompassing:

  Identifying hazards, assessing and controlling risks associated with LV switching operations

  Electrical access permit(s)

  Operational procedures

  Earthing procedures
- Personnel protective equipment (PPE) for LV switching

T2.4.3 High voltage switching principles

Evidence shall show an understanding of high voltage switching principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching of high voltage to a given schedule

- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:
  Types, characteristics and capabilities of electrical apparatus
  Use, characteristics and capabilities of specialised tools and testing equipment
  Network interconnectors source of possible backfeed
- Role of the HV switching operator
- Operational forms, access authorities and permits associated with HV switching encompassing:
  Types of operational forms, access authorities and permits
  Purpose and procedure for operational forms, access authorities and permits
- Use and operation of equipment associated with HV overhead and substation equipment encompassing:
  Test instruments
  Sticks
  Interrupters
  Arc stranglers
- Types and categories of HV switchgear
- Application, function and operating capabilities of switchgear
- Restrictions pertaining to HV switching equipment
- Procedures for the isolation of HV transmission main and working earths
- Earthing HV electrical apparatus practices and procedures for access encompassing::
  - Purposes of "Operational" and additional work part "on-site" earths
  - Factors determining the location and effectiveness of "Operational" earthing
  - Acceptable industry procedures
  - Personal protective equipment
- High voltage switching techniques
- Operate switching apparatus encompassing:
  - Identifying hazards, assessing and controlling risks associated with HV switchgear operation
  - Systematic and defensive techniques
  - Mobile radio procedures
  - Double isolation procedures

T2.4.4 High voltage fault switching principles

Evidence shall show an understanding of high voltage fault switching principles to an extent indicated by the following aspects:

- Primary causes, effects and types of HV electrical faults
- HV protection devices encompassing::
  - Main components
  - Types
  - Categories
  - Applications
  - Functions
- Basic principle of operation of HV system protection devices
- Protection co-ordination and protection "zoning"
- HV feeder auto-reclosing suppression encompassing:
  - Function
  - Application
- Circuit condition requirements and switching considerations when paralleling and

separating HV feeders

T2.4.5 High voltage distribution transformer principles

Evidence shall show an understanding of high voltage distribution transformer principles to an extent indicated by the following aspects:

- Operation of HV distribution transformers encompassing::
  - Principle governing factors for transformer ratings
  - Protection and alarms
  - Operating limitations and the relationship between transformer and HV fuse rating
  - Purpose and principle operation of HV distribution transformer tap changers
  - HV distribution transformer and transformer — cable combination switching practices
  - Paralleling requirements
  - Isolation and earthing procedures for access
  - Common distribution transformer and associated electrical apparatus faults
- HV underground switching equipment

  Note: Examples include arc stranglers, switch operation, load break elbows, switching cubicles, canister fuses, bayonet fuses, F and G switching cubicles, voltage indicators and phasing testers

T2.4.6 High voltage SWER system

Evidence shall show an understanding of high voltage SWER system to an extent indicated by the following aspects:

- Application and function of SWER system components
- Circuit arrangement
- Principle of operation
- Hazards and procedures associated with faulty SWER earth systems
- Procedure to isolate, energise and commission SWER substations

T2.4.7 Feeder automation system

Evidence shall show an understanding of feeder automation system to an extent indicated by the following aspects:

- Function of feeder automation system and the main components
- Operation procedure for a remote field device from a local control station
- Functions of “System Control and Date Acquisition” (SCADA) (or any other relevant Data Acquisition and Control) systems and its main components
- SCADA system security interlocks and access restrictions
- SCADA system operation when switching apparatus or retrieving data via a remote access device such as; Remote Access Terminal (RAT), Dial Up Voice Annunciated System and Local Control Station
- Function of the main components of a local/remote control system
- Operation of a field devices using SCADA systems via a Remote Access Terminal (RAT), Dial Up Annunciated System and Local Control Station

T2.4.8 System switching operations and authorisation procedures — HV

Evidence shall show an understanding of HV system switching principles including

switching authorisation procedures to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to system switching
- Requirements for the use of manuals, system diagrams/plans and drawings
- Types and characteristics of HV systems and equipment to be switched
- Procedures for obtaining correct HV switching authorisation encompassing:
  Identification of OHS hazards, assessing and controlling risks
  Safety procedures and precautions
  Safe approach distances
  Responsibilities and protocols
  Identifying switching resources
  Procedures for obtaining electrical access permits authorities
  Requirements for team switching
  Procedures for coordination of operations
- Techniques in HV system switching encompassing:
  Pre-switching checks
  Switching operational procedures
  Isolation procedures and proving dead de-energised
  Earthing procedures
  Pre-switching checks
  Switching operational procedures
  Emergency fault procedures
  Energisation procedures

T2.4.9 System switching operations and authorisation procedures — LV

Evidence shall show an understanding of LV system switching principles including switching authorisation procedures to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to system switching
- Requirements for the use of manuals, system diagrams/plans and drawings
- Types and characteristics of LV systems and equipment to be switched
- Procedures for obtaining correct LV switching authorisation encompassing:
  Identification of OHS hazards, assessing and controlling risks
  Safety procedures and precautions
  Safe approach distances
  Responsibilities and protocols
  Identifying switching resources
  Procedures for obtaining electrical access permits authorities
  Requirements for team switching
  Procedures for coordination of operations
- Techniques in LV system switching encompassing:
  Isolation procedures and proving dead
  Earthing procedures (comment not aware of any electricity network that earths LV)
  Pre-switching checks
  Switching operational procedures
  Emergency fault procedures
  Energisation procedures

T2.4.10 Co-ordinating and directing switching instructions

Evidence shall show an understanding of coordinating and directing switching instructions to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching sheet instructions
- Specific enterprise processes, policies and procedures to be followed
- Processes of consultation, negotiation and coordination encompassing:
  - Clear and concise instructions and information
  - Methods for the encouragement of feedback and contributions of information and ideas
  - Responsibilities of members of the team
- Techniques in analysing, planning, co-ordination and organising work for a safe outcome and according to statutory requirements and regulations
- Techniques in the effective utilisation of available resources
- Techniques in the co-ordination and directing of switching schedules instructions
- Relationship between the operating authorities and HV customers, operating agreements
- Techniques in co-ordinating and directing HV and LV switching of electrical networks
- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:
  - Types, characteristics and capabilities of LV and HV electrical equipment to be switched
- Responsibilities of the switching operator
- Techniques in writing switching instructions encompassing:
  - Sequence of switching operations
  - Isolation procedures
  - Earthing procedures
  - Switching completion notification procedures
- Techniques in gathering, collating and confirming data on switching procedures

T2.4.11 High voltage overhead and substation switching principles

Evidence shall show an understanding of HV overhead and substation switching principles to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to HV overhead and substation switching
- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:
  - Types, characteristics and capabilities of HV electrical equipment to be switched
  - Use, characteristics and capabilities of specialised tools and testing equipment
- Role and responsibilities of the HV switching operator
- Operational forms, access authorities and permits hazard/risk assessments associated with HV switching encompassing:
  - Types of operational forms, access authorities and permits hazard/risk assessments
  - Purpose and procedure for operational forms, access authorities and hazard/risk assessments
- Use and operation of equipment associated with HV overhead and substation equipment encompassing:

Test instruments
Sticks
Interrupters
Arc stranglers

- HV switchgear encompassing:
  Types
  Categories
  Application
  Operating capabilities
- Operation of HV overhead switching or indicating devices

  Note: Examples include fuses; disconnect fuses; load switching; live line indicators; capacitors; reclosers; sectionalisers, underslung links, airbreaks; switches, disconnects; live line clamps; phasing sticks; phasing tester
- Operation of protection systems and substation equipment

  Note: Examples include fault levels and settings; types and applications; protection systems and substation equipment fault levels and settings; types and applications
- Restrictions pertaining to HV switching equipment
- Procedures for the isolation of HV mains and working earths encompassing:
  Earthing HV electrical apparatus practices and procedures for access authority issuing;
- HV switching techniques;
- Operate switching apparatus encompassing:
  Identifying hazards, assessing and controlling risks associated with HV switchgear operation
  Systematic and defensive techniques
  Mobile radio procedures
  Double isolation procedures

T2.4.12 Low voltage overhead and substation switching principles

Evidence shall show an understanding of low voltage overhead and substation switching principles to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to low voltage overhead and substation switching
- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:
  Types, characteristics and capabilities of LV electrical equipment to be switched
  Use, characteristics and capabilities of specialised tools and testing equipment
- Role and responsibilities of the LV switching operator
- Operational forms, access authorities and hazard/risk assessments associated with HV switching encompassing:
  Types of operational forms, access authorities and hazard/risk assessments
  Purpose and procedure for operational forms, access authorities and hazard/risk assessments
- Use and operation of equipment associated with LV overhead and substation equipment encompassing:
  Test instruments
  Sticks
  Interrupters
  Arc stranglers; (not a common term)
- LV switchgear encompassing:
  Types

Categories
Application
Operating capabilities

- Operation of LV overhead switching or indicating devices:

  Note: Examples include fuses; disconnect fuses; load switching; underslung links, air break switches; disconnects; live line clamps; phasing sticks; phasing tester

- Operation of protection systems and substation equipment

  Note: Examples include fault levels and settings; types and applications, protection systems and substation equipment fault levels and settings; types and applications

- Restrictions pertaining to LV switching equipment
- Procedures for the isolation of LV distributions main and working earths
- Earthing LV electrical apparatus practices and procedures for access authority issuing
- Low voltage switching techniques
- Operate switching apparatus encompassing:
  Identifying hazards, assessing and controlling risks associated with LV switchgear operation
  Systematic and defensive techniques
  Mobile radio procedures
  Double isolation procedures

T2.4.13 High voltage switching instruction preparation

Evidence shall show an understanding of the preparation of a HV switching instruction schedule to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching instruction schedules
- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:
  Types, characteristics and capabilities of HV electrical equipment to be switched
- Points of isolation and earthing locations (safety and working earths)
- Responsibilities of the switching operator
- Techniques in writing switching instructions encompassing:
  Sequence of switching operations
  Isolation procedures
  Earthing procedures
  Switching completion notification procedures

T2.4.14 Low voltage switching instruction preparation

Evidence shall show an understanding of the preparation of a LV switching instruction to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching sheet schedules
- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:
  Types, characteristics and capabilities of LV electrical equipment to be switched
  Isolation points and earthing (if considered necessary)
  Responsibilities of the switching operator
- Techniques in writing switching schedules encompassing:
  Sequence of switching operations

Isolation procedures
Earthing procedures — if necessary
Switching completion notification procedures

T2.5 Vegetation

T2.5.1 Ecological principles for vegetation control

Evidence shall show an understanding of ecological principles for vegetation control to an extent indicated by the following aspects:

- Ecological principles encompassing:
  Interdependence of plants, animals, the soil and the environment
  Environment
  Habitats
  The food chain
- Soil and erosion control principles encompassing:
  Soil types
  Simple tests
  Types of erosion
  Theory of erosion prevention and control
  Land degradation control
  Functions of trees in the environment
- Basic anatomy and physiology encompassing:
  Plant morphology
  Internal anatomy
  Growth patterns and habits
  Simple physiology
- Tree hazard assessment encompassing:
  Symptoms of stress in trees
  Diagnosing tree problems
  Assessments for line clearance
  Personal hazards
  The tree's response to wounding and decay
  Theory of compartmentalisation
  Tree stability (damage to root systems due to excavation)
  Principles of pruning
  Branch collars

T2.5.2 Vegetation control techniques

Evidence shall show an understanding of the control of vegetation to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to the control of vegetation encompassing:
  Clearance zones and approach distances from overhead power lines
  Legislation associated with easement access and maintenance
  Appropriate personal protection equipment
  Equipment maintenance and safety precautions
- Tree climbing and pruning encompassing:
  Chainsaw safety and maintenance
  Basic cross-cutting techniques
  Simple felling
  Use of EWPs
  Safe climbing with ropes and harnesses

Use of chainsaws in the tree
Cutting techniques
Roping techniques
Chemical control of foliage and the required safety techniques
Practical work on site with a range of trees

- Easement management encompassing:
  Legislation relating to easement access and maintenance
  Use of chemicals and herbicides and provision of MSDSs for those substances
  Use of machinery and plant
  Access tracks

T2.5.3 Fundamentals for working safely near live electrical apparatus

Evidence shall show an understanding of working safely up to the defined "safe working zone" near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker to an extent indicated by the following aspects:

- Standards, guidelines/codes of practice, State/Territory/local government legislation, supply authority regulations and or enterprise requirements including relevant certification and licensing, applicable to working safely up to the defined "safe working zone" near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker
- Definitions of terminologies

  Note: Examples include 'safe working zone' 'risk assessment', 'safe approach distances zones', 'safe working distances'.' work permits', access authorisation permits', 'Technical standards' 'isolation procedures' and compliance requirements'
- OHS polices and procedures for working safely encompassing:
  Emergency response and First Aid procedures such as CPR
  Roles and responsibilities of employers, employees and other parties under OHS legislation
  Personal protective equipment
  Identifying hazards, assessing and controlling OHS risks
  First aid procedures
  Duties of a safety observer
  Working at heights/confined spaces
  Permit to work systems and isolation procedures
  Safe application of different types of tools and equipment
  Operation of mobile plant and machinery (eg EWP) near live electrical apparatus
- Electricity supply infrastructure assets and voltages
- Techniques and precautions in undertaking different work functions and working safely up to the defined "safe working zone" near energised electrical apparatus (inc. electrical powerlines) for non-electrical worker

  Note: Examples of work functions that may be performed include, vegetation control, scaffolding, rigging, painting, and/or any other activity that requires working safely near live electrical apparatus by a non-electrical worker

T2.5.4 Coordinate vegetation control inspection programs

Evidence shall show an understanding of the co-ordination of vegetation control inspection programs to an extent indicated by the following aspects:

- Commonwealth/State/Territory/local government legislation/regulations, Standards, codes, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to co-ordinating the inspection of vegetation control encompassing:

Clearance zones and approach distances from overhead power lines
Legislation associated with easement access and maintenance
Use and operation of plant and equipment such as 'EWPs, chainsaws/pole saws, stump grinders
Appropriate personal protection equipment
Equipment maintenance and safety precautions
Endangered plants/animals/insects
Soil erosion
Chemical treatment
Provision of manufacturers and suppliers information such as material safety data sheets (MSDSs)
Traffic management control plan

- Alternative engineering solutions for vegetation management
- Emergency response and First Aid procedures
- Techniques in the inspection of vegetation to determine action required encompassing:
  Diagnosing tree problems and systems of stress in trees
  Identification of fall zone
  Identification of OHS hazards, assessing and controlling risks
  Safety policies, procedures and precautions
  Responsibilities and protocols for team members
  Procedures for obtaining electrical access authorities
  Procedures for coordination of operations
- Techniques in determining the resources required for a particular vegetation control project
- Techniques in determining the condition of the tools and equipment needed for a particular vegetation control project
- Techniques in determining the duration and cost of the vegetation control project
- Techniques in relaying information to team members encompassing:
  Safe precautions and procedures
  Clearances zones and approach distances
  Proper selection, maintenance, use and storage of personal protective equipment
  Procedures regarding safe use of equipment including pre-operational checks for serviceability
  Procedures in the safe transporting, use, storage and disposal of chemicals
- Procedures for removal of vegetation
- Techniques in record keeping of data

T2.5.5 Powerline clearances and approach distances

Evidence shall show an understanding of powerline clearance and approach distance practices to an extent indicated by the following aspects:

- Regulatory environment of powerline clearance encompassing:
  Statutory Requirements
  Commonwealth/State/Territory legislation
  Technical standards, acts, codes and guides
- Approved Work Procedures encompassing:
  Documentation of Work Procedures
  Procedures in the event of an incident
  Note: Examples include events constituting an incident, procedures for responding to incidents
  Safe Approach Distances for plant and equipment
  Note: Examples include Insulated Cranes and Plant Operated by an Authorised or Instructed Person

Safe Approach Distances for Personnel and Hand Held Tools
Special Limits of Approach for Authorised Persons Only
Minimum vegetation approach distances
Minimum Safe Working Distances for personnel
Tool Length Determination
Proximity to Electrical and Telecommunications Apparatus
Safety Precautions
Field Supervision at the Work Site
Duties of the Safety Observer
Identification of OHS hazards, assessing and controlling risks
Types, selection, maintenance, storage and uses of personnel protective equipment
Permit to work systems and isolation procedures
Emergency response and rescue including First Aid etc
Working at heights
Working in confined spaces

T2.5.6 Basic vegetation control hazard assessment and risk management principles

Evidence shall show an understanding of hazard assessment and risk management appropriate to the level of responsibility in the vegetation control field and to an extent indicated by the following aspects:

- Identifying the terminologies associated with risk assessment

  Note: Examples include risk management, risk analysis and risk evaluation activities and eliminating or minimising risk. This incorporates principles and purposes of risk management, processes for conducting risk assessment including risk analysis and risk evaluation activities for selecting and implementing appropriate options for eliminating or minimising risk.
- Relationship risk assessment has with vegetation control
- Basic principles of hazard and risk assessment encompassing:
  What to look for
  Basic procedures in conducting work-site hazards/risk assessment
  Contingences
  Essential components of hazard assessment checks
  Identification of hazards associated with work function and the environment

  Note: Examples include type of equipment to be used, location of the work-site, condition of the surrounding vegetation and climate conditions
- Techniques in the elimination or minimization of hazards/risk encompassing:
  Identification of resources available
  Identification of appropriate methodology in hazard control
  Identification of the hierarchy of control
  Formulating a worksite hazard and risk assessment checklist
  Pre-job Hazard Assessment Check (HAC) Items

  Note: Examples include JSAs, planned inspection, hazard risk assessment form,
  Prompt sheet reference

  Note: Examples include VMP2 (electrical hazards) VMP1 (general) VMP3 (vegetation)
  Recognizing electrical hazards
- Evaluation of risk assessment and management procedures
- Communicating worksite procedures

T2.5.7 Pruning principles near powerline

Evidence shall show an understanding of pruning principles near powerlines to an extent indicated by the following aspects:

- Reasons for pruning around powerlines
- Identifying site conditions encompassing:
  Inspection methods of vegetation to be pruned what to look for
  Determination of work-site working area
  Identification of possible endangered species
  Identification of appropriate personnel protective equipment to be used
  Identification of the location of plant, tools, equipment and fellow workmates for safe work practices
- Inspecting location and determining work methods
- Principles of correct pruning practice encompassing:
  Types of pruning
  Note: Examples include Formative, Corrective, Preventative, Natural target pruning
  Cutting Techniques
  Different Branch Cuts
  Note: Examples include single top cut technique, single under-cut, handsaw technique for light small branches, chainsaw technique for heavy branches, single side-cut technique, step cut (under-cut then a top cut) technique, scarf under-cut- then top cut technique, top scarf - bottom-back cut technique, side scarf - then opposite back-cut technique, spear-cut technique, snipping/cutting back overhang (lv)
  Poor pruning practices
  Correct pruning practices
  Effects of pruning
  Note: Examples include incorrect pruning, how much to prune, size of cut
- Principles of authorised tree trimming encompassing:
  Qualifications for instructed/authorised work
  Qualifications for working in the Safe working zone
  Basic requirements for instructed/authorised work
  Statutory requirements
  Approved work procedures
  Documentation of work procedures
  Procedures in the event of an incident
  Events constituting an incident
  Procedures for responding to incidents

T2.5.8 Establishing rigging requirements for vegetation control

Evidence shall show an understanding of establishing rigging requirements to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with rigging including the operation of cranes, hoists and winches and relevant certification and licensing (if required)
- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
- Safe use of rigging equipment, tools and associated equipment encompassing:
  Types, techniques and application
  Inspecting location
- Identifying site conditions encompassing:
  Reasons for pruning around powerlines
  Inspection of tree and site
  Identifying hazards, assessing and controlling risks

Appropriate sequence of loading and unloading

- Selection and inspection procedures encompassing:
  Rigging equipment, materials and tools
  Note: Examples include natural and synthetic fibre ropes and chains, fittings, winch and capstan
- Establishing rigging in proximity to power lines encompassing:
  Structural integrity for rigging on trees
  Serviceability of safety lines, ropes, load bearing equipment
  Inspecting safety harnesses/belt, straps and slings
  Inspecting lowering devices
  Note: Examples include lifts, restraints, slings, bends and hitches, pulleys, maillon rapides, lowering drum, T-bar flying capstan
- Checking the integrity of support structure; visual inspection of load connections
- Techniques in moving, lifting, shifting, managing and placing loads encompassing:
  Use of appropriate communication and signalling methods
  Codes of practice/compliance
  Enterprise and Commonwealth, State/Territory legislative requirements
  Weather conditions
  Erection of safety nets and lines
  Methods of fixing and anchoring loads
  Load stability

T2.5.9 Powerline access and isolation procedures

Evidence shall show an understanding of the procedures and protocols for access to powerline facilities and isolation of powerlines to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with accessing powerline facilities together with the relevant certification and licensing (if required)
- Powerline access permit procedures and documentation
- Work place signage encompassing:
  Traffic management
  Unauthorised access
  Public protection
- Powerline distribution voltages
- Switching requirements for authorised tree trimming work on high voltage overhead lines encompassing:
  Information required by system control.
  Information to be included on the 'vicinity permit'
  System control functions
  Authorised work adjacent to an area under an access permit
  Communications
  Weather conditions at work site
  Work team communications
  Adequate light at work site
- Safety precautions to ensure powerline isolation procedures has been undertaken

T2.5.10 Tree preservation principles

Evidence shall show an understanding of the principles of tree preservation to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with endangered species of
- Identifying site conditions and inspection of tree and or vegetation encompassing:
  Suitability of this type of tree in this location
  Identifying hazards, assessing and controlling risks with this tree in this location
- Inspecting location and determining work methods for tree preservation encompassing:
  Tree defects
  Tree Diseases
  Insect Attacks
- Relationship to how a tree grows to vegetation control encompassing:
  Australian tree families
- Tree preservation encompassing:
  Methods of clearing vegetation
  Tree trimming
  Pruning
  Tree felling
  Safety work measures/methods
  Prevention of soil erosion
  Regrowth control
  Disposal of debris
  Heritage, significant and urban/rural vegetation
  Fire prone areas

T2.5.11 SPARE CLAUSE

T2.5.12 Assessment of vegetation principles

Evidence shall show an understanding of the principles of conducting assessment of the condition and type of vegetation for the purpose of controlling its growth away from live lines, to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations, permit requirements and/or enterprise requirements associated with the cutting/pruning/controlling the growth of vegetation around live powerlines up to the high voltage live work zone as defined for both Instructed and Authorised Persons in the industry guidelines associated with live electrical apparatus
- Techniques in established procedures for defining species of vegetation, tree types and characteristics, including tree defects and hazards
- Techniques in identifying hazards and risk assessment control measures that encompass job safety assessment and compliance with relevant State or Territory regulatory agencies/bodies, local government legislation, Industry bi-partite body Guidelines/Codes of Practices or other related requirements for Safe work and access near live Electrical and Mechanical Apparatus
- Techniques in determining the appropriate safe working up to the defined “safe working zone” near energised electrical apparatus (including electrical powerlines) for non-electrical worker/ordinary persons
- Safety precautions working on vegetation control encompassing:
  Safe working clearances from live line

Identifying OHS hazards, assessing and controlling OHS risks
Types, selection, maintenance and uses of personnel protective equipment
Permit to work systems and isolation procedures
Safe working practices when using specialised equipment
Emergency response and rescue including First Aid etc
Working at heights and in confined spaces

- Techniques in establishing the appropriate safe work methods and/or type of plant, tools and or equipment to control vegetation

  Note: Examples include the selection of most appropriate tools such as chainsaw, movers, saws, trimmers and or the most appropriate chemical

- Use and application of plant, tools and equipment use to control vegetation

  Note: Examples include the chainsaw, movers, saws and trimmers

- Mathematical calculations and technology related to load, slings, weights and height
- Techniques in communicating and relaying information to other personnel
- Techniques in compiling and recording assessment data collected

T2.5.13 Chemical control of foliage

Evidence shall show an understanding of vegetation control using chemicals to an extent indicated by the following aspects:

- Commonwealth, State and local government legislation, standards, codes, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to the control of vegetation using chemicals
- Chemical treatment principles encompassing:
  Types and characteristics of chemical(s) to be used
  Regulations and procedures in handling and transporting chemicals safely
  Application procedures of chemicals to be used
  Mixing desirable quantities
  Pouring, spraying, and storing procedures
- Techniques in handling equipment to eliminate/reduce risks to the environment from spillages of oils, herbicides, pesticides and chemicals from such equipment as
  Methods of disposing and storage of herbicides, pesticides and chemicals
- Safety precautions specific to working with chemicals encompassing:
  Safe working practices and procedures
  Occupational Health and Safety hazards and precautions
  Identification of OHS hazards, assessment and control of OHS risks
  Types, selection, maintenance, storage and use of personal protective equipment
  Note: Examples include appropriate selection of complete or partial body protection and processes of inspection prior to use and cleaning after use
  Dangers of working in confined spaces and at heights while using chemicals
  Permit to work systems and isolation procedures/protocols
  Safe working policies, procedures and practices when using/operating specialised chemical equipment
  Emergency response and rescue, including First Aid etc
  Reasons and provisions of MSDSs
  Precautions in the use of machinery, plant, equipment and tools when working with chemicals
- Required safety techniques in the handling of herbicides encompassing:
  Use and application of chemical agents
  Transporting and storage of chemicals and solvents
  Cleaning of equipment used in applications
  Procedures for spillages and contamination outside of vegetation control area

T2.5.14 Safety observer principles

Evidence shall show an understanding of responsibilities of a safety observer to an extent indicated by the following aspects:

- Commonwealth, State and local government legislation, standards, codes, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to the duties and responsibilities of a safety observer encompassing:
  - Areas of responsibility
  - Protocols and procedures
  - Emergency response and rescue including First Aid etc
- Enterprise specific duties of a safety observer
- Techniques in observing others in the safe performance of their work
- Safe Approach Distances for Personnel and Hand Held Tools
- Special Limits of Approach for Authorised Persons Only
- Minimum vegetation approach distances
- Minimum Safe Working Distances
- Proximity to Electrical and Telecommunications Apparatus

T2.5.15 Operating tools and equipment from a platform

Evidence shall show an understanding of the techniques in operating tools and equipment from a platform to an extent indicated by the following aspects:

- Commonwealth, State and local government legislation, standards, codes, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to the operating of tools and equipment from a platform
- Types of platforms used for vegetation control
- Advantages and disadvantages of each type of platform
- Types of pre-operational checks on platforms
- Transporting and storage methods
- Safety precautions when using platforms encompassing:
  - Proper use of elevating work platforms
  - Earthing of the EWP
  - Proper methods of mounting and alighting platforms
  - Hydraulic tools
- Use of insulated Elevating Work Platforms encompassing:
  - The insulated Elevating Work Platforms Operator
- Platform operational techniques on a platform encompassing:
  - Height safety
  - Working aloft
- Safety precautions specific to working on platforms encompassing:
  - Safe working practices and procedures
  - Occupational Health and Safety hazards and precautions
  - Identification of OHS hazards, assessment and control of OHS risks
  - Types, selection, maintenance, storage and use of personal protective equipment including harnesses
  - Dangers of working in confined spaces and at heights while on a platform
  - Permit to work systems and isolation procedures/protocols
  - Safe working policies, procedures and practices when using/operating hand and

power tools
and equipment from a platform
Emergency response and rescue including First Aid etc

T2.5.16 Climbing techniques

Evidence shall show an understanding of climbing techniques to an extent indicated by the following aspects:

- Commonwealth, State and local government legislation, standards, codes, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to climbing for the purpose of vegetation control
- Items/structures that are and are not permissible to climb for vegetation control
- Safety precautions which are specific to climbing structures for the control of vegetation encompassing:
  Safe working practices and procedures
  Occupational Health and Safety hazards and precautions
  Identification of OHS hazards, assessment and control of OHS risks
  Types, selection, maintenance, storage and use of personal protective equipment including harnesses
  Dangers of climbing in confined spaces and at heights
  Permit to work systems and isolation procedures/protocols
  Safe working policies, procedures and practices when climbing
  Emergency response and rescue including First Aid etc
- Techniques in rigging encompassing:
  Safety procedures including safety ropes and lines
  Checking and setting up equipment
  Load calculations/estimations
  Techniques in using rigging equipment
  Determining the serviceability of ropes and other lowering devices
- Load charts encompassing:
  Safe working load estimates — field formulas
  Branch and trunk calculations
  Mathematical calculations and use of technology related to loads, slings, weights, and height
- Tree climbing and pruning practices encompassing:
  Safe climbing with ropes and harnesses
  Methods of ensuring operation of safety lines and ropes
  Roping techniques
  Load bearing equipment and lifts
  Purposes of restraints, straps, slings, bends and hitches
  Purposes of pulleys, maillon rapides, lowering drum, T-bar flying capstan
  Techniques in climbing with spikes and pole belts

T2.5.17 Emergency procedures for climbers

Evidence shall show an understanding of the basic emergency procedures in releasing a person from an energised position to an extent indicated by the following aspects:

- Commonwealth, State and local government legislation, standards, codes, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to the requirements of releasing a person from energised situation
- Comprehension of EC24 Release and Rescue encompassing:

Detail a range of emergency situations that may arise during climbing operations
Detail of resources available at the worksite
Determining climber position with respect to live power lines in an emergency
Assess response requirements
Determining the appropriate personal protective equipment to be used

- Techniques in undertaking emergency response procedures for the release of a climber encompassing:
  Assessment of priorities of procedures to follow including isolation of supply
  Procedures for contacting emergency services and power supply company/asset owners
  Assessing the possibility of safe rescue of the climber and the factors to consider
  Assessing the best approach to rescuing the climber
  Determining appropriate personal protective equipment
  Techniques in climbing tree or structure
  Techniques in safely removing climber from energised and/or de-energised supply
  Techniques to the application of First Aid procedures including CPR
  Techniques in lower climber to the ground
  Techniques in First Aid procedures when climber is on the ground

T2.6 Rail traction

T2.6.1 Electrical traction principles

Evidence shall show an understanding of electrical traction principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to the electrical traction
- Electrical traction voltage and current circuit paths encompassing:
  Transmission distribution voltages
  Traction supply system and voltages
  Return and stay current paths, including electrolysis
- Relationship of sectioning, section insulator and overlaps/air gaps in a traction power system
- Traction power system components encompassing:
  Function of transformer/rectifiers
  Configuration and purpose of traction overhead wiring systems
  Function of isolators/switches
  Function of the circuit breaker
- Reliability and security of traction supply

T2.6.2 Electrical traction protection requirements

Evidence shall show an understanding of protection requirements for electrical traction to an extent indicated by the following aspects:

- Traction power system electrical protection encompassing:
  Load protection
  Surge protection
  Fault protection
  Electrolytic protection
- Impact of electromagnetic forces encompassing:
  Telephone interference
  Effects of television/radio interference
- Insulation methods in a traction power system encompassing:
  Types of electrical insulation
  Insulation coordination
  Reason for electrical clearances
- Bonding systems
  Note: Examples include structure bonds, traction bonds/bonding cables and impedance bonds
- Ancillary conductors
  Note: Examples include feeder wires, current return path and other ancillary conductors
- Relationship of current and potential drapers/jumpers to the traction power system

T2.6.3 Electrical overhead traction wiring systems

Evidence shall show an understanding of electrical traction systems to an extent indicated by the following aspects:

- Electrical wiring system components

Note: Examples include earth wires, feeder wire, return conductor, insulators, catenary wire, contact/trolley wire, droppers, tensioning equipment, current collectors, tram support networks, tram fittings, bridge/tunnel fittings

- Electrical traction circuits encompassing:
  Types
  Applications
- Relationship of the components, apparatus and the conductors to the operation of the traction system
- Effective current collection and wire interface
- Effective registration in the traction power system
- Profiling overhead traction wire methods encompassing:
  Factors that impact on current collectors
  Methods to achieving smooth current collector transitions and interfaces
- Dynamic and static forces encompassing:
  Types that effect traction systems
  Effects on effective registration
  Techniques to minimise the adverse effects

T2.6.4 Traction bonding

Evidence shall show an understanding of temporary and permanent traction bonds to an extent indicated by the following aspects:

- Traction bonds and cables encompassing:
  Temporary and permanent bonding methods
  Applications for temporary and permanent bonding
  Components of temporary and permanent bonds
  Interface between traction and signalling circuits
- Safe working procedures/practices when carrying out temporary and permanent bonding encompassing:
  Personal protective equipment (PPE)
  Electrical and visual testing on PPE
- Installation and removal of temporary traction bonds and cables encompassing:
  Types and purpose of tools and equipment
  Installation and removal methods
  Testing for electrical integrity of bonds and cables
- Installation and removal of permanent traction bonds and cables encompassing:
  Types and purpose of tools and equipment
  Installation and removal methods
  Testing for electrical integrity of bonds, cables and equipment

T2.6.5 Electrical traction configurations

Evidence shall show an understanding of overhead configurations used in the traction power system to an extent indicated by the following aspects:

- Traction configuration principles encompassing:
  Types
  Purpose
  Assemblies
  Subassemblies
  Components

- Requirements for the use of enterprise construction manuals, system diagrams/plans and drawings, encompassing:
  Types of components
  Types and function of tools and equipment
- Installation of traction configurations encompassing:
  Installation methods
  Measurement of tolerances
  Recording of tolerances
- Maintenance of traction configurations encompassing:
  Types of components
  Types and function of tools and equipment
  Maintenance/repair procedures
  Inspection and recording procedures
- Diagnose and correct simple faults in specific traction configurations encompassing:
  Types and causes
  Determination of appropriate corrective actions
  Repair and replace procedures for components of specific configurations

T2.6.6 Road rail traction height access equipment

Evidence shall show an understanding of the operation of road rail and rail/tram traction height access equipment used in the installation and maintenance of overhead traction system to an extent indicated by the following aspects:

- Operator requirements encompassing:
  Pre-operational checks
  Recording procedures eg logbook
- Road rail traction height access equipment operation encompassing:
  Equipment characteristics, capabilities and limitations
  Prestart requirements
  Operation procedure
  Basic problem solving equipment faults
  Safe working procedures when mechanical failure occurs
  Use of appropriate communication systems
  Permit to work systems and isolation procedures
- Safe working and safety requirements when using road rail traction height access equipment
- Procedures for effective traffic management
- Electrical safety requirements prior to operating equipment under live overhead equipment and adjacent to or in the vicinity of live overhead equipment
- Emergency procedures in the event of an electrical incident/accident
- Emergency procedures in the event of a safe working/road traffic incident/accident
- OHS and EPA requirements in the context of Commonwealth/State/Territory legislative requirements
- Rescue a person form a height access equipment encompassing:
  Methods for rescuing a person
  Methods for rescuing a person from a disabled height access equipment
  Methods for rescuing an incapacitated person from a height access equipment
  Methods for rescuing a person in contact with live overhead equipment

T2.6.7 Overhead traction equipment and components

Evidence shall show an understanding of overhead traction equipment and components in the traction supply system to an extent indicated by the following aspects:

- Overhead traction equipment encompassing:
  Types
  Purpose
  Note: Examples include switches/isolators, fuse switches, links, section insulators, and fuses
- Types of overhead traction components encompassing:
  Types
  Purposes
  Note: Examples include cantilever hardware, droppers, bay components, portal hardware, head span hardware, section insulators, neutral sections, registration fittings, steady span, tension regulators, and cross spans
- Types of conductors used for overhead wiring such as hard-drawn, CAD, and tin-bearing copper, aluminium, steel, and other alloyed conductors
- Types of traction wire support structures that may consist of portals, cantilevers, drop pieces, head spans, cross spans and pull-offs
- Ancillary equipment
  Types
  Purpose
  Notes: Examples include surge arresters, booster and auxiliary transformers
- Methods for installing/replacing conductors that may consist the use of:
  Preformed fittings
  Compression fittings
  Wedged fittings
  Bolted splices
  Lugs
  Bolted clamps
- Methods for installing/replacing components such as:
  Feeders
  Droppers
  Dissimilar conductors
  Jumpers
  Surge arresters
- Use of plant and equipment for installation/maintenance work, such as:
  Elevating work platforms
  Ladders
  Works trains
  Rail-mounted overhead wiring equipment/vehicles
  Road/rail height access machinery/vehicles
  Voltage detectors
  Micrometer/gauges
  Tension wrenches
  Dynamometers
  Other specialised tools

T2.6.8 DC Traction — energised working practices

Evidence shall show an understanding of the safe working on energised DC traction equipment to an extent indicated by the following aspects:

- Commonwealth/State/Territory/local government legislation, Standards, codes,

supply authority regulations and or enterprise requirements

- Safety precautions specific to working on energised LV DC Traction overhead conductors and cables encompassing:
  Safe approach distances
  Safe working practices, instructions and procedures
  Occupational Health and Safety hazards and precautions
  Identification of OHS hazards, assessment and control of OHS risks
  Types, selection, maintenance, storage and use of personal protective equipment
  Dangers of working in confined spaces and at heights
  Notification to work systems
  Safe working policies, procedures and practices when using/operating specialised equipment and tools
  Emergency response and rescue including First Aid etc;
- Techniques in installation, maintenance, replacing and repairing of energised DC traction overhead conductors, cables and equipment

  Note: Examples of conductors, cables and/or equipment include span, cross-span, head-span, section insulator, support equipment, tramway support network, catenary, dropper, contact/trolley, feeder/ in-span feeder, drape/potential jumper
- Techniques in carrying out work on energised DC traction overhead conductors, cables and equipment

  Note: Examples of the type of work include removing trapped foreign objects, profiling, vertical adjustment of contact or trolley wire
- Techniques in using plant, equipment and/or tools to carry out work on energised DC traction overhead conductors, cables and equipment
- Note: Examples of the type of plant, equipment and/or tools include insulated elevating work vehicles, insulated ladder, insulated work platforms, tensioning equipment, insulated sticks, ropes, slings, and chains

T2.6.9 Traction live line work

Evidence shall show an understanding of the safe working on energised HV AC and/or DC traction equipment to an extent indicated by the following aspects:

- Commonwealth/State/Territory/local government legislation, Standards, codes, supply authority regulations and or enterprise requirements
- Safety precautions specific to working on energised LV DC Traction overhead conductors and cables encompassing:
  Live line minimum approach distances
  Occupational Health and Safety hazards and precautions
  Identification of hazards, assessing and controlling risks
  Types, selection, maintenance and uses of personnel protective equipment
  Live line permit system
  Disabling auto-reclosing function
  Ensuring functioning of fault current protective devices
  Checking integrity of insulation prior to work commencement
  Types and function of specialised live line working equipment and tools inspection before use
  Safe working practices when using specialised equipment and tools
  Methods of using specialised equipment
  Work team communication
  Use of safety observers
  Emergency response and rescue including First Aid etc
- Techniques in the use of hotsticks for the maintenance of energised traction overhead apparatus

- Techniques in the use of glove and barrier on energised traction overhead apparatus

T2.7 Environmental issues - powerline

T2.7.1 Environmental fundamentals

Evidence shall show an understanding of the environmental fundamentals to an extent indicated by the following aspects:

- Environmental standards, codes, environmental legislation, supply authority regulations and or enterprise requirements applicable to the control of environment associated with the worksite encompassing:
  Relevant federal legislation
  Relevant state/territory legislation
  Relevant local government by-laws
  Relevant government or quasi government policies and regulations
  Relevant community planning and development agreements
  Note: Examples include land care agreements
- Employer and employee responsibilities
- Methods of obtaining information on environmental issues and updates
- Methods of identifying environmental impacts from work related activities
- Meaning of environmental terms encompassing:
  Identification, assessment and control of risks
  Compliance
  Best practice
  Sustainable energy
- Procedures in implementing management plans to ensure compliance

T2.7.2 Material handling and the environment

Evidence shall show an understanding of the environmental fundamentals to an extent indicated by the following aspects:

- Methods of obtaining updated environmental information and data sheets on the proper use and handling of equipment and materials
- Environmental standards, codes, environmental legislation, OHS legislation, hazardous substances/dangerous goods regulations, supply authority regulations and or enterprise requirements applicable environmental care when handling materials including provision of manufacturers and suppliers information such as material safety data sheets (MSDS)
- Types and application of personal protective equipment used for hazards substances
- Types and application of personal protective equipment used for hazards substances and dangerous goods
- Techniques in handling equipment to eliminate/reduce risks to the environment from spillages of oils, herbicides, pesticides and chemicals from such equipment encompassing:
  Vehicle loading crane
  Chainsaw
  Enterprise vehicles
  Explosive power tools
- Procedures for handling and control of spillage's of herbicides
- Methods of disposing and storage of herbicides, pesticides and chemicals
- Methods of cleaning mobile plant, equipment and tools
- Recording of data

T2.7.3 Filtering and sampling oil and the environment

Evidence shall show an understanding of the environmental issues when undertaking sampling and filtering of oil to an extent indicated by the following aspects:

- Environmental standards, codes, environmental legislation, supply authority regulations and or enterprise requirements applicable to the work to be undertaken
- Methods of obtaining updated environmental information and data sheets on the proper use and handling of oil used on transformers and switchgear including provision of MSDS
- Techniques in filtering and sampling oil to eliminate/reduce risks to the environment from spillages
- Safety procedures and equipment for handling and control of the oil
- Methods of disposing and storage of the oil
- Methods of cleaning equipment, tools and equipment
- Emergency procedures for spillages of oil to reduce risks to the environment encompassing:
  - Methods of cleaning up excessive spillages
  - Methods of protection to surrounding environment
  - Procedure for notification of relevant personnel and authorities
  - Recording procedures
- PCB contamination, handling and disposal procedures

T2.7.4 Powerline environmental impact - implementation and monitoring

Evidence shall show an understanding of the implementation and monitoring requirements for the impact of powerline installations and operation on the environment and/or the area surrounding the powerline and/or equipment to an extent indicated by the following aspects:

- Identification of relevant legislation, codes and government guidelines for the implementation and monitoring of environmental impact factors in the workplace and areas of power distribution or transmission

  Note: Examples include Commonwealth/State/Territory legislation relevant to the workplace and the Environment Protection Act legislation and common law
- Identification, assessment, control and monitoring of the hazards to the environment associated with the Powerline industry
- Workplace environment quality standards enterprise plan encompassing:
  - Setting of acceptable emission level limits from power plant equipment
  - Impact of the enterprise activities on air and water quality
  - Nature, impact and level of emissions from power plant, power distribution and transmission equipment and network infrastructure

  Note: Examples include noise generation, noxious gas emissions, greenhouse gas production, electromagnetic emissions, electromagnetic field strength, oil leakage, insulation breakdown products
- Provision of manufacturers and suppliers information such as material safety data sheets (MSDSs)
- Gathering of environment management information
- Maintenance of environmental records
- Risk assessment and its management in Powerline industry
- Maintenance strategies for environment protection programs

  Note: Examples include developing processes for promoting, maintaining and improving environmental impact in the workplace and identify techniques for the evaluating and reviewing

environment protection education and training programs and elements of an effective environment protection management system, EPA consultation and accident/incident investigations

T2.7.5 Powerline sustainable energy management Implementation and monitoring

Evidence shall show an understanding of the implementation and monitoring requirements for the management of sustainable energy in powerline installations and operation of plant and equipment to an extent indicated by the following aspects:

- Identification of relevant legislation, codes and government guidelines for the implementation and monitoring of sustainable energy principles in the workplace, the power distribution and the transmission networks encompassing:
  Commonwealth/State/Territory legislation
  Legislation relevant to the workplace
  Environment Protection Act legislation
  Local government by-laws
  Community planning and development agreements
  Note: An example includes land care agreements
- Monitoring and reporting procedures for enterprise specific policy implementation on sustainable energy issues, including the gathering of energy consumption and loss information
- Ongoing development of energy conservation policy -
  Procedures for quantifying energy usage and wastage
  Energy usage auditing procedures
  Planning of energy conservation methods
  Monitoring and review processes
- Resource availability planning for policy implementation
- Techniques in managing documentation

  Note: Examples include information on applicable sustainable energy laws or other requirements; complaint records; training records; process information; process operational log books; inspection, maintenance and calibration records; relevant contractor and supplier information; incident reports; information on emergency preparedness and response

T2.7.6 Disposal procedures for insulating materials

Evidence shall show an understanding of the safe handling and/or disposing of insulation materials used in power distribution devices, which are potential environmental pollutants to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory and local government legislation, supply authority regulations and or enterprise requirements applicable to the handling and disposing of insulation or heat dissipation materials used in power distribution devices
- Identification of environmental issues associated with the handling and disposing of insulation materials
- Safety precautions when handling and disposing of heat dissipation materials
  Safe working practices
  Occupational Health and Safety hazards and precautions
  Identification of hazards, assessing and controlling risks
  Types, selection, maintenance and uses of personnel protective equipment
  Permit to work systems and isolation procedures
  Types and function of specialised equipment
  Safe working practices when using specialised equipment
  Emergency response and rescue including First Aid etc

- Techniques in the handling and disposing of insulation materials encompassing:
  Polychlorinated Bi-Phenyls (PCB's)
  Asbestos
  Insulating Oil
  SF6 gas

T2.8 Enterprise specific

T2.8.1 Enterprise specific — policy and procedure instructions

Evidence shall show an understanding of the enterprise specific policies and procedures to an extent indicated by the following aspects:

- Responsibilities and duty of care of employer and employee relationship
- Methods of obtaining the up-to-date information on enterprise policy and procedures
- Rules and regulations
- Induction into workplace encompassing:
  Location of work area and storage area
  Timetable
  Uniform
  Personal well-being
  Housekeeping rules
  Emergency procedures
  Evacuation procedures
- Techniques when deal with others encompassing:
  Working in teams
  Customer relation
- Complaint and issues procedures
- Overview of enterprise professional development available encompassing:
  Fire fighting procedures
  Fatigue management
- Training and competency development - understanding and promotion

T2.8.2 Enterprises specific — OHS instructions

Evidence shall show an understanding of the enterprise specific Occupational Health and Safety rules, regulations, polices and procedures to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the OHS polices and procedures
- Methods of obtaining the up-to-date information on enterprise OHS policy and procedures
- Specific enterprise personal protection equipment encompassing:
  Type and application
  Where and when to be used
  Method of replacement
  Responsibility of maintenance including cleaning inspection and testing
- Emergency response, rescue, evacuation and First Aid procedures
- Personal well-being encompassing:
  Hygiene
  Fatigue/stress management
  Drugs/alcohol
- OHS training encompassing:
  Induction training
  Specific hazard training

Specific task or equipment training
Emergency and evacuation training
Training as part of broader programs such as equipment operation

- OHS records including audits, inspection reports, workplace health and environmental monitoring records, training and instruction records, manufacturers and suppliers information such as MSDSs, registers, maintenance reports, workers compensation and rehabilitation records and First Aid/medical records

T2.8.3 Enterprises specific — technical drawing and documents

Evidence shall show an understanding of the specific enterprise technical drawings and documents to an extent indicated by the following aspects:

- Types and application of enterprise specific drawings and documents encompassing:
  Electrical and electronic drawings
  Mechanical drawings
  Project charts
  Schedules
  Graphs
  Technical manuals and catalogues
  Instruction/worksheets sheets
- Types and application of enterprise specific symbols and diagrams
- Title box encompassing:
  Description of parts
  Version control

T2.8.4 Enterprise specific — switching diagrams

Evidence shall show an understanding of enterprise specific switching diagrams and drawing to an extent indicated by the following aspects:

- Types and application of enterprise specific switching drawings and documents encompassing:
  Wiring and schematic diagrams and switching symbols
  Mechanical drawings dealing with switching operations
  Project charts
  Switching schedules
  Graphs
  Technical manuals and catalogues
  Instruction/work sheets
- Interpretation of different system switching diagrams encompassing:, where applicable
  LV system switching diagrams
  DC traction supply sectioning diagrams
  HV transmission and distribution system symbols and feeder plans
- Processes of updating switching diagrams

T2.8.5 Enterprise specific — sustainable energy principles

Evidence shall show an understanding of the enterprise policies and procedures in maintaining the operation of plant, equipment and powerline installations using sustainable energy principles to an extent indicated by the following aspects:

- Overview of sustainable energy technologies encompassing:
  Solar
  Wind
  Biomass
  CO2 generation
  Economic benefits of sustainable energy initiatives
- Relationship between "greenhouse effect" and sustainable energy
- Types of renewable energy technology suitable for use in Australia

  Note: Examples include photovoltaic, solar thermal, wind energy conversion, biomass, wind/tidal, gas thermal
- Relationship between safe building design and energy efficiency

  Note: Examples include building aspect, insulation, ventilation, glazing and passive solar design and shading
- Techniques in selecting control devices
  Components within a lighting system
  Energy efficient lighting products, design and installation
  Use of natural light
  Automated lighting control systems
  Assessment of requirements and selection of system
- Techniques in selecting control devices
  Components within a HVAC and refrigeration control system
  Energy efficient refrigerants
  Detection systems to control air flow
  Energy star ratings for coefficient of performance
  Energy control systems
  Advantages of evaporative air conditioners in dry climates
  Assessment of requirements and selection of system

T2.8.6 Enterprise specific -— specialised tools

Evidence shall show an understanding of enterprises specific specialised tools to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the use and care of specialised tools

  Note: Examples of specialised tools and test equipment include but not limited to, voltage detectors; polarity testers, phase rotation
- Characteristics, capabilities and application of specialised tools for a particular job
- Safety policies, procedures and precautions with regards to using, transporting and storage of specialised tools
- Selection methods for obtaining the correct specialised tool for the particular job including during procurement, purchasing and or hiring arrangements
- Techniques in pre-use inspection on the serviceability of specialised tools
- Techniques in the selection, use, maintenance, and care and storage of specialised tools
- Identifying OHS hazards, assessing and controlling risks associated with their use
- Techniques for the safe use of specialised power tools

T2.8.7 Enterprise specific - equipment installation procedures

Evidence shall show an understanding of Enterprise Specific Equipment Installation Procedures to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to equipment installation
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types, characteristics and capabilities of HV substation equipment to be installed
- Identification of components within the equipment to be Installed and associated control housings
- Use, characteristics and capabilities of specialised tools and equipment
- Enterprise Specific Policies and Procedures for equipment to be Installed
- Control equipment and auxiliary relays, flags and alarms
- Techniques in evaluating serviceability of equipment to be Installed
- Safety precautions when testing and measuring equipment to be Installed encompassing:
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment
  Responsibilities and protocols
  Safe working clearances
- Remote and local operating principles and conventions

T2.8.8 Enterprise specific — data management processes

Evidence shall show an understanding of Enterprise Specific Data Management Processes to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to Data Management
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types of enterprise specific computer software
- Techniques in storing and retrieving data and reports from the computer
- Techniques in using the Data Management systems in following necessary commands and protocols in accordance with the Enterprise Specific Procedures
- Calculation of results and data measurements using the computer
- Techniques in the preparation of preliminary works creation and closure

T2.8.9 Enterprise Specific — teamwork high voltage live line

Evidence shall show an understanding of working teams on high voltage live line to an extent indicated by the following aspects:

- Commonwealth/State/Territory legislation, Standards, codes, supply authority regulations and or enterprise requirements associated with working on high voltage live lines
- Safety precautions working on energised live lines when working in teams encompassing:
  Live line minimum approach distances for person and plant
  Occupational Health and Safety hazards and precautions
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment
  Live line access authority/permit system
  Disabling auto-reclosing function
  Ensuring functioning of fault current protective devices

Checking integrity of insulation prior to work commencement
Types and function of specialised live line working equipment and tools inspection prior to use
Safe working policies, procedures and practices when using and operating specialised equipment and tools
Methods of using specialised equipment and tools
Use of safety observers
Emergency response and rescue including First Aid etc

- Relationship and responsibilities of each team member encompassing:
  Roles of individuals in the team
  Contribution to joint outcome
  Goals/plans and objectives of the team
  Work team communication
- Techniques in effective communication
- Techniques in effective teamwork
- Dangers of ineffective teamwork

T2.8.10 Technical enquiries and requests

Evidence shall show an understanding of technical enquiries and requests to an extent indicated by the following aspects:

- Basic Network operating principles and parameters
  - Sources of electricity
  - Basic principles of electricity, the three phase power system, electric shock and resuscitation, power system
  - Aerial and underground voltage systems
  - Low Voltage Network systems
  - High Voltage Network systems
  - Equipment used in a Network system
  - MEN system
  - Hazards and risks in a Network system

  Note: Examples include risk to life, property or commerce, fallen wires/equipment, fires,
  - Voltage gradients

  Note: Examples include step potential, touch potential — (transferred earth potentials)
- Applicable legislation, regulations, standards, industry codes, industry guidelines, and policies
  - relevant sections of legislation used
  - relevant sections of international or Australian standards used
  - relevant sections of Industry codes used
  - relevant sections of Industry guidelines used
  - relevant sections of policies used
  - relevant sections of advisory information used
- Incident event procedures
- Incidents constituting an event
- Incidence response procedures
- General Hazard and risk assessment principles and procedures
- Principles for conducting work-site Hazard Assessment checks,
- Basic safety principles and hazard control measures
- Key industry terms and performance indicators and measures used

  Note: SAIDI — System Average Interruption Duration Index, SAIFI - System Average Interruption Frequency Index, MAIFI — Momentary Average Interruption Frequency Index, CAIDI — Customer Average Interruption Duration Index; Network owners and operators

- Critical industry codes used

  Note: Examples include storm code emergencies
- Key equipment used in the industry

  Note: Examples include industry-specific equipment, switchgear, transformers, aerial conductors, insulators, poles, mobile plant, mobile equipment
- Normal and abnormal industry situations, key processes and systems used in the industry

  Note: Examples include anomalies report, critical system/network failures/anomalies and key processes and systems used in the industry eg maps, drawings, as well as safety and environment processes and practices, communications systems; fires; automatic switching; emergencies; security breaches
- Techniques and processes for responding to a technical enquiry or request in accordance with established procedures in a timely manner

  Note: Examples include ethical performance; assessing applications, enquiries, or requests; using technology and media including catalogues to assist assessments; client quality service; reflecting on the completed enquiry or request
- Enquiries may be internal or with customers
  - customer protocols
  - legal requirements and obligations for property access
  - relevant heritage and environmental requirements

T2.8.11 SPARE CLAUSE

T2.8.12 Enterprise specific — vegetation control equipment

Evidence shall show an understanding of enterprise specific vegetation control equipment to an extent indicated by the following aspects:

- Types and application of vegetation cutting tools encompassing::
  Chainsaws
  Brush cutters
  Hydraulic pruning saws
  Tool line
  Chainsaws
  Specialised pruning tools

  Note: Examples include cocky beaks and pruning saws
- Types and application of vegetation mulching tools
- Types and application of herbicide application equipment
- Purpose and use of cutting plans relevant to the vegetation type
- Cutting techniques of vegetation control tools and equipment
- Techniques in undertaking different branch cuts

  Note: Examples include scarf under-cut, top cut technique, top scarf - bottom-back cut technique, side scarf opposite back-cut technique
- Pre-operational checks on vegetation control tools and equipment
- Techniques in safely using vegetation control equipment encompassing:
  Visual inspection of vegetation control equipment
  Methods of using equipment at heights and in confined spaces
  Precautions to note during use of equipment

  Note: Examples include proximity of other personnel, proximity of powerlines and obstacles, length

of power lead and possible fire danger due to sparks. The type of precautions should not be limited to these samples but dependant on the environment in which the equipment will be used.

- Types of personal protective equipment used in conjunction with vegetation control equipment encompassing:
  Head Protection
  Eye protection
  Hearing protection
  Hand protection
  Foot protection
  Body protection
  General protection
- Basic maintenance of vegetation control equipment

  Note: Examples include cleaning, proper storage, basic repair and replacement and testing for compliance to manufacturer's and OHS requirements

T2.8.13 Enterprise specific — procedures and work practices relating to fault restorations

Evidence shall show an understanding of the enterprise specific procedures and work practices relating to fault restorations to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations, Standards, codes, and or enterprise requirements applicable to the procedures and work practices relating to fault restorations
- Requirements for the use of operational manuals, system diagrams/plans and drawings
- Identify and interpret enterprise operating procedures
- Techniques in the applying enterprise operating procedures

T2.8.14 Enterprise specific — procedures and work practices relating to critical events

Evidence shall show an understanding of the enterprise specific procedures and work practices relating to critical events to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the procedures and work practices relating to critical events
- Requirements for the use of operational manuals, system diagrams/plans and drawings
- Identify and interpret enterprise operating procedures
- Techniques in the applying enterprise operating procedures

T2.8.15 Enterprise specific — procedures and work practices relating to generating plant

Evidence shall show an understanding of the enterprise specific procedures and work practices relating to generating plant to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the procedures and work practices relating to generating plant
- Requirements for the use of operational manuals, system diagrams/plans and drawings

- Identify and interpret enterprise operating procedures
- Techniques in the applying enterprise operating procedures

T2.8.16 Enterprise specific — procedures and work practices relating to managing network demand

Evidence shall show an understanding of the enterprise specific procedures and work practices relating to managing network demand to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the procedures and work practices relating to managing network demand
- Requirements for the use of demand management manuals, system diagrams/plans and drawings
- Identify and interpret enterprise demand management procedures
- Techniques in the applying enterprise demand management procedures

T2.8.17 Enterprise specific — effective management and communication

Evidence shall show an understanding of the effective management and communication to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to assisting in effective management and communication
- Enterprise operational principles encompassing:
  Workplace OHS enterprise plan
  Environmental enterprise polices and procedures
  Industrial relations polices and procedures
  Anti-discrimination polices and procedures
- Relationship between the management and employees

  Note: Examples include methods used to collate and distribute/disseminate information, responsibilities of each member of the work team, staff development activities and legislation requirements with regard to OHS training, methods of addressing barriers such as literacy and cultural differences and provisions relating to OHS issue resolution
- Techniques associated with organisational policies and procedures related to human resources encompassing:
  Relevant awards and certified agreements
  Legislation impacting on people management
  Range of support services and expertise available
- Techniques in managing relationships encompassing:
  Identifying problems
  Methods of conflict resolution
  Methods of consultation, communication, negotiation and mentoring
  Strategies for positive feedback
- Techniques in leadership in achieving enterprise strategic and operational plans
- Techniques in managing relationships under stress encompassing:
- Stress management

T2.8.18 Enterprise specific — write management reports

Evidence shall show an understanding of the methodology used in writing enterprise

specific management reports to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the writing enterprise specific management reports
- Techniques in researching, collating and analysing information for the report encompassing:
  Recording, filing, retrieving systems
  Storing and retrieving data from computer systems
- Relationship of management reports to enterprise polices and procedures encompassing:
  Enterprise structure and resources
  Workplace OHS and risk management enterprise data
  Financial and operational data
  Environmental enterprise polices and procedures
  Industrial relations polices and procedures
  Anti-discrimination polices and procedures
- Techniques in writing enterprise specific management reports encompasses

  Note: Examples include methods used to disseminate information and facilitate enterprise requirements, document proformas and compliance and legislative requirements to produce effective reports in the appropriate format

T2.8.19 Enterprise specific — procedures and work practices relating to managing critical events

Evidence shall show an understanding of the enterprise specific procedures and work practices relating to managing critical events to an extent indicated by the following aspects:

- Commonwealth/State/Territory and local government legislation, Standards, codes, Commonwealth, State/Territory and local government legislation, supply authority regulations and or enterprise requirements applicable to the procedures and work practices relating to managing critical events
- Requirements for the use of critical event manuals, system diagrams/plans and drawings
- Identify and interpret enterprise critical event management procedures
- Techniques in the applying enterprise critical event management procedures

T2.9 Drafting and drawing

T2.9.1 Interpretation of power distribution network drawings and documentation

Evidence shall show an understanding of power distribution network documentation to an extent indicated by the following aspects:

- Requirements for the use of manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types and application of power distribution network documentation drawings and documents encompassing:
  - Wiring and schematic diagrams, drawings and switching symbols
  - Mechanical drawings dealing with the power distribution network
  - Project charts
  - Schedules
  - Graphs
  - Technical manuals and catalogues
  - Instruction/worksheets sheets
- Interpretation of different diagrams and documentation on LV and HV systems encompassing:
  - Overhead distribution extensions
  - Underground distribution extensions
  - Distribution substation
  - Street lighting system

T2.9.2 Overhead distribution extension layout principles

Evidence shall show an understanding of the layout principles for overhead distribution to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to overhead distribution layout
- Requirements for the use of overhead line construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Methods in determining material, equipment and tool lists encompassing:
  - Components types and quantity required
  - Spacing of components such as equipment, poles, cross-arms
  - Costings of items and components
- Purchasing and contractual arrangements to include a requirement to eliminate OHS hazards, minimise risks and provide residual OHS risk information
- Determination of conductor size, type and route length -
  - Resources needed for the stringing and maintenance of conductors
  - Types of low LV and HV overhead electrical conductor connections
  - Minimum clearances between overhead conductors and low LV and/HV structures
  - Estimation of the duration of overhead distribution extension project

T2.9.3 Surveying techniques

Evidence shall show an understanding of the fundamentals of surveying for the purpose of producing an overhead or underground distribution extension to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply and aviation authority regulations and or enterprise requirements applicable to the surveying for an overhead and underground extension
- Techniques in measuring heights and distances
- Techniques in taking bearings angles of deviation using a compass
- Techniques in using a clinometer
- Techniques in recording and storage of data
- Requirements for the use of overhead line construction manuals, system diagrams/plans and drawings
- Techniques in plotting long spans

  Note: Examples include measuring stick, clinometer, trundle wheel, tapes, correction for sloping ground, distance across objects and range rods
- Techniques in pegging pole positions

  Note: Examples include foot path alignments, types of pegs, pegs of other authorities and locating survey pegs

T2.9.4 Introduction to computer software (powerline) and CAD

Evidence shall show an understanding of the fundamentals of computer aided drafting (CAD) for drafting and layout of distribution extension and upgrades to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the drafting and layouts of distribution extensions and upgrades
- Types of computer hardware and software, tools and equipment for the production of a draft and layout of distribution extension and or upgrade
- Techniques in storing and retrieving programs and files from the computer
- Identification and methods of retrieving and manipulating, digital symbols, designs, layouts, fonts and graphs stored in the computer
- Techniques in using the CAD package in following necessary commands and protocols in accordance with the operating instructions of the CAD software manufacturer

  Note: Examples include using file structure, menu utilisation, system library usage, data banking, achieving, file management and maintenance procedures
- Calculation of dimensions and drafting measurements using the computer
- Techniques in the preparation of preliminary sketches using the computer
- Techniques in using 2D computer graphics system and associated equipment to produce a distribution extension and or upgrade draft or layout
- Techniques to diagnosing basic faults in computer operation

T2.9.5 Principles of lighting design

Evidence shall show an understanding of the principles to light design layout to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes,

supply authority regulations and or enterprise requirements applicable to the light design principles

- Requirements for the use of street lighting system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types of tariffs and charges
- Types of street lighting components
  Note: Examples include column types, foundations, brackets, luminaries and mounting heights
- Types of electrical street lighting circuits
  Note: Examples include types of supply, lighting circuit and control circuit
- Fundamentals of lighting production encompassing:
  Electromagnetic spectrum
  Visible and non-visible radiation
  Spectral energy distribution
  Infra-red, ultra-violet, radiation-safety, incandescence and phosphorescence
  Reflection and refraction
- Fundamentals of lighting concepts encompassing:
  Terms and units
  Purpose of reflectors and diffusers
- Factors affecting external lighting design
- Calculation of light output
- Determining illuminance encompassing:
  Point to point method
  Lumen method
- Determining rated life of luminaries
- Fundamentals of street lighting design
- Considerations for special lighting situations
  Note: Examples include security lighting, hazardous street locations, and emergency lighting

T2.9.6 Underground mains layout principles

Evidence shall show an understanding of the layout principles for underground mains distribution extension to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to underground mains distribution extension
- Requirements for the use of underground mains construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Methods in determining material, equipment and tool lists encompassing:
  Components types and quantity required
  Spacing of components and equipment
  Costings of items and components
- Purchasing and contractual arrangements to include a requirement to eliminate OHS hazards, minimise risks and provide residual OHS risk information
- Determination of conductor size, type and route length
- Resources needed for the laying of conductors
- Determining the appropriate excavation for the location
- Determining the size and depth of excavation
- Determining the trench and pit layout procedures

- Minimum clearances between conductors
- Estimation of the duration of underground distribution extension project

T2.9.7 Distribution substation minor upgrade layout principles

Evidence shall show an understanding of the layout principles for a distribution substation minor upgrade to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to a distribution substation minor upgrade
- Requirements for the use of distribution substation minor upgrade construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Methods in determining material, equipment and tool lists encompassing:
  Components types and quantity required
  Spacing of components and equipment
  Costings of items and components
- Purchasing and contractual arrangements to include a requirement to eliminate OHS hazards, minimise risks and provide residual OHS risk information
- Determination of conductor size, type and route length
- Resources needed for the laying of conductors, cables and equipment
- Determining the appropriate installation sequence
- Minimum clearances between conductors and equipment
- Estimation of the duration of underground distribution extension project

T2.9.8 Principles in drafting street lighting system

Evidence shall show an understanding of the principles to layout and draft a street lighting system to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to street lighting system layouts and drafts
- Requirements for the use of street lighting system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Methods in determining material, equipment and tool lists encompassing:
  Components types and quantity required
  Spacing of components such as equipment, poles, cross-arms
  Costings of items and components
- Purchasing and contractual arrangements to include a requirement to eliminate OHS hazards minimise risks and provide residual OHS risk information
- Determination of conductor size, type and route length
- Determination of street lighting positions for optimum visibility and minimise traffic hazards
- Techniques in mounting and position of lights
- Resources needed for the installation of street lighting system
- Methods of pegging out of pole positions and/or underground cable positions
- Minimum clearances between overhead conductors and low LV/and HV structures
- Estimation of the duration of overhead distribution extension project

T2.10 Substations

T2.10.1 Visual inspection procedures — substations

Evidence shall show an understanding of the procedure to undertake a visual inspection of a scheme to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with visual inspection procedures of a scheme
- Requirements for the use of manuals, system diagrams/plans and drawings
- Identify obvious deficiencies in operating to the standard functionality
- Techniques in determining relay malfunction encompassing:
  Targeting
  Techniques in determining wiring defects

T2.10.2 Surge relay operation and maintenance — substations

Evidence shall show an understanding of the operation and maintenance procedures associated with discrete protection and control systems to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with operating procedures
- Requirements for the use of operating manuals, system diagrams/plans and drawings
- Techniques encompassing:
  Gas collection and analysis
  Bleeding and resetting
  Calibration, operational and sensitivity checks
  Trip and alarm checks
- Surge relay types and uses, including transformer main tanks, diverter switch chambers

T2.10.3 Commissioning of discrete protection devices — substations

Evidence shall show an understanding of the commissioning procedures associated with discrete protection and control systems to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the commissioning procedures
- Requirements for the use of commissioning manuals, system diagrams/plans and drawings
- Techniques in commissioning procedures encompassing:
  Planning
  Policy
  Testing techniques
  Close out requirements

T2.10.4 Substation DC circuit breaker principles

Evidence shall show an understanding of the substation DC circuit breaker principles to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the DC circuit breakers
- Types of DC CB's

  Note: Examples include self and withdrawable types
- Characteristics of DC CB's encompassing:
  Purpose of DC CB's
  Application of DC CB's
- Principles of operation of different types of DC CB's encompassing:
  Arc expulsion versus arc containment
  Latched versus magnetically held
  Advantages and disadvantages of different types
  Fixed or withdrawable
  Protection/diagnostic technology
- Principles of operation of high speed DC CB encompassing:
  Characteristics
  Calibration
- How DC CB's are designated

  Note: Examples include feeder, rectifier, EDR, bus-section and negative breakers, auto-reclose or non auto-reclose type
- Type and function of DC CB peripheral components

  Note: Examples include Delta I relays, busbar, control wiring, trunk and associated plug/receptacle
- Identification, characteristics, application and care of DC CB components

  Note: Examples include holding coils, closing coils, contactors, resistors, arc chutes, blow-out coils, arcing contacts, main contacts, braids, moving arm, pole face, arcing horns, electronic cards, dashpots, fingers, diode strings, fuses, insulators, latching mechanisms, motors, wiring, relays
- Characteristics, application and care of hand and specialised tools used on DC CB's

  Note: Examples include combination/multigrips/long nose pliers, side cutters, screwdrivers, wire strippers, crimpers, knife, hacksaw, hammers, mallets, levels, tape measures, spanners, T-wrench, pistol drills, battery drills, heat gun, de-soldering tools and soldering iron/torches, Allen keys, socket spanners, gauges, feeler gauges and specialist tools supplied by the manufacturers
- Characteristics, application and care of test and measurement instruments used on DC CB's

  Note: Examples include multimeters, tong testers, ammeters, voltmeters, ohmmeters, test lamps, high and low voltage insulation resistance/ continuity testers, earth resistance tester, Ductor, drop-out test sets

T2.10.5 Substation DC circuit breaker maintenance

Evidence shall show an understanding of the maintenance of substation DC circuit breaker's and associated equipment to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the maintenance of DC circuit breakers
- Requirements for the use and interpretation of manuals, system diagrams/plans and drawings encompassing:
  1500V sectioning diagrams
  Substation HV operating diagrams
  Substation arrangement diagrams and layout drawings
  Technical/manufactures' specifications
  Maintenance instructions/schedules
- Relationship and function of DC CB's equipment/component interface

encompassing:
DC CB frame
Connection fingers
Associated busbar, physical arrangements and clearances

- Safety precautions when undertaking maintenance procedures on DC CB's encompassing:
  Safe working practices
  Occupational Health and Safety hazards and precautions
  Identification of hazards, assessing and controlling risks
  Types, selection, maintenance and uses of personnel protective equipment
  Permit to work systems and isolation procedures
  Types and function of specialised equipment
  Safe working practices when using specialised equipment
  Emergency response and rescue including First Aid etc
- Techniques in maintenance of DC CB's encompassing:
  Closing and opening operations
  Range settings, adjustments and calibration
  Spring settings
  Main contact arrangement and auxiliary contact arrangement
  Arc chute inspection and procedures
  Basic fault finding and repair/adjustment techniques
  Control cards, their uses, application and fault finding
  Earthing requirements and techniques
- Techniques in testing and commissioning of DC CB's encompassing: supply authority regulations and or enterprise requirements, standards and procedures

T2.10.6 Substation DC circuit breaker installation

Evidence shall show an understanding of the installation of substation Direct Current circuit breakers (DC CB's) and associated equipment to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the installation of substation Direct Current circuit breakers (DC CB's)
- Safety precautions when installing substation Direct Current circuit breakers (DC CB's) encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Identification of hazards, assessing and controlling risks
  Types, selection, maintenance and uses of personnel protective equipment
  Permit to work systems and isolation procedures
  Safe working practices when using specialised equipment
  Emergency response and rescue including First Aid etc
- Use and interpretation of technical manuals and diagrams encompassing:
  Manufacturer/Enterprise Manuals, block, wiring and schematic diagrams
  1500V sectioning diagrams
  Substation HV operating diagrams
  Substation arrangement diagrams and layout drawings
  Technical/manufactures' specifications
  Maintenance instructions/schedules
- Techniques in the safe installation of DC CB's

T2.10.7 Substation tools and equipment

Evidence shall show an understanding of the types, uses and techniques when using the tools and equipment associated with substation to an extent listed below:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the use of high voltage or high current test equipment associated with substation
- Safety precautions when using tools and equipment on substations encompassing:
  Safe operation procedures
  Occupational Health and Safety hazards and precautions
  Identification of hazards, assessing and controlling risks
  Types, selection, maintenance and uses of personnel protective equipment
  Permit to work systems and isolation procedures
  Safe working practices when using specialised equipment
  Emergency response and rescue including First Aid etc
- Techniques in the use of tools and equipment associated with substations encompassing:
  Recorders

  Note: Examples include oscilloscopes, real time recorders, storage recorders, data loggers and chart recorders. Measurements may include harmonics, transient capture and point-on-wave assessment
- Insulation test instruments

  Note: Examples include digital, analogue instruments up to 5kV DC and 10kV AC. Techniques include Guarding and shielding. Measurements may include polarisation index, step voltage methods with appropriate temperature correction, dielectric dissipation factor on grounded and ungrounded objects
- Meters and the techniques used to carry out measurements

  Note: Examples may include temperature, winding resistance, conductor resistance, capacitance and inductance, phase angle, frequency, ratio and phase shift and vector group
- Timing measurement tools

  Notes: Examples may include sequence timers, event timers, contact timers. Measurements on circuit breakers and other interrupter types may include close-open, open-close, close-open-close, open-close-open sequences
- Equipment used

  Note: Examples may include chain blocks, tension devices, power hand tools, slings and hoists, hydraulic crimping tools, elevated work platforms and other mobile plant used to gain access to work at height, appropriate hand tools and other mechanical instruments

T2.10.8 Typical fault conditions and symptoms — substations

Evidence shall show an understanding of typical fault conditions and symptoms related to the plant and/or equipment type to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements pertaining to typical fault conditions and systems
- Interpretation of faults in operating mechanisms which may include drive trains and mechanical power drives, stored energy systems including hydraulic systems, pneumatic systems and mechanical storage systems, accumulators
- Interpretation of faults in electrical control systems which may include electro-mechanical relay systems, micro-processor based systems, PLC systems, integrated control systems or combinations of electrical/mechanical systems
- Types of electrical systems including AC, DC and combinations of both
- Types of fault conditions

  Note: Examples may include failure to operate, failure in service and include the appropriate procedures for work on in service plant/equipment

- Types of symptoms

  Note: Examples may include alarms, relay flags, mechanical defects, insulation deterioration, leaks, over-pressure, under pressure, out of tolerance measurements and checks

T2.10.9 Analyse and interpret results and measurements — substations

Evidence shall show an understanding of measurements and the interpretation and analysis of those measurements related to the plant and/or equipment type to an extent indicated by the following aspects:

- Type of measurements

  Note: Examples include timing, current, voltage, capacitance, inductance, impedance, phase angle, phase shift, resistance, dielectric dissipation factor, frequency, polarisation index, ratio, vector group, temperature
- Interpretation and analysis the use of techniques

  Note: Examples include digital comparison of data, extrapolation, use of graphs and charts, statistics and tables, mathematical calculation of expected values and comparison with manufacturers data and measurements
- Techniques in the processes involved in follow-up actions and recommendations resulting from analysis and interpretation of results and measurements

T2.10.10 Equipment components and materials — substations

Evidence shall show an understanding of equipment components and materials related to the plant and/or equipment type to an extent indicated by the following aspects:

- Types of components

  Note: Examples include those which together make up the complete unit of plant and/or equipment, replacement components or appropriate substitutes, their dimensions, suitability and serviceability; also the components associated with the local control systems of the equipment including indication of levels, quantities, volumes, pressures and temperatures and the operating principles of these devices and components
- Types of materials

  Note: Example include those associated with the insulation, construction, fabrication or lubrication of the plant/equipment
- Techniques in enterprise procedures and regulatory/legislative requirements for the handling/use and storage of equipment components and materials which may present an OHS hazard to persons in the workplace

T2.10.11 Substation safety practices

Evidence shall show an understanding of substation safety practices to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements pertaining to substation safety practices
- Techniques in the use of protective apparatus and apparel for substations work, including responsibilities with regard to the use and maintenance of protective apparatus and apparel and the types of protective apparatus and apparel used for work in substations
- Requirements for the use of ladders and appropriate ladder types for work in substations

  Note: Examples include safe work methods when carrying, erecting, collapsing and lowering different types of extension ladder against substation structures, plant and equipment, maintenance checks on different types of ladders, renewal of extension ropes and the safety issues relating to clearances from energised conductors

- Requirements for climbing and working at heights in substations

  Note: Examples include attached climbing principles, selection, use and operation of elevated work platforms and any OHS requirements associated with the use of EWPs
- Control of small fires

  Note: Examples include the identification, selection and operation of the appropriate extinguishing mediums for various types of fires and the precautions for personal protection when fighting small fires
- Control of oil spills

  Note: Examples include the identification, use and maintenance of spill oil control equipment and materials, oil containment facilities and systems
- Rescue and release procedures encompassing:
  The rescue personnel from energised conductors
  Emergency descent from an EWP and may include rescue from confined spaces
- Enterprise requirements encompassing:
  Safe access and Authorisation to Work procedures
  Use of mobile extendable equipment on or near energised HV conductors
  Emergency response procedures
- Hazards associated with work in substations including earthing systems, transfer potentials, step and touch effects, electrostatic and electromagnetic induction, dangers of near approach to energised conductors

T2.10.12 Substation LV supply design principles

Evidence shall show an understanding of the design principles of Substation LV AC and DC supply systems to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements
- Wiring conventions, systems and labelling conventions
- Substation equipment identification and layout, wiring and schematic diagrams and other appropriate diagrammatic representations
- LV design specifications, supply requirements, electrical load assessments
- Substation LV system distribution requirements including:
  Substation batteries
  Isolation requirements
  Paralleling requirements
  Battery Chargers
  DC distribution panels and control systems
  AC distribution panels and control systems
  Auto change-over requirements
- Control equipment and auxiliary relays, flags and alarms
- Common panel layouts

T2.10.13 Substation control systems design principles

Evidence shall show an understanding of the design principles of Substation control systems to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements
- Wiring conventions, systems and labelling conventions
- Substation equipment identification and layout, wiring and schematic diagrams and other appropriate diagrammatic representations

- Control system design specifications, functions and alarms
- Substation control system requirements which may include:
  Circuit breaker control
  Note: Examples include auto reclose, pole discrepancy, anti hunting, spring charge timer over run
  Transformer control
  Note: Examples include parallel operations, cooling control, master/slave operation, tap changer control, alarm systems
  Reactive plant control systems
  Note: Examples include over voltage/under voltage, under frequency load shed, VAR control

T2.10.14 Hydraulic and pneumatic operating mechanism principles - Substations

Evidence shall show an understanding of the design principles of hydraulic and pneumatic operating mechanism principles to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory/local government legislation, standards, supply authority regulations and or enterprise requirements
- Control system operating diagrams, including nomenclature, symbols and operating sequences, units of measurement
- Fundamentals of pressure intensification, forces and energy accumulators
- Applications for substation high voltage equipment, which may include:
  Note: Examples include circuit breaker operating mechanisms, interrupter mechanisms, pumps and compressors, GIS operating mechanisms and transformer cooling systems
- Safety precautions for work on hydraulic and/or pneumatic systems encompassing:
  Note: Examples include safe working practices and procedures; identification of hazards, assessment and control of OHS risks; types, selection, maintenance and use of personal protective equipment

T2.10.15 High voltage insulation system principles — substations

Evidence shall show an understanding of the design principles of high voltage insulation systems to an extent indicated by the following aspects:

- Insulation design principles encompassing:
  Common materials used
  Electrical characteristics
  Thermal characteristics
  Uses and applications to substation high voltage plant and equipment
  Grading
  Construction
  Cooling
- Common contaminants and their effects encompassing:
  Internal contaminants
  External contaminants
- Testing and measurement of insulation quality encompassing:
  Test types and common measuring instruments and techniques
  Resistance and resistivity
  Losses
  Measurement errors
  Temperature corrections
  Safe work practices related to testing and measurement
- Safety precautions when testing and measuring high voltage insulation systems encompassing:
  Safe working practices and procedures

Identification of hazards, assessment and control of OHS risks
Types, selection, maintenance and use of personal protective equipment

T2.10.16 Power transformers and reactor principles — substations

Evidence shall show an understanding of the principles of power transformer construction and operations to an extent indicated by the following aspects:

- Transformer types
  Note: Examples include shell, core, auto, double wound, three phase, single phase and combinations of these types, step up and step down transformers, transmission and generation types
- Reactor types
  Note: Examples include shunt and series, applications and design considerations
- Iron circuit characteristics
  Note: Examples include steel types, losses and techniques used to eliminate excess eddy currents and other circulating currents
- Winding configurations and construction techniques
  Note: Examples include helical, spiral, disc, interleaved disc types
- Insulation methods and techniques
  Note: Examples include fully insulated windings and graded insulation techniques, oil filled and gas filled power transformers
- Transformer and reactor ratings, losses and efficiency
  Note: Examples include equivalent circuits and vector relationships, impedance percent
- Nameplate details
  Note: Examples include BIL, tapping winding detail, physical layout, cooling ratings, physical details
- Transformer and reactor cooling types and their effects on design and rating
- Transformer and reactor auxiliaries
  Note: Examples include temperature indicators, over pressure devices and control systems
- Winding configurations
  Note: Examples include star-star, star-delta, star-zigzag, nomenclature and common methods of diagrammatic representation of winding configuration
- Operating constraints as single units and in parallel
- Tapping windings encompassing:
  Placement issues
  Tapping range
  OLTC versus off load TC techniques
  Types in use
  Note: Examples include high speed resistor, reactor and vacuum types, Jansen mechanisms, dead tank and live tank types
  Control system characteristics
- High voltage bushing selection encompassing:
  Type
  Insulation system used, rating, BIL
  Selection criteria
  Testing considerations

T2.10.17 Static reactive plant principles — substations

Evidence shall show an understanding of the principles of power transformer construction and operations to an extent indicated by the following aspects:

- Applications of static reactive plant in high voltage networks, including voltage control, VAR control, transient response capacity

- Types of static reactive plant including high voltage capacitors, high voltage reactors, static VAR compensators and combinations of these
- Operating characteristics and operational constraints including point on wave switching issues
- Ratings, cooling systems and control systems and ancillary equipment used
- Configurations and system layout including single star, double star, bridge type
- Typical protection systems used including neutral unbalance current, neutral unbalance voltage
- Techniques used when balancing elements within static reactive plant
- Safety precautions when testing and maintaining high voltage static reactive plant encompassing::
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment

T2.10.18 On load tap changer principles — substations

Evidence shall show an understanding of the principles of power transformer high speed on load tap changers to an extent indicated by the following aspects:

- Selector types and applications for high voltage power transformers
- Diverter switch types and applications for high voltage power transformers including live tank, dead tank, resistor type, reactor type, vacuum type, pennant flag, pennant cycle
- Ratings and construction principles
- Operating mechanism types, stored energy systems and associated control systems
- Operating principles and operating sequences of selectors and diverters
- Measurement requirements including contacts, differential wear, transition resistors and transient protection devices, rotation lag, out of sequence controls and end-of-life unit and component assessment
- Online diagnostic tools and devices
- Ancillary equipment including online filters, over pressure relays and devices
- Testing requirements including cycle timing, differential delay, energy accumulator mechanical and operational tests and control system functional tests
- Safety precautions when testing and maintaining high voltage power transformer on load tap changers encompassing::
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment

T2.10.19 Substation switching practices

Evidence shall show an understanding of substation switching practices to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to substation switching
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types, characteristics and capabilities of HV substation equipment to be switched
- Procedures for obtaining correct HV switching authorisation encompassing:
  Identification of hazards and controlling risks
  Safety procedures and precautions

Responsibilities and protocols
Identifying switching resources

- Techniques in HV substation switching encompassing:
  Isolation procedures and proving dead
  Earthing procedures
  Pre-switching checks
  Switching operational procedures
  Emergency fault procedures
  Commissioning procedures
- Use, care and operation of equipment associated with HV substation equipment encompassing::
  Test instruments
  Sticks
- HV switchgear encompassing:
  Types
  Categories
  Application
  Operating capabilities
- Basic Operation of protection systems
- Restrictions pertaining to HV substation switching equipment
- Restrictions pertaining to Enterprise Specific procedures

T2.10.20 Low voltage substation switching principles

Evidence shall show an understanding of low voltage substation switching principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to low voltage substation switching
- Requirements for the use of manuals, system diagrams/plans and drawings encompassing:
  Types, characteristics and capabilities of LV electrical equipment to be switched
  Use, characteristics and capabilities of specialised tools and testing equipment
- Role and responsibilities of the LV switching operator
- Operational forms, access authorities and permits associated with LV switching encompassing:
  Types of operational forms, access authorities and permits
  Purpose and procedure for operational forms, access authorities and permits
- Use, care and operation of equipment associated with LV substation switching
- LV switchgear encompassing:
  Types
  Categories
  Application
  Operating capabilities
- Operation of LV substation switching or indicating devices
- Operation of protection systems and substation equipment
- Restrictions pertaining to LV switching equipment
- Earthing LV electrical apparatus practices and procedures for access
- Low voltage switching techniques
- Restrictions pertaining to Enterprise Specific procedures

T2.10.21 Circuit breaker construction principles — substations

Evidence shall show an understanding of circuit breaker construction principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to circuit breakers
- Requirements for the use of manuals, circuit breaker diagrams/plans and drawings
- Types, characteristics and capabilities of HV substation circuit breakers installed
- Use, characteristics and capabilities of specialised tools and equipment
- Identification of components within the circuit breaker and associated control housings
- Identification of energy sources within the circuit breaker and associated control housings
- Identification of insulation paths within the circuit breaker
- Types and characteristics of operating mechanisms
- Types and characteristics of interrupter chambers
- Safety precautions when Constructing circuit breakers encompassing::
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment

T2.10.22 Circuit breaker operating principles — substations

Evidence shall show an understanding of circuit breaker Operating Principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to circuit breakers
- Requirements for the use of manuals, circuit breaker diagrams/plans and drawings
- Operation of protection systems and substation equipment associated with circuit breakers
- Use, characteristics and capabilities of specialised tools and equipment
- Capabilities of operating mechanisms
- Capabilities of interrupter chambers
- Enterprise Specific Policies and Procedures for the operation of circuit breakers
- Techniques in evaluating serviceability of circuit breaker operation
- Control equipment and auxiliary relays, flags and alarms
- Safety precautions when Constructing circuit breakers encompassing::
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment
  Responsibilities and protocols
  Access for operating

T2.10.23 Infrared imaging principles — substations

Evidence shall show an understanding of Infrared Imaging Principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to Infrared Imaging

- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types of enterprise specific computer software
- Techniques in storing and retrieving data and reports from the computer
- Use, characteristics and capabilities of specialised tools and equipment
- Enterprise Specific Policies and Procedures for Infrared Imaging reporting
- Techniques in evaluating serviceability of circuit breaker operation
- Procedures for obtaining correct HV switchyard arrangements encompassing:
  Identification of hazards and controlling risks
  Safety procedures and precautions
  Responsibilities and protocols
  Identifying switching resources
- Safety precautions when testing and measuring equipment with Infrared Imaging encompassing::
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment
  Responsibilities and protocols

T2.10.24 Rotating reactive plant principles — substations

Evidence shall show an understanding of Synchronous Condenser Principles to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to Synchronous Condensers
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types, characteristics and capabilities of Synchronous Condensers installed
- Identification of components within the Synchronous Condensers and associated control housings
- Use, characteristics and capabilities of specialised tools and equipment
- Enterprise Specific Policies and Procedures for Synchronous Condensers
- Techniques in evaluating serviceability of Synchronous Condensers operation
- Safety precautions when testing and measuring Synchronous Condensers encompassing::
  Safe working practices and procedures
  Identification of hazards, assessment and control of OHS risks
  Types, selection, maintenance and use of personal protective equipment
  Responsibilities and protocols
  Safe working clearances
- Communicating worksite procedures

T2.10.25 Commissioning of distribution protection and control systems — substations

Evidence shall show an understanding of the commissioning procedures associated with distribution protection and control systems to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the commissioning procedures
- Requirements for the use of commissioning manuals, system diagrams/plans and drawings

- Techniques in commissioning procedures encompassing:
  Planning
  Policy
  Testing techniques
  Close out requirements

T2.10.26 Voltage regulation scheme principles — substations

Evidence shall show an understanding of the operation and maintenance procedures associated with voltage regulation schemes to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the operating procedures
- Requirements for the use of operating manuals, system diagrams/plans and drawings
- Principles of operation and operating sequences including:
  Voltage control, VAR control
  Live Bus/Dead Bus synchronising checks
  Tap changer principles
  Requirements for parallel operations
  Settings
  Grading
- Techniques associated with:
  Isolation requirements
  Enterprise maintenance requirements
  Setting checks
  LV injections
  Electrical measurements
- Ancillary equipment which may include transducers, Buswire schemes, tap position indicators, local/remote control systems, alarm systems
- Voltage regulation scheme types which may include electro mechanical, micro-processor or combinations of both

T2.10.27 Use of test equipment on a discrete protection scheme — substations

Evidence shall show an understanding of the types and applications of test equipment to an extent indicated by the following aspects:

- Standards, codes, Commonwealth, State/Territory and local government legislation, supply authority regulations and or enterprise requirements applicable to the use and application of electrical and/or electronic test equipment
- Types and applications of test equipment used on discrete protection scheme
- Techniques in the use of test equipment encompassing:
  Electronic test equipment
  Note: Examples include Doble, Ohmnicrome
  Gas injection equipment
  Manufactures test equipment
  Multimeters
  Phase angle meters
  Meggers

T2.10.28 Electrical equipment — distribution field device protection and control

schemes — substations

Evidence shall show an understanding of the electrical equipment associated with distribution field device protection and control schemes to an extent indicated by the following aspects:

- Types and applications of electrical equipment encompassing:-
  Characteristics
  Capabilities

  Note: Examples include the following schemes, automatic circuit reclosers (ACR's), gas switches, secondary injection tests, primary injection tests, TMR Radio's, SCADA, remote control, overcurrent, earth fault, sensitive earth fault, inverse time curves, definite time curves, tripping, reclose, DC supplies, AC supplies and alarms

T2.11 Advanced power systems

T2.11.1 Power system layouts

Evidence shall show an understanding of system components and layouts to an extent indicated by the following aspects:

- Distribution system layouts encompassing:
  Overhead/underground
  Urban/rural
  HV customers
  High rise building systems
  Three phase lines
  Single phase lines
  SWER systems
  Spur, parallel and ring systems
  Typical substation types
- Transmission system layouts encompassing:
  Lines, buses, transformers and cables
  Line/bus layouts including single, double, ring and breaker and half systems
  HV crossing methods

T2.11.2 Circuit breaker auxiliary systems

Evidence shall show an understanding of circuit breaker auxiliary systems to an extent indicated by the following aspects:

- Types and characteristics of high pressure air systems including air storage and air handling processes
- Types and characteristics of DC systems including battery types, charging systems, protection systems
- Types and characteristics of special ambient gases (SF6) systems including gas conditioning, storage and handling systems
- Types and characteristics of vacuum interrupters
- Types and characteristics of oil filled and oil handling

T2.11.3 DC transmission system principles

Evidence shall show an understanding of DC transmission systems to an extent indicated by the following aspects:

- Structure of DC transmission systems
- Types of equipment required for DC transmission systems
- Types of connections used for DC transmission systems
- Principles of control of DC transmission systems
- Advantages of DC transmission in comparison to AC transmission
- Disadvantages of DC transmission in comparison to AC transmission

T2.11.4 AC transmission system components

Evidence shall show an understanding of AC transmission system components to an extent indicated by the following aspects:

- Support structures and reasons for selection
- Insulators and reasons for selection
- Conductors and reasons for selection
- Vibration management systems and principles
- Line ratings based on voltage, span, tension and temperature

T2.11.5 AC transmission line electrical parameters

Evidence shall show an understanding of AC transmission line electrical parameters to an extent indicated by the following aspects:

- Typical arrangements
- Parameters of significance
- Calculation of line parameters

  Note:
  Calculation of resistive, inductive and capacitive values assuming regular transposition and solid conductors
- Comparison with actual values
- Typical parameter values and ratios for different voltage level lines

T2.11.6 AC transmission lines equivalent circuit calculations

Evidence shall show an understanding of AC transmission line models to an extent indicated by the following aspects:

- Types of transmission line models based on line length
- Calculation of voltage drop, line regulation, and transmission efficiency
- Load sharing between lines

T2.11.7 Basic design characteristics of transmission structures and associated equipment

Evidence shall show an understanding of basic design features and characteristics of transmission structures and associated equipment and or components to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to installing of poles/structures and associated equipment and or components
- Transmission systems principles encompassing:
  Terminologies
  Primary and secondary
  Voltage levels
  Types of lines
- Characteristics of structure encompassing:
  Types of structure (towers and poles, concrete and steel)
  Characteristics of types of structures
  Installation methods
  Maintenance techniques
- Characteristics of associated equipment used on structures encompassing:
  Insulators
  Earthing

Note: Examples include overhead earth and communication lines

T2.11.8 Voltage control devices on interconnected transmission systems

Evidence shall show an understanding of voltage control techniques to an extent indicated by the following aspects:

- Conditions leading to voltage collapse
- Effects on system of high and low voltage
- Voltage control devices

  Note: Examples include voltage regulators applied to generators and synchronous phase modifiers, electromagnetic voltage regulators, series and parallel capacitors, OLTC transformers and static VAR compensators (SVC's). SVC's includes saturated reactor compensators; thyristor controlled reactor compensators and combined systems
- Production of harmonics and methods of harmonic control
- Location of voltage control devices within the system

T2.11.9 Calculation of rating of voltage control devices

Evidence shall show an understanding of voltage control devices to an extent indicated by the following aspects:

- Typical devices applications and capacities
- Estimation of rating of VAR regulating devices using graphical techniques

T2.11.10 Control of power flow in interconnected transmission systems

Evidence shall show an understanding of power flow control to an extent indicated by the following aspects:

- Use of system components to control power flow patterns

  Note: Examples include base load, spinning reserve, regulating machines, rapid start plant, phase shifting transformers and load shedding
- Principles of automated control
- Synchronising power
- Relationship of power and frequency
- Machine stabilisation techniques
- System oscillations and stability

  Note: Examples include damped and undamped oscillation, relationship of fault clearance times and system stability, critical clearance times

T2.11.11 Control of transient overvoltages

Evidence shall show an understanding of transient overvoltages to an extent indicated by the following aspects:

- Causes and effects of transient overvoltages

  Note: Examples include switching transients and lightning transients, effects on plant items
- Control techniques and systems

  Note: Examples include surge diverters, shield wires and CB arc control
- Insulation systems

  Note: Examples include insulation systems, insulation coordination and insulation grading

T2.11.12 Corona and discharge losses

Evidence shall show an understanding of corona to an extent indicated by the following aspects:

- Factors leading to the generation of corona

  Note: Examples include voltage levels, conductor spacings, conductor sizes and shaping, atmospheric conditions
- Consequences of corona
- Corona reduction

  Note: Examples include conductor selection, conductor bundling, conductor surface treatment, grading rings
- Internal discharge

  Note: Examples include causes of internal discharge, effects of internal discharge, testing techniques

T2.11.13 AC generators

Evidence shall show an understanding of power flow control to an extent indicated by the following aspects:

- Constructional features of alternators

  Note: Examples include weights, lengths, lengths, cooling mediums, cooling systems, prime mover types, prime mover attachment, types of windings, core arrangements
- Principle of operation

  Note: Examples include induction machines, synchronous machines
- Modes of operation

  Note: Examples include island and infinite bus operation, running up of prime movers, loading the alternator, requirements for synchronising, methods of synchronising
- Use of reactive capability diagram

  Note: Examples include related diagram types, current circle diagram, performance chart, capability diagram, values represented, per unit representation, limits representation and meaning
- Automatic voltage regulators

  Note: Examples include need for voltage control, required attributes of an AVR, range, response time, constraints on AVR capability, desirable attributes of an AVR, power consumption, compensation, rotor stabilisation, automatic changeover systems, input and output requirements and components
- Operation on an infinite bus

  Note: Examples include definition of infinite bus, power/angle dependence, reactive flow/voltage dependence, power/angle diagram, effect of saliency, transient conditions, practical and theoretical stability limits, voltage dependence of stability, control of reactive flow using AVR and generator transformer tap changer

T2.11.14 Fault calculation techniques

Evidence shall show an understanding of the calculation of fault levels to an extent indicated by the following aspects:

- Calculation of fault levels in symmetrical and asymmetrical fault conditions

  Note: Examples include types of faults, interconnected and radial systems, symmetrical components, representation of voltages and currents, sequence impedances of system plant, calculation/determination of sequence impedance networks, determination of operative sequence impedances, fault or arc impedances, first approximation techniques
- Interrupting device capabilities

  Note: Examples include determination of fault current breaking capability and let through energy capability of fuses and circuit breakers, DC offset and transient condition effects

T2.11.15 Visual inspection procedures

Evidence shall show an understanding of the procedure to undertake a visual inspection of a scheme to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with visual inspection procedures of a scheme
- Requirements for the use of manuals, system diagrams/plans and drawings
- Identify obvious deficiencies in operating to the standard functionality
- Techniques in determining device malfunction
- Techniques in determining wiring defects

T2.11.16 Commissioning procedures

Evidence shall show an understanding of the commissioning procedures associated with relevant equipment to an extent indicated by the following aspects:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the commissioning procedures
- Requirements for the use of commissioning manuals, system diagrams/plans and drawings
- Techniques in commissioning procedures encompassing:
  Planning
  Policy
  Testing techniques
  Close out requirements

T2.11.17 Protection scheme requirements

Evidence shall show an understanding of protection system types to an extent indicated by the following aspects:

- Requirements of a protection scheme

  Note: Examples include relationship to primary system design, purpose of protection, safety of persons, protection of plant, system instability, system break up, loss of customers, loss of revenue, protection zones, restricted schemes, unrestricted schemes, duplicate protection, local backup protection, remote backup protection, selectivity, discrimination, stability, sensitivity, reliability
- Components of a protection scheme

  Note: Examples include current transformers, potential transformers, summation current transformers, interposing transformers, multitapped transformers, all-or-nothing relays, induction relays, balanced beam relays, directional relays, biased relays, solid state relays, microprocessor based relays, gas relays, thermal sensors, hardwired communication, powerline carriers systems, microwave systems, fibre optic systems, need for isolation, need for interfacing
- Protection applied to buses

  Note: Examples include overload, differential, earth leakage, structure leakage, combined schemes, protection overlap
- Protection applied to transformers

  Note: Examples include biased differential, gas, winding temperature, oil temperature
- Protection applied to single/radial lines

  Note: Examples include overcurrent, earth leakage, slow earth leakage, distance, auto reclose, sectionalising, over voltage
- Protection applied to interconnected lines

Note: Examples include overcurrent, pilot wire, directional, directional overcurrent, current differential, phase comparison, current comparison, distance, impedance, admittance, offset

T2.11.18 Discrete protection systems

Evidence shall show an understanding of the detailed operation and setting of discrete protection systems to an extent indicated by the following aspects:

- Earth fault protection

  Note: Examples include master earth leakage schemes, sensitive earth fault relays and schemes, residual earth fault scheme, core balance earth fault scheme, frame/structure earth leakage scheme, time graded discrimination, backup protection
- Overcurrent protection

  Note: Examples include feeder overcurrent protection, instantaneous overcurrent schemes, inverse timed overcurrent schemes, types and location of components of an overcurrent scheme, CT summation, time graded discrimination, backup protection
- Alarms and controls

  Note: Examples include auxiliary relays, voltage regulating relays, line drop compensation, gas relay types, gas relay scheme operation and setting, over temperature schemes

T2.11.19 Interdependent protection systems

Evidence shall show an understanding of the detailed operation of interdependent protection systems to an extent indicated by the following aspects:

- Overcurrent and earth leakage intertripping, interlocking and blocking

  Note: Examples include logic mapping, master control, elctromechanical, electronic, shading coils
- Pilot wire, phase comparison

  Note: Examples include opposed voltage schemes, circulating current schemes, location of components of a scheme, pilot supervisory techniques,
- Load shedding, voltage control, parallel operation, load rejection
- CB failure protection
- Reclose systems

  Note: Examples include applications, single shot, multishot, blocking schemes, synchronisation checking

T2.11.20 Complex protection systems

Evidence shall show an understanding of the detailed operation of complex protection systems to an extent indicated by the following aspects:

- Distance

  Note: Examples include characteristics, electromechanical, electronic, impedance, mho, offset mho, switched schemes, non-switched schemes, blocking schemes, bus zone
- Differential, transformer differential, bus overcurrent

  Note: Examples include principles, feeder protection, transformer protection, bias systems, harmonic restraint, CT connections, bus protection, low impedance schemes, high impedance schemes, bus overcurrent schemes, generator protection, CT connections, special considerations, digital systems
- Types of revenue metering
- Applications of SCADA
- Complex protection systems for communications
- Harmonic control
- Point on wave switching

T2.11.21 Financial impact statements

Evidence shall show an understanding of financial impact statements to an extent indicated by the following aspects:

- Techniques in budgeting and tracking project progress
- Preparation and analysis of budget figures
- Techniques in the co-ordination of contingencies and risks that have a budget effect
- Techniques in dealing with problems that have a budget effect
- Examples of forms of recording project status and costings
- Application of relevant computer software packages
- Methods of prepare proposals encompassing:
  - Prepare specifications
  - Prepare tender
  - Evaluation and letting of tenders
- Techniques in estimating encompassing:
  - Contract documents
    Note: Examples include drawings, specifications, general conditions, special conditions
  - Resources costs
    Note: Examples include hourly rates (labour, plant, material, subcontractors)
  - Direct and indirect costs
  - Contingency costs
  - Project margin
  - Cost of money
  - Budget
  - Preliminary tender
  - Labour costing
  - Equipment costing
  - Economic comparisons
  - Contract variations
  - Techniques in prepare and interpret proposals and tender documents
- Techniques in preparing tender documents
- Techniques in interpret tender documents
- Techniques in preparing cost estimates for a project from relevant data
- Techniques in preparing financial impact statements

T2.11.22 Instrument transformers

Evidence shall show an understanding of the detailed operation of instrument transformers to an extent indicated by the following aspects:

- Voltage and current transformer principles and terminology
- Types and classes of current transformers
- Constructions of current transformers
- Characteristics of current transformers
- Testing of current transformers
- Types and categories of voltage transformers
- Constructions of voltage transformers
- Characteristics of voltage transformers
- Testing of voltage transformers

T2.11.23 Locate and rectify faults in electrical equipment

Evidence shall show an understanding of procedures for the location and rectification of faults in electrical equipment up to 1000 volts AC and or 1500 volts DC, to an extent indicated by the following aspects:

- Relationship of Occupational Health and Safety to the location and rectification of faults in electrical equipment encompassing:
  Act and regulations
  Identification of personal safety
  Workplace hazards
  Working with electrically operated tools and equipment
  Emergency First Aid/resuscitation
  Rescue from a live electrical situation
  Enterprise policies and procedures
- Types of drawings encompassing:
  Differentiation between symptoms
  Faults and causes in malfunctioning equipment
  Fault-finding techniques and procedures
- Fundamental electrical concepts encompassing:
  Effects of current
  Practical resistors
- Sources of EMF
  Series, parallel and series-parallel circuits
  Electrical measurement;
  Capacitors
  Inductors
  Magnetism
- Fundamentals of general appliances encompassing:
  Basic principles of appliances (non mathematical);
  Appliance identification
  Appliance ratings
  Basic principles of operation of control equipment and protection devices
  Fault conditions and symptoms
  Safe isolation procedures
  Test equipment
  Safe testing procedures, including continuity
  Fault types in appliances
  Fault-finding procedures (prescriptive)
- Fundamentals of single phase induction motors encompassing:
  Basic principles of operation (non mathematical)
  Motor identification
  Motor ratings
  Basic principles of operation of control equipment and protection devices
  Fault conditions and symptoms
  Safe isolation procedures
  Test equipment
  Safe testing procedure, including continuity
  Fault types in “phase splitting” and universal type motors
  Fault-finding procedures (prescriptive)
- Fundamentals of three phase induction motors encompassing:
  Basic principles of operation (non mathematical)
  Motor identification

Motor ratings
Motor starter principles
Basic principles of operation of control equipment and protection devices
Fault conditions and symptoms
Safe isolation procedures
Safe testing procedure
Fault-finding procedures (prescriptive)

- Fundamentals of single and three phase electrical heaters encompassing:
  Basic principles of operation
  Types of electrical heaters
  Electrical heater identification
  Electrical heater ratings
  Basic principles of operation of control and protection devices
  Fault conditions and symptoms
  Safe testing procedure
  Fault-finding procedures (prescriptive)

T2.11.24 Metering devices and principles

Evidence shall show an understanding of the detailed operation of metering devices and principles to an extent indicated by the following aspects:

- Common circuit configurations
- Meters and measurement principles
- Instrument transformer application
- Testing of metering systems and devices
- Implications of market operation

T2.11.25 Communication devices and principles

Evidence shall show an understanding of the detailed operation of communication devices and principles to an extent indicated by the following aspects:

- Types of communication systems
- Interface to power system equipment
- Hardware configurations
- Testing of communication links

T2.11.26 Test equipment A — fundamental

Evidence shall show an understanding of the detailed operation of fundamental test equipment to an extent indicated by the following aspects:

- Care and safe use
- Operating principles
- Comparison of different operating principle meters used for the same purpose
- Accuracy and loading effects of meters

  Note: Examples include measurement of voltage, current, power, resistance, insulation resistance, impedance and phase sequence and the use of oscilloscopes

T2.11.27 Test equipment B — protection

Evidence shall show an understanding of the detailed operation of protection test equipment

to an extent indicated by the following aspects:

- Care and safe use
- Operating principles
- Comparison of different operating principle meters used for the same purpose
- Accuracy and loading effects of meters

  Note: Examples include measurement of timing, voltage, current, resistance, inductance, capacitance, impedance, frequency, phase angle, phase difference and the use of primary, secondary and gas injection equipment

T2.11.28 Test equipment C — metering

Evidence shall show an understanding of the detailed operation of metering test equipment to an extent indicated by the following aspects:

- Care and safe use
- Operating principles
- Comparison of different operating principle meters used for the same purpose
- Accuracy and loading effects of meters

  Note: Examples include measurements of, voltage, current, power, reactive power, phase angle, resistance, inductance, capacitance, impedance, frequency, harmonics and the use of transient and data logging devices

T2.11.29 Test equipment D — control

Evidence shall show an understanding of the detailed operation of control equipment test equipment to an extent indicated by the following aspects:

- Care and safe use
- Operating principles
- Comparing of different control system methods and equipment for the same purpose

  Note: Examples include circuit breaker, isolators, On Load Tap Changer, pumps, fans, fire systems,

T2.11.30 Test equipment E — field

Evidence shall show an understanding of the detailed operation of field device test equipment to an extent indicated by the following aspects:

- Care and safe use
- Operating principles
- Comparison of different operating principle meters used for the same purpose
- Accuracy and loading effects of meters

  Note: Examples include measurements of voltage, current, power, reactive power, phase angle, resistance, inductance, capacitance, impedance, frequency, harmonics and the use of transient and data logging devices

T2.11.31 Primary plant testing

Evidence shall show an understanding of Primary Plant testing to an extent indicated by the following aspects:

- Transformers:

  Note: Examples include DC high voltage tests, AC high voltage tests, induced high voltage tests, ratio tests, polarity tests, winding resistance tests, impedance tests, insulation resistance tests,

transformer vector group test, winding temperature indicator test, alarm tests, neutral ct tests

- Circuit breakers:

  Note: Examples include DC high voltage tests, AC high voltage tests, induced high voltage tests, function tests, operation timing, minimum voltage operation test, insulation resistance test, contact resistance test, auxiliary contact test, alarm tests

- Capacitor banks:

  Note: Examples include DC high voltage tests, AC high voltage tests, induced high voltage tests, neutral ct tests, balance tests, insulation resistance

T2.11.32 Quality of supply measures

Evidence shall show an understanding of quality of supply measures to an extent indicated by the following aspects:

- Measure, analysis and provide solutions for the following;
  Voltage variation outside of standards
  Voltage sags and swells
  Repeated fluctuations
  Inpulses
  Momentary interruptions
  Frequency variation
  Harmonics
  Note:
  Includes causes, effects and methods of minimisation

T2.11.33 Geographic information systems principles

Evidence shall show an understanding of Geographic Information Systems principles to an extent indicated by the following aspects:

- Standards, codes, supply authority regulations and or enterprise requirements associated with the use of geographic information systems
- Requirements for the use of system manuals, system diagrams/plans and drawings
- Techniques in system use encompassing:
  System structure
  Preparation of data
  Methods of data entry
  Methods of accessing data
  Linking to other databases
  Output options

T2.11.34 SPARE CLAUSE

T2.11.35 Secondary Switching/isolation principles and sheet preparation

Evidence shall show an understanding of secondary switching/isolation principles and sheet preparation to an extent indicated by the following aspects:

- Techniques in performing and demonstrating correct sequence of isolation and/or restoration encompassing:
  Communications with appropriate authorities

Ensuring adequate protection remains in service to provide plant protection
Reading and interpreting drawings for switching /isolating
Sheet/instruction preparation

T2.11.36 Disconnect and reconnect fixed wiring electrical equipment fundamentals

Evidence shall show an understanding of disconnection and reconnection procedures for fixed wiring electrical equipment up to 1000 volts AC and or 1500 volts DC, to an extent indicated by the following aspects:

- Safe electrical work practices and procedures according to standards such as AS/NZ 4836:2001 or equivalent
- Safe use of tools and plant
- Safe use of ladders and elevated work platforms
- Safe use of protective clothing
- Hazards in the (electrical) work environment encompassing:
  Shock hazards
  Fire hazards
  Chemical hazards
  Other Hazardous areas
- Special situations
- Procedures for dealing with fires associated with electrical equipment
- Procedures for dealing with PCBs
- Electric shock victim rescue methods and procedures encompassing:
  Basic First Aid treatment for shock
  Burns and bleeding
- Purpose of each procedure and application encompassing:
  Expired air resuscitation (EAR);
  External cardiac-compression (ECC)
  Cardio-pulmonary resuscitation (CPR)
  Combined application of EAR and ECC (purpose of each procedure and application)
- Components of a basic electrical circuit(s) encompassing:
  Source
  Control
  Protection
  Load
- Types of circuit diagrams encompassing:
  Symbols
  Conventions
  Interpretations
  Free sketches
- Types of circuit connections and functions encompassing:
  Open circuit
  Closed circuit
  Short circuit
- Techniques in basic electrical measurement

  Note:
  It includes the use of multimeters; use of ammeter; use of voltage measuring and indicating devices; testing of measuring instruments; care of measuring instruments; voltage, current and resistance measurement; estimating values of voltage, current and resistance; using ohms law
- Fundamental principles of electrical concepts:

Note: Examples include effects of current; practical resistors; sources of EMF; simple practical circuit; series, parallel and series-parallel circuits; electrical measurement; capacitors; inductors; magnetism

- Techniques in insulation resistance measurement and requirements
- Earthing principles and systems

T2.11.37 Negotiation techniques

Evidence shall show an understanding of negotiation techniques to an extent indicated by the following aspects:

- Techniques associated with organisational policies and procedures related to human resources encompassing:
  Relevant awards and certified agreements
  Legislation impacting on people management
  Range of support services and expertise available
- Techniques in managing relationships encompassing:
  Identifying problems
  Methods of conflict resolution
  Methods of consultation, communication, negotiation and mentoring
  Strategies for positive feedback
- Techniques in client interaction encompassing:
  Relationships between client and enterprise
  Outcomes of the interaction
  Methods of achieving outcomes

T2.11.38 Disconnect and reconnect fixed wiring electrical equipment procedures

Evidence shall show an understanding of disconnection and reconnection procedures for fixed wiring electrical equipment up to 1000 volts AC and or 1500 volts DC, to an extent indicated by the following aspects:

- Methods for testing insulation resistance encompassing:
  Continuity of prospective earthing conductor
  Continuity between exposed conductive parts and the earthing system
- Methods of recognising acceptable test results for compliance with safety requirements
- Methods of recognising unacceptable test results and require an appropriate qualified person to further investigation
- Cable types and conductor termination methods and techniques encompassing:
  Conductors solid
  Stranded and flexible
  Colour codes
- Single and three phase systems and loads encompassing:
  Number of active and live conductors required
  Line and phase voltage
  Typical loads
- Identification and rating of general appliances
- Single phase induction motors encompassing:
  Motor identification
  Motor ratings
  Direction of rotation
- Three phase induction motors encompassing:

  - Motor identification
  - Motor ratings
  - Direction of rotation
- Single and three phase heaters encompassing:
  - Types of heaters
  - Heater identification
  - Heater ratings
- Electrical distribution arrangement encompassing:
  - Power systems within premises
  - Purpose of switchboards/distribution boards (residual current devices and ELCBs)
- Circuit isolation and protection devices
- Isolation procedures encompassing:
  - Work clearance
  - Testing for voltage
  - Lock-off and tagging
  - Techniques in isolation and tagging
  - Regulation, codes of practice and procedures
- Disconnection procedures, practices and requirements
- Types of replacement equipment
- Methods of ensuring equipment is safe to connect to supply
- Methods of reconnection procedures, practices and requirements
- Methods of return equipment to service

T2.11.39 Project management

Evidence shall show an understanding of project management to an extent indicated by the following aspects:

- Commonwealth, State and local government legislation, standards, codes, supply authority regulations and or enterprise requirements including relevant certification and licensing applicable to the duties and responsibilities for management a project
- Analyse functions of project management to determine achievement of project objectives
- Relationship of stakeholders to the project
- Techniques in development of project plan encompassing:
  - Project integration
  - Scope
  - Timelines
  - Cost
  - Quality
  - Resources
  - Communication/protocol requirements
  - Risk/uncertainties
  - Procurement and contacting
- Relationship between project processes, project life and project phases
- Planning and control procedures, resource management and risk management
- Techniques, methodologies and tools available to project managers
- Types of internal and external environmental factors that may affect the project

T2.11.40 Harmonics

Evidence shall show an understanding of effects of harmonics to an extent indicated by the following aspects:

- Characteristics and effects of harmonics on protection device functions/malfunction
- Effects of harmonics on the following:
  Transformers
  Generators
  Motors
  Quality of supply

T2.11.41 Fault-finding and diagnosing techniques

Evidence shall show an understanding of procedure for the systematic fault isolation through the application of diagnostic techniques to an extent indicated by the following aspects:

- Principles of analytical questioning
- Techniques in drawing valid conclusions from first observations
- Concepts of broad first-line testing
- Consideration of/responsibility for, avoidance of further damage
- Interpretation of specific test results: cause/effect
- Techniques for isolation to appropriate level encompassing:
  Half-split
  Module/function isolation (kernel technique)
  Substitution
  Diagnostic software
  Requirements for the use of manuals, system diagrams/plans, drawings, handbooks, specifications and fault pathways
- Software/firmware functions awareness
- Factors affecting field versus workshop repair costs
- Scheduling minor/major repair activities, downtime
- Implications of temporary repairs
- Use of system knowledge and history
- Data interpretation, expected versus actual
- Feedback to design/production/installation processes
- Subsystems and system structures
- System signals/status indicators
- Known failure modes and trends
- Action threshold warnings versus catastrophic failure
- Component ratings/upgrades
- Disassembly/reassembly techniques and care
- Relative costs of repair and replacement encompassing:
  Remaining life
  Ongoing maintenance
  Additional benefits of replacement equipment, e.g. improved productivity, quality

T2.11.42 Basic design characteristics of poles/structures and associated equipment

Evidence shall show an understanding of basic design features and characteristics of poles/structures and associated equipment and or components to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to installing of poles/structures and associated equipment and or components
- Distribution systems principles encompassing:
  Terminologies
  Primary and secondary
  Voltage levels
  Supply quality
  Load curve profiles (residential/industrial/commercial)
  Types of feeders
  Urban and rural single-phase systems
  SWER
- Characteristics of poles encompassing:
  Types of poles (wood, concrete and steel)
  Installation methods of poles (tooling, rake, life, labelling, sinking)
  Maintenance techniques of poles - above and below ground pole strength and loads
- Characteristics of associated equipment used on poles and structures encompassing:
  Crossarms (types and standard sizes)
  Insulators

T2.11.43 Survey principles

Evidence shall show an understanding of the principles of surveying to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to surveying in the electricity supply industry
- Survey principles encompassing:
  Measurement of ground levels
  Deviation angles
  Compass bearings
  Basic survey of short distribution line extension

T2.11.44 Design characteristics of underground and overhead conductors and cables, poles and structures

Evidence shall show an understanding of basic design features and characteristics of underground cables, lines, poles/structures and associated equipment and or components to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to installing conductors and associated equipment
- Overhead lines characteristics encompassing:
  Type of components
  Characteristics of conductor material
  Mechanical limitations and physical dimensions of lines
  Current rating factors (heating, voltage drops, power losses) of conductors
  Aerial bundled cables (HV and LV)
  Covered conductors
- Characteristics and constructional features of poles and structures encompassing:
  Types of poles and structures
  Characteristics of poles/structure materials

Mechanical limitations of poles/structures
Footings and additional support techniques

- Characteristics and constructional features of underground cables encompassing:
  Underground cables constructional features
  Insulation materials and abbreviations
  Cable dielectrics
  Electric stress, cable voltage drop
- Calculation of cable volt drop in relation to length of cable run
- Techniques in reducing electrical stress on cables
- Cable rating factors
- Methods of joining and terminating cables
- Techniques in the installation of cables above and below ground
- Techniques in cable testing and the location of cable faults
- Techniques in cable drawing

T2.11.45 Voltage regulations of feeders and associated equipment

Evidence shall show an understanding of basic the voltage regulations of feeders and associated equipment and or components to an extent indicated by the following aspects:

- Terminologies used
  Note:
  Examples include distribution system, service line, customer's terminals, customer voltage, utilisation voltage, base voltage, voltage variation and bandwidth
- Voltage limits and effects of voltage variation
- Causes of variation
  Note:
  Examples include inductance, capacitance and reactance of distribution lines and transformers
- Methods of voltage control
  Note:
  Examples include off-load and on- load tap changers, voltage regulating relays, line drop compensation, different types of voltage regulators
- Voltage profiles:
  Note: Examples include principles, effect on voltage profiles, limits of voltage, voltage drops due to LV mains transformers, tap settings feeder and service lines
- Sketch/draw voltage profiles
- Calculations to determine percentage voltage drop for components within the distribution feeder

T2.11.46 Distribution transformers fundamentals

Evidence shall show an understanding of fundamentals of distribution transformers to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the safe operation and testing of distribution transformers and auxiliary equipment
- Drawing layouts, conventions and symbols
  Note: Examples include vector group of transformers and three phase transformers
- Construction of a distribution transformer
- Characteristics when operated under load and no load conditions
- Percentage impedance determinations by test and calculation
- Function and operation of tap charging switches including solid state tap changing

equipment
- Function and operation of transformer auxiliary equipment
- Problems caused by harmonics in transformers
- Methods and equipment used to over come harmonics in transformers

T2.11.47 Distribution transformers testing

Evidence shall show an understanding of testing procedures of distribution transformers to an extent indicated by the following aspects:

- Safety precautions specific to the testing of distribution transformers
- Procedures for safely connecting distribution transformers for testing
- Testing of distribution transformers to determine losses
- Calculation of transformer's efficiency
- Methods and types of equipment used to cool transformers encompassing:
  Properties of transformer oil
  Tests performed on transformer oil
- Techniques in performing selected tests on transformer oil
- Techniques in performing testing procedures on armer
- Techniques in testing distribution transformers
- Distribution transformer parallel connections encompassing:
  Conditions and restrictions for parallel operations
  Calculations of loading on transformers operating in parallel
- Connection of transformer in parallel to supply a common load

T2.11.48 Power test equipment

Evidence shall show an understanding of power test equipment testing to an extent indicated by the following aspects:

- Safety precautions specific to the use and connection of power test equipment
- Meter operational principles
  Note: Examples include moving coil, moving iron, transducer, digital and analogue
- Types, operation and use of meters encompassing:
  Phase sequence meters
  Phase angle meters
  Instrument transformers
  Wattmeters
  Energy meters
  Phase system analysers
  Power oscilloscopes
  Frequency meters

T2.11.49 Polyphase circuit analysis and application (pre-requisite E2.8.9 Circuit analysis)

Evidence shall show an understanding of polyphase systems and its application towards the calculation of circuits' conditions to an extent indicated by the following aspects:

- Structure of a three phase system encompassing:
  Components
  Sequence of phases

Balanced and unbalanced load conditions

- Calculations of phase and line voltages for a specified phase sequence
- Calculation of voltage, current, power, power factor in a three phase system encompassing:
  Balanced three phase systems
  Unbalanced delta connected loads
  Unbalanced four-wire star connected loads
  Unbalanced three-wire star connected loads
  Unbalanced four-wire star connected systems
- Calculation of the neutral displacement voltage in unbalanced three-wire star connected systems
- Selection and connection of meters to confirm calculations
- Control of harmonics encompassing:
  Harmonic analysis of non-sinusoidal waves of voltage and current
  Production of harmonics in three phase power systems
  Effects of harmonics on three power systems and loads
  Types of harmonics commonly encountered on three phase power systems
  Identification by observation of harmonic components present in a waveform
- Calculation of effective value of non-sinusoidal waves
- Calculate the current/voltage in a complex load given a voltage/current with a Fourier analysis of up to 3 terms
- Pre-unit system in calculations encompassing:
  Reasons for use
  Groups of parameters commonly represented
  Common applications of the per-unit system to represent device specifications
  Applications of per-unit quantities in simple electrical calculations
- Method of symmetrical components encompassing:
  Reasons for the use
  Types of components used to represent a three phase system
  Reasons for difference in the impedance of a component to the various symmetrical components
  Commonly occurring relationships between different sequence impedances for common component groups

T2.11.50 Design of circuit switching

Evidence shall show an understanding of circuit switching to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to the design of the electrical distribution system
- Definitions, symbols used, operational features and applications of switching devices

  Note: Examples of switching devices include circuit breaker, load break switches, general purpose switch, limited purpose switch, isolators, earthing switch, automatic circuit reclosers (ACR), sectionalisers and expulsion drop out fuses (EDO)
- Types of HV circuit breakers

  Note: Examples of HV CB include air CBS, air-blast CBS, sulphur-hexafluoride puffer type CB, vacuum CB, small oil volume CB, bulk oil CB and auxiliary devices
- Types of isolators and air-break switches

  Note: Examples include load break switchgear, ring main switches, wall type indoor switches, outdoor switchgear, EDOs, ACRs, sectionalisers and HV separable connectors
- Concept of arc interruptions encompassing:

Characteristics of arc interruption
Restricting voltage
Dielectric strength

- Arc interruptions under different load conditions
  Note: Examples include resistive, inductive and capacitive
- Main contact systems and classes of mechanisms used on switchgear
- Select switchgear for a given application and considerations encompassing:
  Environmental
  Current rating
  Fault current levels
  Voltage levels
- Techniques in design of single line diagrams

T2.11.51 Distribution earthing system

Evidence shall show an understanding of distribution earthing system to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to the distribution earthing system
- Reason and types of distribution earthing systems
- Terminologies used in the earth systems including, touch and step potential
- Conditions associated when an active HV conductor fails to earth
- Selection of earthing electrodes and grids
- Determination of the earthing resistance of copper clad rods using earthing monograms

T2.11.52 Distribution tariff principles

Evidence shall show an understanding of distribution tariff system to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to the distribution earthing system
- Definitions of terms used
- Types of tariffs available to the consumer
- Relationship between tariffs and electricity supply costs
- Factors affect tariff selection
- Relationship between the terms, demand, load factor and power factor to tariffs
- Techniques to the selection of tariffs for specific applications encompassing:
  Calculation of cost of energy consumed

T2.11.53 Protection schemes

Evidence shall show an understanding of protection schemes to an extent indicated by the following aspects:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to protection schemes
- Types of protection schemes encompassing:
  Reasons for use

  - Application of protection zones around system elements
  - Degree of protection
- Types of feeder protection equipment encompassing:
  - Over current protection inverse time-current operating characteristics
- Operation of over current protection equipment used on distribution systems
- Operation of ACRs and there time-current characteristics
- Types and characteristics of over-current relays
- Coordination methods of a distribution feeder protection scheme
- Earth fault protection used on a distribution feeder
- Operation of a single wire earth return (S.W.E.R) system

T2.11.54 Distribution system planning principles

Evidence shall show an understanding of effect system planning to an extent indicated by the following aspects:

- Factors affecting distribution design
- Principles involved in distribution planning encompassing:
  - Load forecasts
  - Future demands and supply reliability
- Principles involved in load types effecting substation design encompassing:
  - Customer load control
  - System unbalance
- Methods of sketching and interpreting daily load curves
- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to protection schemes
- Effects of third harmonics
- Effects of fluorescent lamps
- Magnitude of third harmonics
- Cable losses and after diversity maximum demand
- Daily load curves encompassing:
  - Residential
  - Industrial
  - Commercial
- Application of electrical power and process steam plants encompassing:
  - Reasons for economy of combined plants
  - Heat balance diagrams
  - Ratio of steam to electric power
- Capital and interest cost encompassing:
  - Terms used in supply economics
  - Compound interest
  - Comparing capital and running costs

T2.11.55 Quality standard principles

Evidence shall show an understanding of quality standards and how they relate to an extent indicated by the following aspects:

- Quality system standards, international standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the quality standards

- Principles of auditing
- Types of auditing quality systems encompassing:
- Interpret the international standard ISO 9001/2 relating to electrical distribution operation
- Quality system documentation encompassing:
  Types of documentation required
  Documentation control system
  Overhead and underground design manuals
- Responsibilities of auditors encompassing:
  Function
  Activities

T2.11.56 Analysis protection targeting

Evidence shall show an understanding of the use of fault information to analyse and develop optimal network restoration strategies to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the analysis of protection targeting
- Requirements for the use of operational manuals, system diagrams/plans and drawings
- Techniques in the collation of protection data
- Techniques in the analyse and assessment of fault information encompassing:
  Public
  Employee
  Protection equipment
- Application methods of fault information to analyse and develop optimal network restoration strategies encompassing:
  Public and employee safety
  Enterprise reliability guidelines
- Resource availability

T2.11.57 Analysis control and protection information

Evidence shall show an understanding of the methods used to analysis control and protection information to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the analysis of protection targeting
- Requirements for the use of operational manuals, system diagrams/plans and drawings
- Techniques in the collation of control and protection data
- Techniques in the analyse and assessment of control and protection information
- Methods of using control and protection information to analyse and develop operation strategies encompassing:
  Enterprise reliability guidelines
  Generation availability

T2.11.58 Distribution underground line component fundamentals

Evidence shall show an understanding of the different types and function of distribution underground components to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the use and application of distribution underground components
- Requirements for the use of underground line construction manuals, system diagrams/plans and drawings
- Types, function and characteristics of distribution underground components
- Safety policies, procedures and precautions related to the handling and installing distribution underground components

T2.11.59 Generator control systems - EHV

Evidence shall show an understanding of EHV generator control systems to an extent indicated by the following aspects:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the operation of a portable generator
- Safety precautions specific to the synchronisation of generator sets encompassing:
  Safe working policies, practices and procedures
  Synchronising procedures
- Techniques in the installation of generator sets control systems encompassing:
  The synchronising of generator control systems onto and off the network without interruption to supply
  Estimation of EHV load
  Assessing the appropriateness of the generator
- Operating a generator in parallel to a single EHV job encompassing:
  Overhead systems
  Indoor systems
  Customer Installations
  Kiosk Substations
  EHV generator set and control system to EHV Distribution assets

T2.11.60 Transmission line component fundamentals

Evidence shall show an understanding of the different types and function of transmission components to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the use and application of transmission components
- Requirements for the use of transmission line construction manuals, system diagrams/plans and drawings
- Types, function and characteristics of transmission components
- Safety policies and procedures precautions related to the handling and installing transmission components

T2.11.61 Analysis network event records

Evidence shall show an understanding of the methodology in analysing network event records to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the analysis of critical events
- Requirements for the use of critical event data, manuals, system diagrams/plans and drawings
- Sources of critical event data
- Analyse and assess network event records and relevant data

  Note: Examples include the use of event records and data to analyse and develop optimal network restoration strategies taking into account public and employee safety, enterprise reliability guidelines and resource availability
- Safety policies, procedures and precautions related to critical events encompassing:

  Occupational Health and Safety hazards and precautions
  Identification of OHS hazards, assessing and controlling risks
  Types, selection, maintenance, storage and uses of personnel protective equipment
  Checking integrity of the system for minimum disruption
  Effective communication methods and chain of command
  Emergency response and rescue including First Aid procedures

T2.11.62 Preparing polices and procedures

Evidence shall show an understanding of the preparation of polices and procedures to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the preparation of polices and procedures
- Types of standard forms, documentation and data
- Techniques in disseminating polices and procedures
- Techniques in undertaking approval processes

T2.11.63 Prime mover principles

Evidence shall show an understanding of the prime mover principles to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, supply authority regulations, Standards, codes, and or enterprise requirements applicable to the prime movers
- Requirements for the use of operational manuals, system diagrams/plans and drawings
- Types, characterises and applications of energy sources and conversion systems encompassing:

  Wind
  Steam turbine
  Gas turbine
  Diesel

T2.11.64 LV system load calculation principles

Evidence shall show an understanding of the LV system load calculation principles to an extent indicated by the following aspects:

- Structure of LV systems

- Ratings of LV system components
- Methods of determining load on LV systems
- Records of load on LV systems
- Effect of added load on LV mains
  Note: Examples include variation of current, voltage, and power factor
- Load flow in parallel operation
- Enterprise specific network coordination tools

T2.11.65 HV system load calculation principles

Evidence shall show an understanding of HV system load calculation principles to an extent indicated by the following aspects:

- Structure of HV systems
- Ratings of HV system components
- Relationship to HV customers
- Methods of determining load on HV systems
- Records of load on HV systems
- Effect of added load on HV feeders
  Note: Examples include variation of current, voltage, power, reactive power and power factor
- Load flows in parallel or loop operation
- Enterprise specific network coordination tools

T2.11.66 EHV transmission system load calculation principles

Evidence shall show an understanding of EHV system load calculation principles to an extent indicated by the following aspects:

- Structure of EHV transmission systems
- Ratings of EHV system components
- Relationship to EHV customers
- Relationship to generation sources
- Methods of determining load on EHV systems
- Records of load on EHV systems
- Effect of added load on EHV transmission systems
  Note: Examples include variation of current, voltage, power, reactive power and power factor
- Load flows in parallel or loop operation
- Enterprise specific network coordination tools

T2.11.67 Zone substation modification design — principles

Evidence shall show an understanding of the principles to design zone substation modifications to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the zone substation design principles
- Requirements for the use of zone substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types of designs

Note: Examples of substation modification design include replacement of one item or a small quantity of items of primary plant, secondary equipment or SCADA equipment. A further example is a full or partial retrofit of SCADA into an existing substation

- Types of zone substation primary plant

  Note: Examples include HV circuit breakers, reclosers, power, current or voltage transformers, disconnectors, surge arrestors, busbars, busbar supports, load control and frequency injection facilities

- Types of secondary equipment

  Note: Examples include batteries, battery chargers, protection relays, control devices or panels

- Types of SCADA modification

  Note: Examples include full or part implementation of SCADA retrofits, replacement of SCADA IEDs, RTUs and SMUs

T2.11.68 Management of transmission, sub-transmission and zone substation design process — principles

Evidence shall show an understanding of the principles to manage the process of transmission, sub-transmission and zone substation designs to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the substation design management principles
- Requirements for the use of the substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Type of design management

  Note: Examples include design commencement, carrying out and completion activities

- Types of design process commencement activities

  Note: Examples include acquisition of site survey, acquisition of geotechnical and resistivity details, completion of environmental considerations, acquisition of design project scope documents, component manufacturer's details, engagement of necessary consultants/contractors

- Types of design carrying out activities

  Note: Examples include completion of checklists, signoff of checklists, general design administration/housekeeping activities

- Types of design process completion activities

  Note: Examples include the issue of design documentation to allow construction, closure of the design process, carrying out of the post delivery review and implementation of corrective actions, issue of corrected design documents reflecting field mark ups

T2.11.69 Transmission, sub-transmission and zone Substation building design process — principles

Evidence shall show an understanding of the principles of transmission, sub-transmission and zone substation building designs to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the substation design management principles
- Requirements for the use of the substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types of building designs

  Note: Examples include fixed and/or portable control, switchgear, frequency injection and miscellaneous building designs

- Types of building floor construction

Note: Examples include concrete poured in situ, precast, elevated ultra floor beams with poured in situ slab, pre-manufactured steel framed floor

- Types of building walls construction

  Note: Examples include steel framed, masonry, precast tilt-up, steel framed and lined

- Types of roof construction

  Note: Examples include steel framed, sheet steel clad

- Parameters to be considered

  Note: Examples include establishment of equipment dimensions, weights and dynamic loadings, suitability of building room/compartments and door opening dimensions for the equipment to be housed, compliance with security, fire rating and safety, pressure relief, BCA and BA requirements, compliance with electrical requirements, i.e. frame leakage, earthed metal isolation, appropriateness of floor reference levels, provision of cable supports, penetrations and pulling ring requirements, building light and power design and drafting

T2.11.70 Transmission, sub-transmission and zone substation primary plant design process — principles

Evidence shall show an understanding of the principles of transmission, sub-transmission and zone substation primary plant designs to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the substation design management principles
- Requirements for the use of the substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types of primary plant designs parameters

  Note: Examples include electrical equipment in accordance with the Single Line Diagram, bay spacing, busbar heights, statutory and maintenance clearances in accordance with AS2067 and organisational requirements, switchyard equipment layout, lightning protection, control and power cables routes within and outside switchyard

T2.11.71 Transmission, sub-transmission and zone substation control and protection design process — principles

Evidence shall show an understanding of the principles of transmission, sub-transmission and zone substation control and protection designs to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the substation design management principles
- Requirements for the use of the substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types of drawings to be produced

  Note: Examples include AC and DC circuit diagrams, panel layouts, connection diagrams, label lists and control cable schedules

- Types of control and protection designs parameters

  Note: Examples include protection and control systems implemented to suit statutory and organisational requirements, AC and DC circuit diagrams correct and documented

  SCADA hardwired and serially communicated signals, metering, load control, power factor control, AC and DC supplies, protection and control panel layouts and control cable termination diagrams

T2.11.72 Transmission, sub-transmission and zone substation earthing design

process — principles

Evidence shall show an understanding of the principles of transmission, sub-transmission and zone substation earthing designs to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the substation design management principles
- Requirements for the use of the substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types of activities to be carried out

  Note: Examples include earth resistivity tests coordination, design of the earth grid, confirmation of control of transfer of EPR
- Types of earthing design parameters

  Note: Examples include coordination and analysis of earth resistivity tests, design and drafting of earth grid including electrodes, grid connections, equipment connections and remote earthing connections to conduct maximum earth fault currents without exceeding the maximum allowable earth potential rise (EPR), confirmation of acceptable step and touch potentials including attenuation or hazard control measures, water, telephone service and LV neutral supplies isolation to isolate local EPR

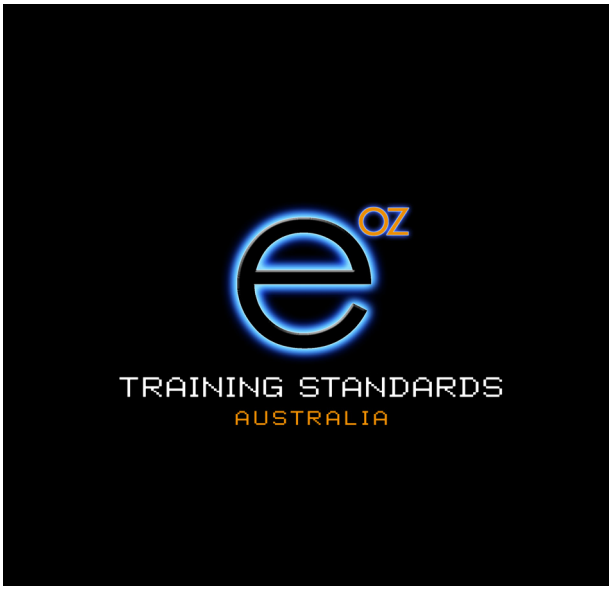
T2.11.73 Transmission, sub-transmission and zone substation civil and structural design process — principles

Evidence shall show an understanding of the principles of transmission, sub-transmission and zone substation civil and structural designs to an extent indicated by the following aspects:

- Commonwealth, State/Territory and local government legislation, Standards, codes, supply authority regulations and or enterprise requirements applicable to the substation design management principles
- Requirements for the use of the substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of OHS risks
- Types of activities to be carried out

  Note: Examples include earthworks, foundation design including relationship to geotechnical analysis, footing layout including assignment of reference levels and benchmark, conduits, pits and drainage, hydraulics including fire and safety facilities, access roads, fences and gates including implementation of EPR control measures, transformer fire and sound attenuation measures, bunding and oil containment, indoor and outdoor structural steelwork
- Types of civil and structural parameters

  Note: Examples include access road OK for low loaders and cranes (width, space turning radius, gradient), outdoor steelwork (stands) may include: strain/landing tower, surge arrestor, isolator, voltage transformer, current transformer, circuit breaker, fault thrower, lightening masts, cages/screens, sealing ends, cable supports, operating stands and busbar supports
- Indoor steelwork may include: frequency injection, cable supports, cages/screens, cable ladder supports



UET06

Electricity Supply Industry
Transmission, Distribution and Rail Sector Training Package

Volume 2 — Part 2.2
Essential Knowledge and Associated Skills — Electrotechnology

Volume 2 of 2

Table of Contents

Electrotechnology Essential Knowledge and Associated Skills (EKAS)

The following section of the Electricity Supply Industry (ESI) – Transmission, Distribution and Rail Training Package is the Essential Knowledge and Associated Skills. The reference of these is found in each ESI – Transmission, Distribution and Rail Competency Standard Unit in section 6. The references in this section are expanded in this section of the Training Package. Users of the Training Package are to include the full array of the Essential Knowledge and Associated Skills clauses content contained herein when developing learning specifications and support materials to assure the content of theory and associated skills training aspect of the respective competency standard unit is met.

Clauses and contents specific to the electrotechnology area have been allocated with the letter "E"

The Electricity Supply Industry (ESI) – Transmission, Distribution and Rail Training Package Essential Knowledge and Associated Skills section of this Training Package is likely to change from time to time. Changes are periodically made to reflect the latest industry practices. In relation to this section, users are advised to check for any changes that may have been made to the aligned EKAS clauses and content by:

- checking the version identifier code of the version you currently have with the latest Training Package
- accessing the relevant National Training Package Developer website (www.ee-oz.com.au) to assure the correct EKAS is being used.

Contextualisation

In the competency standard units, "notes" have been placed against respective aspects that include scope, performance criteria, range statement and essential knowledge and associated skills and other related sections. The insertion of these "notes" is primarily to provide users and support material developers with examples of the form and type related to technical content principles, technology, equipment, or processes that may be used to cover the outcomes. The examples should be treated as information that adds clarity for the purposes of assisting in guidance of the depth and breadth that is to be covered.

As the type, form, process, or technique of technology and equipment may change it is therefore expected and encompassing: on RTOs to continue to be current in the content of their delivery arrangements.

It is therefore appropriate for RTOs to use the notes in relation to technology and equipment references as advisory information. In these instances RTOs should aim to accommodate the adoption of improved and new technologies in the scope/range and essential knowledge and associated skills of the competency standard units by varying the context examples given in the referenced 'Notes:' to the Performance criteria, Range statement and Essential knowledge and associated skills. However, the contextualisation must not be such that the outcome of the competency standard units is altered in any way.

Where contextualisation of the notes varies the outcome of the competency standard units and its related content, RTOs should consult with EE-Oz Training Standards to explore options for incorporating and/or covering the new arrangements, so that currency of the Training package is maintained.

It should be noted that any need to alter the competency standard units from its intended outcome requires a new or varied competency standard unit. Such changes are to be undertaken through the continuous improvement processes required of Training Packages, which in relation to this Training Package is managed by EE-Oz Training Standards.

E2.1 Cables, conductors and terminations

E2.1.1 Cable protection and support

Evidence shall show an understanding of cable protection and support method and accessories to an extent indicated by the following aspects:

a) Requirements to protect and support cables adequately

Note: Examples of protection are protection against mechanical damage, protection from adverse temperatures and corrosion and protection from magnetic field that may affect the performance of the cable.

b) Cable support and protection devices, accessories and typical applications

Note: Examples include metallic and non-metallic conduits, duct and trunking, cable ladder and tray, cable clips and ties and related accessories.

c) Installation techniques encompassing:

- Cable installation equipment
- Cable drawing and hauling techniques

E2.1.2 Cable types and applications

Evidence shall show an understanding of the types of cables used in electrotechnology and their application to an extent indicated by the following aspects:

a) Structural components of cables and their purpose

Note: Components include conductors and conductor material; insulation; sheathings and servings.

b) Application of various cables types

c) Cable variates

Note: Cable varieties include single cables, flexible cables, flexible cords, shielded cables, armoured cables, ribbon cables, other similar and like cables

d) Typical characteristics and use of power circuit cables and control circuit cables

E2.1.3 Cables in buildings, structures and premises

Evidence shall show an understanding of installing cables in buildings, structures and premises to an extent indicated by the following aspects:

a) Building construction method and construction sequence.

b) Typical cable routes through buildings, structures and premises.

c) Building codes affecting the installation of cables in buildings, structures and premises

Note: Building codes include limitation on penetration structural elements and maintenance of fire protection interiority

d) Cable segregation requirements

E2.1.4 Basic cable and conductor terminations

Evidence shall show an understanding of basic cable and conductor terminations to an extent indicated by the following aspects:

a) Insulation removal and replacement

b) Conductor handling and cable terminations encompassing:

- General aspects and soldering involving pins on electronic components and stranded conductors carrying current up to 25 amperes.

- Application of connecting devices for conductors and terminals
- Continuity through connections and insulation resistance testing
- Stress release on cables/conductors.

E2.1.5.1 Power cable and conductor terminations

Evidence shall show an understanding of power cable and conductor terminations to an extent indicated by the following aspects:

a) Types of cable glands and their application

Note: Types include glands for circular sheathed cables; steel wire armoured (SWA) cables and mineral-insulated metal-sheathed (MIMS) cables.

- Cable termination techniques

b) Terminal types and applications

- c) Conductor termination techniques encompassing:
- Need for sound termination
- Consequences of poor conductor termination
- Conductor and terminal preparation

Note: Conductors include copper and aluminium

E2.1.5.2 Bus bar techniques

Evidence shall show an understanding of bus bar techniques to an extent indicated by the following aspects:

a) Materials and applications

b) Shaping techniques

c) Terminations and connections

E2.1.6.1 Telecommunication cable and conductor terminations

Evidence shall show an understanding of telecommunication cable and conductor terminations to an extent indicated by the following aspects:

a) Approved termination devices and sockets.

b) Special termination tools and their use.

c) Cable colour coding up to 100 pair indoor and outdoor cable

d) End to end testing

e) Methods of terminating cables encompassing:

- Cables less than twenty pair
- Twenty pair cable and greater

f) Cable labelling devices

g) Colour coding of cables, sockets and termination modules and standard connectors used with twisted pair, optical fibre and coaxial cables

E2.1.6.2 Telecommunication aerial cabling

Evidence shall show an understanding of telecommunication aerial cabling to an extent

indicated by the following aspects:

a) Hazard and control measures in aerial cabling working environment
b) Soundness of pole for aerial cabling
c) Aerial safety equipment
d) Procedure to applying pole top rescue
e) Aerial construction methods and regulations
f) Joining of an aerial cables

E2.1.6.3 Telecommunication below ground cabling

Evidence shall show an understanding of telecommunication below ground to an extent indicated by the following aspects:

a) Hazard and control measures in underground cabling working environment
b) Types and purposes of mechanical and manual aids.
c) Purpose, location, and capacity of man holes and pits.
d) Types of underground cable
e) Procedure for the excavation of a site for the installation of a man hole, pit, pipe and conduit

E2.1.7.1 Performance (copper) data cable installation and terminations

Evidence shall show an understanding of performance data cabling and conductor installation and terminations to an extent indicated by the following aspects:

a) High performance cable types encompassing:
- High performance transmission parameters
- Electrical characteristics
- Structure of UTP, FTP, and STP higher performance cables

b) High performance cabling installation and termination encompassing:
- Separation and segregation requirements and techniques
- Requirements for connecting hardware as defined in current Standards
- Installation requirements and techniques applicable to high performance cable

E2.1.7.2 Coaxial cable installation and terminations

Evidence shall show an understanding of coaxial cabling installation and terminations to an extent indicated by the following aspects:

a) Coaxial cable types encompassing:
- Structure of qualshield and trishield coaxial cables armour plated coaxial cable
- Typical applications

b) Coaxial cabling installation and termination encompassing:
- Separation and segregation requirements and techniques.
- Coaxial cable connectors compatible with the cable type and the environment
- Installation requirements and techniques applicable to coaxial cables
- Coaxial cable connectors and termination techniques

E2.1.7.3 Optical fibre cabling installation and terminations

Evidence shall show an understanding of optical fibre cabling installation and terminations to an extent indicated by the following aspects:

a) Operating principles of optical fibre transmission encompassing:

- Types of optical fibre types available for telecommunications voice and data transmission.
- Difference between multimode and single mode transmission.
- Advantages of optical fibre cable compared to other cables.
- Applications of optical fibre cables.
- Requirements of optical fibre cables as specified in current Standards
- Hazards associated with working with optical fibre.

b) Installation techniques encompassing:

- Purpose and procedures for pre-testing optical fibre cable prior to installation.
- Regulations, standards and codes applicable to optical fibre installation
- Bending radii and hauling requirements.
- Cable support and securing mechanisms
- Safety precautions

c) Termination and splicing techniques

- Risk control measures applied in the preparation of fibre for termination.
- Termination devices and method
- Preparation and splicing techniques.
- Devices used to protect terminations and splices against mechanical damage and prevent contamination.

E2.1.8 Electronic cable and conductor terminations

Evidence shall show an understanding of terminating cable and conductor used in electronic equipment to an extent indicated by the following aspects:

a) Cable and conductor types and characteristics encompassing:

- Insulated wire
- Harness wiring,
- High performance cables

Note: 1. Examples of characteristics are transmission performance parameters and electrical characteristics
2. Types include UTP, FTP, and STP

b) Coaxial cables types and characteristics

Note: Types include qualshield, trishield coaxial are armour plated coaxial cables

c) Cable anchoring and support methods

d) Termination methods

E2.3 Control technologies

E2.3.19 Control programming fundamentals

Evidence shall show an understanding of control programming fundamentals to an extent indicated by the following aspects:

a) Control applications of software

b) Software terminology

c) Programming languages currently used by industry

d) Control system development encompassing:

- flowcharts
- pseudocode
- Nassi-Schneidemann charts
- algorithms

e) Programming styles encompassing:

- programming structure
- documentation
- installing a language compiler
- using a text editor
- compiling source code
- generating executable files
- scalar and structured data types
- constants and variables
- reading from keyboard and writing to screen
- arithmetic, relational and logical operations
- making decisions using if/then, if/then/else, nested if/then and case
- looping operations using while/do, repeat/until and for/do
- programming to access external devices via I/O boards
- functions

  Note: Examples are macros; global and local variables, auto and static variables; Intrinsic functions used in control; Writing functions; Linking in external functions to control hardware

- numerical and character arrays

E2.3.20 Microcontroller programming basics

Evidence shall show an understanding of microcontroller control system programming methods to an extent indicated by the following aspects:

a) Programming terms encompassing:

- instruction
- instruction mnemonic
- operation code (op code)
- address, operand, label, mnemonic and comment fields

b) Language levels and their features encompassing:

- machine code
- assembly language
- high level language types (in current use by industry) and their application

c) Language simulators and emulators

d) Assembler Language programming basics encompassing:

- Programming input/output functions
- Timing loops

E2.4 Communications and computer technologies

E2.4.3.2 Networking fundamentals

Evidence shall show an understanding of networking fundamentals to an extent indicated by the following aspects:

a) Analogue and digital signals encompassing:

- How information is carried
- Signal distortion

Note: Examples include attenuation, reflection, noise, dispersion, jitter, latency and collisions

b) Types of networks, network components and hardware

c) Local Area Network (LAN) architectures

d) Networking protocols and the OSI model

e) Network signal propagation

f) Transmission Control Protocol / Internet Protocol (TCP/IP)

g) Basics of Encoding Networking Signals

h) Internet services

E2.4.11 Personal computers, hardware structure

Evidence shall show an understanding of personal computers, hardware structure to an extent indicated by the following aspects:

a) Structure and components and their function

Note: Examples include motherboards, memory modules, video modules, connecting buses, storage devices and the like.

b) Assembling and dismantling techniques

c) Hardware faults and troubleshooting techniques

Note: Confined to subsystem level

d) Basic network hardware and components

e) Connection of network media

f) Set up of standard network configuration

E2.4.12 Computer hardware sub-assemblies

Evidence shall show an understanding of computers, hardware components to an extent indicated by the following aspects:

a) Sub-assemblies architecture and their function

b) Sub-assemblies faults and troubleshooting techniques

c) Repair techniques

E2.4.14 Personal computer operating systems, basics

Evidence shall show an understanding of personal computer operating systems to an extent indicated by the following aspects:

a) Basic function, components and concepts

b) Operating systems in use

c) System installation and configuration

E2.4.16 Personal computers, engineering applications software basic

Evidence shall show an understanding of computers applications to an extent indicated by the following aspects:

a) Application software types

Note: Examples include Apparatus set up and calibration, Electronic Design Automation system, Aided Design, Engineering data analysis software, Engineering modelling, Project management.

b) Configurations and preferences

c) Use of particular software packages

E2.4.21 Client side programming

Evidence shall show an understanding of client side programming the to an extent indicated by the following aspects:

a) Client server architecture

b) Hyper Text Markup Language (HTML) encompassing:

- Forms
- Table
- Cascading style sheets

c) Hyper Text Markup Language (HTML) scripting encompassing:

- Exposed object model
- Events and event handling
- Objects methods, properties, events
- Window, document, form, and form elements
- String object, methods, properties
- Form field validation

Note: Examples of scripting language are JavaScript and Visual Basic (VB) Script

d) Extendable Markup Language (XML) encompassing:

- Syntax
- Structure (well formed XML)
- Schemas
- Transformations
- Parsing Document Object Model (DOM) and Simple API (SAX)
- Scripting to Document Object Model (DOM)

e) Extendible Stylesheet Language (XSL) generating HTML from XML

f) Wireless thin client programming

Note: Examples include Java2 Micro Edition (JEME), Mobile Information Device Profile (MIDP), Windows CE and Palm OS

g) Consideration for system architecture

h) Configurations and profile overview

E2.4.22 Server scripting

Evidence shall show an understanding of server scripting the to an extent indicated by the following aspects:

a) Client server architecture

b) Web and Application Servers

c) Server scripting languages eg. JSP, ASP, PHP, Perl

d) Server script Tags

e) Integrating script with HTML

f) Server script object model

g) Request, Response, Session, Application

h) Using server objects

i) Server components

j) Using components in server scripts

k) Scope of server components eg. session, page, application

l) Component get / set methods

m) Deploying server components

n) Advanced server scripting concepts

E2.4.39 Internet, network basics

Evidence shall show an understanding of network basics to an extent indicated by the following aspects:

a) Workstation Configuration

b) The function and interaction of workstation sub systems encompassing:

- Outline of network-aware operating systems
- Workstation network hardware
- Basic networking terminology
- IP configuration
- Browser configuration
- Digital bandwidth and data throughput

c) The OSI Model encompassing:

- The OSI Reference Model
- Encapsulation
- The TCP/IP reference model
- TCP/IP protocols
- Comparison of the Open Systems Interconnection (OSI) model and the TCP/IP model

d) Network Devices encompassing:

- Basic Local Area Network (LAN) Devices
  Note: Examples include repeaters, hubs, bridges, switches, routers, clouds, network segments
- Basics of data flow through LANs
- Operating system network configuration and diagnosis tools

e) The Physical Layer encompassing:

- Most Common LAN Media (STP, UTP, Coax, Optical fibre)

- Wireless communication
- Cable Specification and Termination
- TIA/EIA standards
- Testing Cables
- Features of an advanced cable tester
- Advanced cable tester
- Jacks and Patch panels
- OSI Layer 1 components and devices:
- Transceivers
- Repeaters
- Multi-port repeaters (hubs)
- Collisions and Collision Domains in Shared Layer Environments
- Basic Topologies Used in Networking

  Note: Examples include Linear bus, Ring, Dual ring, Star, Extended star, Tree, Irregular, Complete (mesh) and Cellular network topologies

f) The Data Link Layer encompassing:

- Comparing OSI Layer 1 and 2 with various LAN standards
- Comparing the IEEE model with the OSI model
- Logical Link Control (LLC)
- Media Access Control (MAC) sub-layers
- Converting between decimal and hexadecimal numbers
- MAC Addressing
- Framing
- Media Access Control (MAC) and various implementations

g) Layer 2 Trouble Shooting encompassing:

- Basics of Token Ring
- Basics of Fibre Distributed Data Interface (FDDI)
- Ethernet and IEEE 802.3
- Layer 2 Devices (NICs, Bridges, Switches)
- Effects of Layer 2 Devices on Data Flow
- Basic Ethernet Troubleshooting
- Network discovery tools and their use

h) IP Design encompassing:

- Autonomous systems
- Path Determination
- Comparing flat and hierarchical addressing
- IP Address Classes
- Reserved Address Space
- Basics of Sub-netting and Creating Subnets:
- Determining subnet mask size
- Computing hosts per sub-network
- IP configuration on a network diagram
- Host/subnet schemes
- Private addresses

i) The Network Layer encompassing:

- Router interfaces/ports
- DHCP initialisation sequence
- Function of the address resolution protocol (ARP) within a subnet
- Indirect Routing

- Proxy ARP
- Viewing and interpreting ARP tables
- Routable and non-Routable Protocols
- Overview of Routing Protocols (e.g. RIP, IGRP, EIGRP, OSPF)
- Routing encapsulation sequence
- Multi-protocol routing
- Connectionless and Connection-oriented network services
- IP and transport layer
- Static routing and dynamic routing
- Protocol Analyser Software

j) The Transport Layer encompassing:

- Purpose of the transport layer
- Comparing TCP and IP
- TCP and UDP
- TCP segment format
- UDP segment format
- TCP Connection Methods
- Examining and interpreting layer 4 traffic using an analyser

k) The Session Layer encompassing:

- Session layer overview
- Dialogue control
- Dialogue separation
- Layer 5 protocols

l) The Presentation Layer encompassing:

- Presentation layer functions and standards
- File formats
- Data encryption and compression

m) The Application Layer encompassing:

- Application processes
- Direct and indirect network applications
- Making and breaking a connection
- Domain Name System
- Network Applications Services

E2.4.40 Internet, network routing

Evidence shall show an understanding of network routing to an extent indicated by the following aspects:

a) Subnetting encompassing:

- The purpose of IP address
- The role of host address on a routed network
- The role of broadcast addresses on a routed network
- Calculating sub-net addresses
- Calculating host addresses on a sub-netted network
- Calculating the sub-net mask
- Reserved addresses and reserved sub-nets

b) Layer 3 and 4 Protocols encompassing:

- Compare the Internet TCP/IP protocols and the OSI model
- TCP and UDP operation and segment format

- TCP and UDP port numbers
- The Internet Layer and IP datagrams

c) Routing encompassing:

- Path determination
- Routed versus routing protocol
- Network-layer protocol operations
- Multi-protocol routing
- Static and dynamic routes
- Applications of static routing
- Default routes
- Dynamic routing operations
- Network metrics
- Time to convergence
- Distance-Vector Routing
- Routing loops, their cause and control
- Link-State Routing
- Unsynchronised link-state advertisements (LSAs) problems
- Hybrid routing protocols
- LAN-to-LAN routing
- LAN-to-WAN routing
- Path selection and switching of multiple protocols and media

d) Basic Router Configuration encompassing:

- WAN standards, devices and technologies
- Router functions
- Router user interface
- Router access modes
- Help functions
- Editing functions
- Router programming modes
- Basic router interface configuration
- Basic routing configuration
- Basic router diagnostic commands

e) Neighbour Discovery Techniques encompassing:

- Examining router status using diagnostic commands, eg show and debug commands
- Using and interpreting a router's neighbour discovery features, eg CDP neighbour commands
- Basic networking testing using ping and trace route commands
- Checking real-time traffic with debug
- Operating telnet sessions to explore other routers
- Setting router names to enable the identification of routers when telneting
- Setting passwords and names to provide access for telnet sessions

f) Router Security encompassing:

- Router entry points
- Basic line and user security features of a router
- Setting up the router Web interface
- Browsing to a router

g) Router Boot Sequence encompassing:

- Functional components of a router
- Internal router's configuration components

- External router configuration sources
- Router booting modes
- Configuration and systems files
- Router boot sequence
- Varying boot sequence through the configuration register
- Varying the boot sequence through software commands, eg boot system commands
- Basic features of a deployment tool like ConfigMaker
- Configuration practice
- Web server set up

h) IOS Management encompassing:

- Locating the Cisco IOS software
- Configuration register values
- Commands for revealing system file status and requirements
- Bootstrap Options in Software
- TFTP server set up and operation
- Procedures for TFTP transfer of router IOS
- Back up and recover router IOS
- Sources and versions of router IOS from vendor
- Up date a router IOS
- Vendor IOS installation tools

i) Password Recovery encompassing:

- Modifying the boot sequence to gain entry to a protected router (eg 1600 series and 2500 series)
- Re-configuring the router after entry with and without loss of previous configuration

j) DNS Configuration encompassing:

- The Role of DNS in Router Configurations
- Setting up DNS on a router
- Verifying DNS operation

k) Troubleshooting encompassing:

- Typical layer 1 errors
- Typical layer 2 errors
- Typical layer 3 errors
- Network troubleshooting strategies.

E2.5 Drawings, diagrams, schedules, manuals, standards and regulations

E2.5.1.1 Drawings interpretation and sketching

Evidence shall show an understanding of drawings interpretation and sketching to an extent indicated by the following aspects:

a) Basic technical drawing conventions and symbols

b) Freehand technical sketching techniques

E2.5.1.2 Drawings and diagrams

Evidence shall show an understanding of drawings, diagrams and schedules used in electrotechnology work to an extent indicated by the following aspects:

a) Drawing types and applications encompassing:

- Drawing layouts and conventions

  Note: Examples include mechanical drawings, electrical/electronic schematics, wiring diagrams, PC boards, location diagrams (architectural drawings), cable routes and switching arrangements and building details.

- Drawing symbols

  Note: Examples include symbols representing electrotechnology circuit components, equipment location and cable routes and control arrangements.

b) Cable/wiring/connection and equipment/component/schedules.

E2.5.2.1 Technical standards, regulations and codes for general electrical installations

Evidence shall show an understanding of technical standards and regulations that apply to electrical installations to an extent indicated by the following aspects:

a) Regulation for undertaking electrical work

b) Standards philosophy and format

- How to read and apply a standard.
- Standards and Codes that apply to all types of electrical installations

Note: 1. Standards include Standards mandated under regulation or by an authority, deemed-to-comply standard and local service requirements.

2. Codes include those applicable to electrical safe working practices.

c) Applying standards, regulations and codes to general electrical installation encompassing:

- Protection for safety
- Installation design
- Selection of electrical equipment
- Installation of electrical equipment

d) Testing and verification

E2.5.2.2 Technical standards, regulations and codes for special electrical installations

Evidence shall show an understanding of technical standards and regulations that apply to special electrical installations to an extent indicated by the following aspects:

a) Additional requirements for special installations

b) Applying standards, regulations and codes to special electrical installation

Note: Special installations are those in caravan parks, construction and demolition sites, marinas, medical treatment areas and moveable premises

E2.5.2.3 Technical standards, regulations and codes for testing and tagging portable and cord connected electrical apparatus

Evidence shall show an understanding of technical standards and regulations that apply to testing and tagging portable and cord connected electrical apparatus to an extent indicated by the following aspects:

a) Regulation for undertaking testing and tagging work

b) Standards and Codes that apply to testing and tagging

- How to read and apply a standard
- Standards and Codes that apply to testing and tagging

Note: 1. Standards include Standards mandated under regulation or by an authority, deemed-to-comply standard and local service requirement

2. Codes include those applicable to electrical safe working practices

c) Applying standards, regulations and codes to testing and tagging encompassing:

- Apparatus and cord inspection and testing
- Tests and testing methods
- Test results and compliance requirements

d) Tagging system methods and requirements.

E2.5.3 Technical standards, regulations and codes for lifts and escalators

Evidence shall show an understanding of technical standards and regulations that apply to lifts and escalators to an extent indicated by the following aspects:

a) Standards philosophy and format

b) How to read and apply a standard

c) Standards and Codes that apply to lifts and escalators

d) Applying standards, regulations and codes

E2.5.4 Technical standards, regulations and codes rail networks

Evidence shall show an understanding of technical standards and regulations that apply to rail networks and escalators to an extent indicated by the following aspects:

a) Standards philosophy and format

b) How to read and apply a standard

c) Standards and Codes that apply to rail networks

d) Regulations

E2.5.5 Technical standards, regulations and codes for extra low voltage work

Evidence shall show an understanding of technical standards, regulations and codes related to extra-low voltage work to an extent indicated by the following aspects:

a) Limitation imposed by regulations

b) How to read and apply a standard

c) Aspects of technical Standards that apply to extra-low voltage work

E2.5.6 Technical standards, regulations and codes for refrigeration and air conditioning

Evidence shall show an understanding of technical standards and regulations that apply to refrigeration and air conditioning to an extent indicated by the following aspects:

a) Standards philosophy and format

b) How to read and apply a standard

c) Standards and Codes that apply to refrigeration and air conditioning

d) Regulations

e) Equipment manufactures specifications

E2.5.7 Technical standards, regulations and codes for telecommunications cabling

Evidence shall show an understanding of technical standards and regulations that apply to telecommunications cabling to an extent indicated by the following aspects:

a) Role of Australian Communications Authority (ACA) under the Telecommunication Act 1997

b) Penalties for non compliance

c) Standards and Codes that apply to telecommunications cabling encompassing:

- Current technical standards applicable to cabling
- Aspects of other technical standards or codes of practice called up by regulation
- Cabling Provider Rules' requirements
- Certified components
- d) Application of Standards, Codes and regulations encompassing:
- Cabling installation, protection and segregation
- Earthing and protection
- Cable connections
- Certification
- Labelling and documentation of cabling and active communication equipment

e) Cabler Registration requirements and processes

E2.8 Electrical principles

E2.8.1.1 Basic electrical principles

Evidence shall show an understanding of electrical principles to an extent indicated by the following aspects:

a) Nature of electrical current and charge

b) Sources of electricity

c) Effects of current

d) Single-source single-load circuits encompassing:

- components that make up the circuit, and
- relationship between voltage and current

e) Consequences of a short-circuit and an open-circuit.

E2.8.1.2 Fundamental electrical principles

Evidence shall show an understanding of electrical principles to an extent indicated by the following aspects:

a) Fundamental and derived units encompassing:

- basic units of measurement.
- SI derived units for force, pressure, energy/work temperature and power.
- conversion of units to multiple and submultiple units.
- transposition of a given equation for any variable in the equation.
- value of electrical and related mechanical quantities given in any combination of units, multiple units or submultiple units.

b) Power, work and energy encompassing:

- relationship between power, work and energy.
- input, output, efficiency or losses of electrical systems and machines in terms of units / multiple units of power.
- effect of losses in electrical wiring and machines.

c) Electrical characteristics of materials encompassing:

- characteristics of solid conductors, electrolytes, insulators and semi-conductors.
- mechanisms of electrical conduction in solids, liquids and gases.
- The terms “electric charge”, “electric current” and “electromotive force.”

d) The simple circuit encompassing:

- symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in circuit diagram.
- purpose of each component in the circuit.
- effects of an open-circuit, a closed-circuit and a short-circuit.

e) Resistance encompassing:

- relationship between voltage and current from measured values in a simple circuit.
- Value of voltage, current and resistance in a circuit given any two of these quantities.
- power dissipated in a circuit from voltage, current and resistance values.
- relationship between voltage, current and resistance and the power dissipated in a

circuit.

f) Effects of current encompassing:

- physiological effects of current.
- the fundamental principles (listed in AS/NZS 3000) for protection against the physiological effects of current.
- basic principles by which electric current can result in the production of heat; the production of light; the production of magnetic fields; a chemical reaction.
- typical uses of the effects of current.
- mechanisms by which metals corrode.
- The fundamental principles (listed in AS/NZS 3000) for protection against the damaging effects of current.

g) Sources of electrical energy – conversion of other forms to electrical energy encompassing:

- basic principles which electricity is produced from a chemical reaction (primary cells, secondary cells and fuel cells); produced from a magnetic field coupled with motion; produced from light; produced from heat; produced from force.
- single emf source equivalent circuit.

h) Using measuring instruments encompassing:

- safe working procedures when working with instruments.
- handling and storage of instruments to ensure they are protected from damaged.
- selection of an instrument to measure voltage, current or resistance.
- connection of instruments into a circuit to measure voltage, current and resistance
- reading analogue scales and digital readouts in measuring voltage, current and resistance.

E2.8.2.1 Direct current circuit principles

Evidence shall show an understanding of electrical principles to an extent indicated by the following aspects:

a) Factors affecting resistance encompassing:

- The factors of length, cross-sectional area and material effect the resistance of conductors.
- effects of temperature change on the resistance of various conducting materials.
- the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature.
- effects of resistance on the current-carrying capacity and voltage drop in cables.

b) Resistors encompassing:

- features of fixed and variable resistor types and typical applications.
- characteristics of temperature, voltage and light dependent resistors and typical applications of each.
- specifying a resistor for a particular application.
- resistance of a colour coded resistor from colour code table and confirm the value by measurement.

c) Series circuits encompassing:

- setting up and connecting a single-source series dc circuit.
- Measurement of resistance, voltage and current values in a single source series

circuit.

- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities.
- relationship between the voltage drops around a circuit and the applied voltage.
- relationship between voltage drops and resistance in a simple voltage divider network.
- output voltage and current levels of connecting cells in series.

d) Parallel circuits encompassing:

- setting up and connecting a single-source parallel circuit.
- Measurement of resistance, voltage and current values in a single-source parallel circuit.
- the voltage, current, resistance or power dissipated from measured or given values of any of these quantities.
- relationship between currents entering a junction and currents leaving a junction.
- relationship between branch currents and resistances in a two branch current divider network.
- voltage and current levels of connecting cells in parallel.

e) Series/parallel circuits encompassing:

- setting up and connecting a single-source series / parallel circuit.
- Measurement of resistance, voltage and current values in a single-source series/ parallel circuit.
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities.
- relationship between voltages, currents and resistances in a bridge network.
- voltage and current levels of connecting cells in series parallel.

f) Measurement of electrical quanlities encompassing:

- hazards involved in using electrical instruments and the safety control measures that should be taken.
- operating characteristics of analogue and digital meters.
- selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application.
- measuring resistance using direct, volt-ammeter and bridge methods.
- instruments used in the field to measure voltage, current, resistance and insulation resistance and the typical circumstances in which they are used.

g) Capacitance encompassing:

- definition of capacitance and explain how a capacitor is charged.
- the units by which capacitance is measured.
- relationship between capacitance, voltage and charge.
- Behaviour of a series d.c. circuit containing resistance and capacitance components.

h) Capacitors encompassing:

- hazards involved in working with capacitance effects and the safety control measures that should be taken.
- factors which determine the capacitance of a capacitor and explain how these factors are present in all circuits to some extent.
- effects of capacitors connected in parallel by calculating their equivalent capacitance.

- effects on the total capacitance of capacitors connected in series.
- common faults in capacitors.
- testing of capacitors to determine serviceabity.

E2.8.2.2 Alternating current principles - power

Evidence shall show an understanding of alternating currents principles used in power circuits to an extent indicated by the following aspects:

a) Sinusoidal alternating voltage and current encompassing:

- Generation of a sinusoidal voltage with a single turn coil rotated in a uniform magnetic field.
- the terms 'period', 'maximum value', 'peak-to-peak value', 'instantaneous value', 'average value', 'root-mean-square (r.m.s.) value', 'crest factor' and 'form factor' in relation to a sinusoidal waveform.
- the instantaneous value of induced voltage of a generated sinusoidal waveform.
- measurement of the instantaneous, peak, peak-to-peak values and the period of a sinusoidal waveform.
- the root-mean-square (r.m.s.) value and frequency of a sinusoidal waveform .
- phase relationship between two or more sinusoidal waveforms.

b) Phasors encompassing:

- the terms 'in-phase', 'out-of-phase', 'phase angle', 'lead', and 'lag'.
- the phase angle between two or more alternating quantities from a given sinusoidal waveform diagram.
- convention for representing voltage, current and the reference quantity in a phasor diagram.
- phasor diagrams two or more a.c. values of voltage and/or current.

c) Resistance in a.c. circuits encompassing:

- connection of a single-source a.c. circuit to take resistance, voltage and current measurements.
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities.
- the relationship between voltage drops and current in a resistive a.c. circuit.

d) Inductance in a.c. circuits encompassing:

- definition of 'inductive reactance'.
- the inductive reactance of a given inductor and show the relationship between inductive reactance and frequency.
- equivalent inductive reactance in an a.c. circuit or any part of a circuit.
- application of Ohm's Law to determine voltage, current or inductive reactance in a purely inductive a.c. circuit given any two of these quantities.
- examples of inductive components in power circuits and systems and describe their effect on the phase relationship between voltage and current.
- the comparative current limiting characteristics of inductors and resistors.

e) Capacitance in a.c. circuits encompassing:

- definition of 'capacitive reactance'.
- the capacitive reactance of a given capacitor and the relationship between capacitive reactance and frequency.

- equivalent capacitive reactance in an a.c. circuit or any part of a circuit.
- application of Ohm's Law to determine voltage, current or capacitive reactance in a purely capacitive a.c. circuit given any two of these quantities.
- examples of capacitive components in power circuits and systems and describe their effect on the phase relationship between voltage and current.

f) Impedance encompassing:

- definition of 'impedance'.
- impedance of series, parallel and series-parallel circuits and diagrams showing the relationship between resistive, inductive and capacitive components (impedance triangle).
- connection of a single-source a.c. circuit and take resistance, voltage and current measurements.
- voltage, current or impedance values from measured or given values of any two of these quantities.
- phasor diagram usage to solve problems and show the relationship between voltages and currents in a.c. circuits.

g) Resonance encompassing:

- conditions in a circuit that produce resonance.
- the relationship between resonance and frequency.
- the effect on the current of series resonance and parallel resonance conditions.
- applications where resonance is applied

h) Power and power factor encompassing:

- difference between true power, apparent power and reactive power and the units.
- definition of the term "power factor".
- the effects of low power factor.
- local and AS/NZS 3000 requirements regarding the power factor of an installation and power factor improvement equipment.

i) Multiphase systems encompassing:

- features of a multiphase system.
- voltages generated by single and multiphase alternators.
- reasons for the adoption of three-phases for power systems.

j) Three-phase principles encompassing:

- Generation of three-phases in a single alternator.
- r.m.s. value of voltage generated in each phase.
- the relationship between the phase voltages generated in a three-phase alternator and the conventions for identifying each.
- the term "phase sequence" (also, referred to as "phase rotation").
- determination of the phase sequence of a three-phase supply.

k) Three-phase star-connections encompassing:

- connection of three-phase star system.
- the phase relationship between line and phase voltages and line and phase currents of a star-connected system.
- the r.m.s. value of line and phase voltage given any one of these quantities.
- the r.m.s. value of line and phase current given any one of these quantities.
- the terms "balanced load" and "unbalanced load".

- example of balanced and unbalanced loads in typical power systems.

l) Three-phase four wire systems encompassing:

- purpose of the neutral conductor in a three-phase four wire systems.
- effects of a high impedance in the neutral conductor of a three-phase four wire system supplying an unbalanced load where MEN earthing is employed.
- the value and phase relationship of neutral current in an unbalanced three-phase four wire systems given line currents and power factors.
- the AS/NZS 3000 requirements regarding neutral conductors.

m) Three-phase delta-connections encompassing:

- connection of three-phase delta system.
- phase relationship between line and phase voltages and line and phase currents of a delta-connected system.
- the r.m.s. value of line and phase voltage given any one of these quantities.
- the r.m.s. value of line and phase current given any one of these quantities.
- example of delta-connection loads in typical power systems.

n) Interconnected star and delta systems encompassing:

- relationship between line and phase voltages and line and phase currents in a system with a star-connected supply device and a delta-connected load.
- relationship between line and phase voltages and line and phase currents in a system with a delta-connected supply device and a star-connected load.

o) Energy and power requirements of a.c. systems encompassing:

- the purposes for measuring power, energy, power factor and maximum demand of a.c. power systems and loads.
- methods used to measure power, energy power factor and maximum demand.
- power factor improvement of a three-phase installation.

p) Harmonics encompassing:

- the term “harmonic” in relation to the sinusoidal waveform of an a.c. power system.
- sources in a.c. systems that produce harmonics.
- problems that may arise in a.c. circuits as a result of harmonics and how these are overcome.

E2.8.3 Power factor

Evidence shall show an understanding of power factor to an extent indicated by the following aspects:

a) Effects of low power factor on control-gear, switchgear and circuit cables.

b) Requirements for maintaining a high power factor.

c) Fundamentals of methods used to improve power factor.

d) Actions and conditions that cause lower power factor

E2.8.4 Three phase circuits

Evidence shall show an understanding of three phase circuits to an extent indicated by the following aspects:

a) Star and delta circuit configurations

b) Relationship between line and phase voltages and between line and phase currents.

c) Relationship between line voltage, line current and power.

d) Balanced and unbalanced four wire systems.

e) Consequences of high impedance in the neutral conductor where multiple-earthed-neutral (MEN) is used.

E2.8.5 Magnetism

Evidence shall show an understanding of magnetism to an extent indicated by the following aspects:

a) Concept of magnetism

b) Magnetic field patterns and magnetic screening

c) Applications of permanent magnets

d) Concepts of electromagnetism

e) Magnetic characteristics of material

f) Magnetic field around a straight conductor and a solenoid carrying current.

g) Factors effecting the force between adjacent current-carrying conductors, calculate the force, and state its direction.

E2.8.6 Electromagnetic principles

Evidence shall show an understanding of electromagnetic principles to an extent indicated by the following aspects:

a) Magnetism encompassing:

- field patterns around given permanent magnets.
- magnetic induction and its effects.
- principles of magnetic shielding and its application.
- Classification of magnetic materials.
- typical applications of permanent magnets.

b) Electromagnetism encompassing:

- magnetic field patterns around a straight current carrying conductor and a solenoid.
- direction in which the magnetic field around a straight current carrying conductor.
- direction of the north pole of a solenoid.
- factors effecting the force and direction between adjacent current-carrying conductors.

c) Magnetic quantities encompassing:

- magnetic terms and units for magnetomotive force, reluctance, magnetic flux, magnetising force and flux density.
- property of permeability and the meaning of actual and relative permeability.
- values of magnetomotive force, magnetising force, flux density, permeability and reluctance in given magnetic circuits.

d) Magnetisation curve encompassing:

- the terms “saturation”, “hysteresis” and “losses’ in relation to magnetic materials and circuits.
- magnetic characteristics of various materials from magnetisation curves, permeability curves and hysteresis loops.

- magnetic losses and the resulting effects on the performance of electrical machines.

e) Electromagnetic induction encompassing:

- factors required to induce an emf in a conductor.
- Faraday's Law.
- diection of induced voltage in a moving conductor in a magnetic field.
- relationship between the forces acting on a closed conductor when an emf is induced in it. (Lenz's law).

f) Inductance and inductors encompassing:

- concept of inductance, self-inductance and mutual inductance. (in terms of storage of magnetic energy).
- factors affecting inductance and how the unit of inductance is derived.
- inductance of a solenoid given necessary physical data.
- value of induced voltage in a given circuit.
- growth/decay of current in an inductor and determine the time constant of a series L-R circuit.
- Types of inductors

g) Application of electromagnetic principles encompassing:

- principles of operation and applications of magnetism, electromagnetism and induction.
- hazards associated with induced voltages.
- situations where the effects of inductance and electromagnetism has an adverse effect.

h) Rotating machine construction and operating principles encompassing:

- main components of a rotating machine.
- voltage generated and back emf induced in the "armature" conductors of a machine.
- motor effect produced by an electric current, including the development of torque in a motor and opposing torque in a generator.
- induced voltage in a conductors, force on a conductor and torque of various machines.

i) Generators encompassing:

- circuit arrangement and connection of various types of generators.
- common methods of excitation used for generators.
- methods used to regulate the output voltage of generators.
- effects of load on a generator.
- applications of generators.

j) Machines encompassing:

- circuit arrangements and connections of various common motors.
- performance of motors from measured values.
- effects of load on a motor.

k) Specialty machines encompassing:

- tachogenerator – construction, operation and applications.
- servomotors – construction, operation and applications.
- stepper motors – construction, operation and applications.
- EC motors – construction, operation and applications.

E2.8.7 Harmonic fundamentals

Evidence shall show an understanding of harmonics in power circuits to an extent indicated by the following aspects:

a) Nature of harmonics and effect on a sine wave.

b) Consequences of harmonics on cables and electrical apparatus

c) Causes of harmonics in modern electrical systems

d) Method of reducing harmonics

E2.8.8 Electrotechnology science and materials

Evidence shall show an understanding of electrotechnology science and materials to an extent indicated by the following aspects:

a) Trade calculations encompassing:

- mathematical techniques
- relevant calculations
- linear measurement, areas, volumes, ratios

b) Engineering mechanics encompassing:

- base physical quantities
- concepts, principles, S.I. units, their applications in
- engineering calculations in relation to physical quantities and
- associated formulae
- mass, velocity, acceleration, force, weight, density, angles
- energy/work/power
- moments/torque
- centre of gravity
- mechanical advantage
- levers
- pulley blocks
- efficiency
- friction
- vectors
- resolution of forces
- forces in strung conductors
- forces on poles and towers
- determination of sag
- pressure/stress
- elementary fluid mechanics

c) Engineering materials encompassing:

- classification
- ferrous and non-ferrous metals
- steels, alloys,
- properties

- tensile strength
- temperature and expansion in metals
- stress and strain
- ductility
- applications
- corrosion
- galvanic corrosion
- hardwoods and soft woods

E2.8.9.1 Circuit analysis

Evidence shall show an understanding of circuit analysis to an extent indicated by the following aspects:

a) Voltage and current Laws

b) Circuit components

c) Types of circuits

Note: Types include RL, RC and RLC circuits; polyphase circuits; magnetically coupled circuits and two port networks

d) Circuit analysis techniques application and use

Note: Techniques include Nodal and mesh analysis; superposition; Thevenin and Norton equivalents; maximum power transfer; complex frequency; Laplace transforms; and Fourier transforms;

e) Use of software tools for analysing circuits.

E2.8.9.2 Electrical power circuit analysis

Evidence shall show an understanding of electrical power circuit analysis to an extent indicated by the following aspects:

a) Superposition theorem

b) Kirchhoff's laws

c) Mesh analysis

d) Thevenin's and Norton's theorems

e) Maximum power transfer theorem

f) Complex impedance

g) Frequency domain

h) Transients

E2.8.9.3 Polyphase power circuit analysis

Evidence shall show an understanding of polyphase circuit analysis to an extent indicated by the following aspects:

a) Complex power 1∅ and 3∅

b) Balanced, unbalanced 3∅

c) Impedance of 3∅ loads

d) Measurement in 3∅ circuits

e) Line voltage drops

f) Neutral current

g) Fault currents

- symmetrical
- asymmetrical

E2.8.10.1 Engineering maths fundamentals

Evidence shall show an understanding of engineering maths fundamentals to an extent indicated by the following aspects:

a) SI Units, scientific and engineering notation, significant figures and accuracy encompassing:

- Conversion between decimal notation, scientific notation and engineering notation

b) Evaluation of expressions using a calculator

c) Substitution in algebraic formulas

d) Simplification of algebraic formulas encompassing:

- Addition of like terms
- Removal of brackets
- Multiplying and dividing terms
- Algebraic fractions

e) Applying the laws of indices

f) Simplification of expressions involving square roots

g) Present and interpret data encompassing:

- building tables of values
- building graphs
- reading graphs

h) Solving right-angled triangles encompassing:

i) Pythagoras' Theorem

- trig ratios

E2.8.10.2 Engineering maths

Evidence shall show an understanding of engineering maths to an extent indicated by the following aspects:

a) Transposition encompassing:

- fractional expressions
- exponential and logarithmic expressions
- trigonometric expressions

b)Estimations, errors and approximations encompassing:

- Errors in measurement
- Maximum probable error
- Significant figures
- Estimations and approximations

c) Quadratic functions encompassing:

- Graphs of quadratic functions represented by parabolas and the significance of the leading coefficient.
- Zeros represented graphically.
- Solution of quadratic equations by factoring and the quadratic formula.
- Solution of simultaneous linear and quadratic equations algebraically and geometrically.

d) Exponential Functions:

- characteristics and
- applications in engineering

e) Logarithmic Functions :

- characteristics and
- applications in engineering

f) Trigonometric Functions: :

- characteristics and
- applications in engineering

g) Methods for solving simultaneous equations encompassing:

- determinants
- Cramer's rule

h) Complex numbers encompassing:

- polar to rectangular conversion
- rectangular to polar conversion

i) Matrices

2.8.11 Power engineering computations

Evidence shall show an understanding of electrical computations to an extent indicated by the following aspects:

a) Graph functions and applications encompassing

- linear, non linear
- parabolic
- hyperbolic
- logarithmic
- exponential

b) Complex numbers encompassing

- Polar form
- Rectangular form

c) Simultaneous equations

d) Quadratic equations

e) Phasor diagrams

f) Star-delta transformations

E2.8.12 Electrical concepts and applications

Evidence shall show an understanding of electrical concepts to an extent indicated by the

following aspects:

a) Electrical supply and distribution within a building or premises

b) Arrangement of circuits

c) Protection for safety requirements and their practice

d) Difference between alternating and direct current

e) Measurement and calculation of voltage, current, resistance and power in practical circuits.

f) Concepts and applications of magnetism and electromagnetic induction

g) Transformer operating principles and their application

h) Hazards associated with electrical systems and apparatus.

E2.9 Electronic principles and applications

E2.9.1.1 Electronic component basics

Evidence shall show an understanding of the electronic components to an extent indicated by the following aspects:

a) Types of components

Note: Examples of types are resistors, inductors, capacitors, diodes, transistor, integrated circuits, printed circuit boards, sub-assemblies, and mounting/enclosing, connection and termination hardware.

b) The physical features and primary characteristic of components.

Note: 1. Features include shape, size and connections
2. Characteristics include parameter and power ratings and polarity.

c) Methods of identifying and marking of component ratings.

d) Identifying and handling static sensitive components.

E2.9.8 Amplifier fundamentals

Evidence shall show an understanding of amplifier fundamentals to an extent indicated by the following aspects:

a) Basic op amp configurations encompassing:

- ideal operational amplifier characteristics gain, bandwidth, input and output resistance.
- the inverting amplifier circuit calculating voltage gain and input resistance.
- the non-inverting amplifier circuit calculating voltage gain and input resistance.
- the inverting summer circuit calculating output voltage for given input voltages.
- voltage follower.
- differential amplifier circuits, differential amplifier using op amps need for balancing circuit resistances.

b) Op amp limitations encompassing:

- non-ideal characteristics of an op amp manufacturers' specifications compared to ideal characteristics.
- need for frequency compensation in some types of op amps using manufacturers' data to apply frequency compensation.
- offset nulling methods used manufacturers' data.
- bias compensation need for equal DC resistance between each input and the common line.
- slew rate definition of term specifications of slew rate for typical op amps.
- frequency response how frequency response varies with circuit gain bandwidth product frequency response characteristics for different op amp types definition of bandwidth.

c) Comparators encompassing:

- effect of using an op amp in open loop operation.
- basic configuration of a comparator.
- analysis of comparator operation.
- how positive feedback is applied applications.
- Schmitt trigger basic principle of operation advantages applications.

- comparator circuit applications.
- types of comparator ICs.

d) Op amp applications encompassing:

- clipping circuits and precision rectifiers principle of operation applications.
- RC sine wave oscillators, block diagram, Wien bridge oscillator configuration, basic operation phase shift oscillator, basic operation applications.
- square wave oscillators, converting a sine wave to a square wave using a comparator, applications.
- op amp integrator circuits, circuit configuration, output voltage for a given DC input voltage, why ramp is linear, relationship of time constant of the circuit to output, waveform and applications.
- differentiator circuits, circuit configuration, output waveform for a given input waveform, effect on waveform if the time constant is changed applications.
- function generators, block diagram, output waveforms applications.
- active RC filter circuits (basic types only), principle of operation, low pass and high pass filter circuit configurations, band pass and band stop filter circuit configurations applications.

E2.9.12 Electronic fault finding

Evidence shall show an understanding of electronic fault finding techniques to an extent indicated by the following aspects:

a) Factors to consider in clarifying the nature of a fault encompassing:

- Initial fault report
- Confirmation of symptoms of the fault
- Comparison of symptoms with normal operation

b) Effect to cause reasoning — assumptions of possible causes

c) Methods for testing assumptions encompassing:

- Visual inspection
- Sectional testing
- Split-half tests
- Component isolation

d) Dealing with intermittent faults

Note: Typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference.

E2.9.63 Direct current power supplies

Evidence shall show an understanding of DC power supplies to an extent indicated by the following aspects:

a) Operating principles and application of DC power supplies

b) Output waveforms of various rectification circuits

c) Ripple an output DC voltage for capacitive power supply filter circuits

d) Operation of a Zener diode shunt voltage regulator

e) Selection of 3 terminal regulators from data sheets

E2.11 Equipment and tools

E2.11.1 Hand tools

Evidence shall show an understanding of hand tools and their use to an extent indicated by the following aspects:

a) Hand tools for cutting, shaping, drilling, threading, tapping, and finishing metallic and non-metallic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

b) Tools for measuring and marking out.

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

c) Tools for dismantling and assembling electrical and electronic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

E2.11.2.1 Power tools

Evidence shall show an understanding of fixed and portable tools and their use to an extent indicated by the following aspects:

a) Fixed power tools for cutting, shaping, drilling, and finishing metallic and non-metallic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of fixed power tools

b) Portable power tools for cutting, shaping, drilling, and structural components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of fixed power tools
- requirements for use on construction sites.

E2.11.3.1 Fixing and support devices and techniques

Evidence shall show an understanding of accessories and support and fixing device and

methods and their use to an extent indicated by the following aspects:

a) Electrical/electronic/instumentation/refrigeration/airconditioning/telecommunications accessories for supporting, fixing and protecting wiring/cabling/piping and functional accessories.

b) Device for securing and mounting electrical/electronic accessories encompassing:

- types and safe application of screws, bolts, rivets and similar devices
- types and safe application of devices for fixing to timber, metal, hollow structures and masonry and concrete
- types and safe application of fixing adhesives and tapes
- hazards and safety measures when working with adhesives and chemical fixing devices
- regulatory requirements for use of powder fixing tools.

E2.11.3.2 Mobile plant, tools and equipment

Evidence shall show an understanding of tools and equipment for use with mobile plant to an extent indicated by the following aspects:

a) Types of plant and their use

b) Regulatory requirements for use of specific plant and equipment

E2.11.4 Dismantling and assembling techniques

Evidence shall show an understanding of techniques for assembling and dismantling electrotechnology apparatus to an extent indicated by the following aspects:

a) Purpose of sequencing dismantling and assembling.

b) Importance of marking/labelling and storing parts

c) Techniques for dismantling and assembling close fitting parts.

d) Use of gasket and seals.

E2.11.5 Basic electrical testing and measuring devices and techniques

Evidence shall show an understanding of the safe use and care of portable voltage testers, voltmeters, ammeters and resistance measuring instruments to an extent indicated by the following aspects:

a) Types of voltage testers, multimeters, clamp meters, continuity testers and insulation resistance testers and their application.

b) Features of testing/measuring devices

Note: Features include safety, user calibration and parameter and range settings.

c) Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement of test/measuring devices

d) Taking readings

e) Storage, maintenance and care of test/measuring devices.

f) Australian Standard quality assurance requirements for test equipment calibration certification.

E2.11.6.1 Advance electrical testing and measuring devices

Evidence shall show an understanding of the safe use and care of advance measuring instruments to an extent indicated by the following aspects:

a) Test/measuring devices and their application

b) Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement of test/measuring devices

c) Taking readings

d) Storage, maintenance and care of test/measuring devices

E2.11.7.1 Electronic testing and measuring devices and techniques

Evidence shall show an understanding of the safe use and care of electronic measuring instruments to an extent indicated by the following aspects:

a) Test/measuring devices and their application

Note: Examples are analogue and digital multimeters, voltage and digital testers, signal generators and oscilloscopes

b) Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement of test/measuring devices

c) Taking readings

d) Storage, maintenance and care of test/measuring devices

E2.11.7.2 Advanced electronic testing and measuring devices and techniques

Evidence shall show an understanding of the safe use and care of advance electronic measuring instruments to an extent indicated by the following aspects:

a) Test/measuring devices and their application

Note: Examples are frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF communications service monitor.

b) Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- loading and matching
- storage and delay
- circuit arrangement of test/measuring devices

c) Taking and interpreting readings

d) Notion of decibels including dBm, dBr, dBu, dBo

E2.11.11.1 Electronic soldering equipment and techniques

Evidence shall show an understanding of electronic soldering equipment and their use to an extent indicated by the following aspects:

a) Electronic soldering equipment encompassing:

- types of equipment and their purpose

- hazards associated with their use
- care and maintenance of brazing and soldering equipment

b) Electronic soldering techniques encompassing:

- safe use of equipment
- preparation of surfaces
- adjusting heat
- application

E2.18 Safety

E2.18.1 Occupational Health and Safety principles

Evidence shall show an understanding of Occupational Health and Safety to an extent indicated by the following aspects

a) The basic legal requirements covering occupational health and safety in the workplace encompassing:

- general aims and objectives of the relevant state or territory legislation relating to OHS.;
- employer and employee responsibilities, rights and obligations
- major functions of safety committees and representatives
- powers give to Occupational Health and Safety Inspectors

b) The requirements for personal safety in the workplace encompassing:

- the safety precautions that are required to ensure personal safety in the workplace
- potential hazards in relation to improper industrial housekeeping
- sources of pollution in an engineering environment and outline control measures

c) Workplace safety check, identifying potential workplace hazards and suggested measures for accident prevention encompassing:

- safety checklist for a typical workplace environment
- identifying and reporting potential workplace hazards
- methods of prevention of safety hazards within a typical workplace environment

d) working safely with electrical tools or equipment encompassing:

- causes of electrical accidents and state the effects that electric shock can cause
- purpose of circuit protection devices, such as fuses, circuit breakers and Residual Current Devices (RCDs)
- safe isolation of an electrical supply.

e) emergency procedures for the rescue of an electric shock victim equipment

f) emergency First Aid for an electric shock victim

Note: Emergency First Aid is limited to first-on-the scene assistance to a victim of electric shock , and basics of CPR.

E2.18.2 Electrical safe working practices

Evidence shall show an understanding of working safely on or around electrical equipment through the application of risk management principles and control measures for dealing with non-electrical hazards and extra-low voltage, low-voltage and high-voltage hazards and high-current hazards. The following aspects indicate the extent of understanding required:

a) Risk management and assessment of risk encompassing:.

- Principle and purpose of risk management
- Processes for conducting a risk assessment

b) Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:

- Arrangement of power distribution and circuits in an electrical installations
- Parts of an electrical system and equipment that operate at low-voltage and extra-low voltage

- Parts of an electrical system and equipment where high-currents are likely.

Risks and control measures associated with high-voltage encompassing:.

- Parts of an electrical system and equipment that operate at high-voltage,
- The terms ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
- Control measures used for dealing with the hazards of high-voltage.

d) Optical fibre safety encompassing:

- Coherent optical sources and joining procedures
- Laser safety class 3a devices or their replace

e) Risks and control measures associated with low voltage encompassing:.

- Risks associated with modifying electrical installations, fault finding, maintenance and repair
- Control measures before, while and after working on electrical installations, circuits or equipment
- Isolation and tagging-off procedures
- Risks and restrictions in working live
- Control measures for working live.

f) Risks and control measures associated with harmful dusts and airborne contaminants.

Note: Sources include thermal insulation, fibrous cement materials and asbestos and other fibre reinforced switchboard materials.

g) Safety, selection, use, maintenance and care of test equipment encompassing:.

- Safety characteristics of electrical testing devices
- Safe use of electrical testing device
- Checks and storage methods for maintaining the safety of testing devices.

E2.18.8.2 Occupational Health and Safety, enterprise responsibilities

Evidence shall show an understanding of OHS enterprise responsibilities to an extent indicated by the following aspects:

a) Provisions of relevant health and safety legislation

b) Principles and practice of effective occupational health and safety management

c) Management arrangements relating to regulatory compliance

d) Enterprise hazards and risks, control measures and relevant expertise required

e) Characteristics and composition of workforce and their impact on occupational health and safety management

f) Relevance of enterprise management systems to occupational health and safety management

g) Analysis of working environment and design of appropriate occupational health and safety management systems

h) Analysis of relevant data and evaluation of occupational health and safety system effectiveness

i) Assess resources to establish and maintain occupational health and safety management systems.

E2.18.9 Electronic safe working practices

Evidence shall show an understanding of working safely on or around electronic equipment through the application of risk management principles and control measures for dealing with non-electrical hazards and extra-low voltage, low-voltage and high-voltage hazards and high-current hazards. The following aspects indicate the extent of understanding required.

a) Risk management and assessment of risk encompassing:

- Principle and purpose of risk management
- Processes for conducting a risk assessment

b) Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:

- Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage
- Parts of an electronic systems and equipment where high-currents are likely.

c) Risks and control measures associated with high-voltage encompassing:

- Parts of an electronic systems and equipment that operate at high-voltage
- The terms used - 'touch voltage', 'step voltage', 'induced voltage' and 'creepage' as they relate to the hazards of high-voltage, and
- Control measures used for dealing with the hazards of high-voltage.

d) Risks and control measures associated with low voltage encompassing:

- Risks associated with installation, fault finding, maintenance and repair
- Control measures before, while and after working on electronic systems or equipment
- Isolation and tagging-off procedures
- Risks and restrictions in working live
- Control measures for working live.

e) Risks and control measures associated with the high levels of radiation encompassing:

- RF hazards
- Maximum exposure levels to RF
- Maximum exposure to microwave radiation

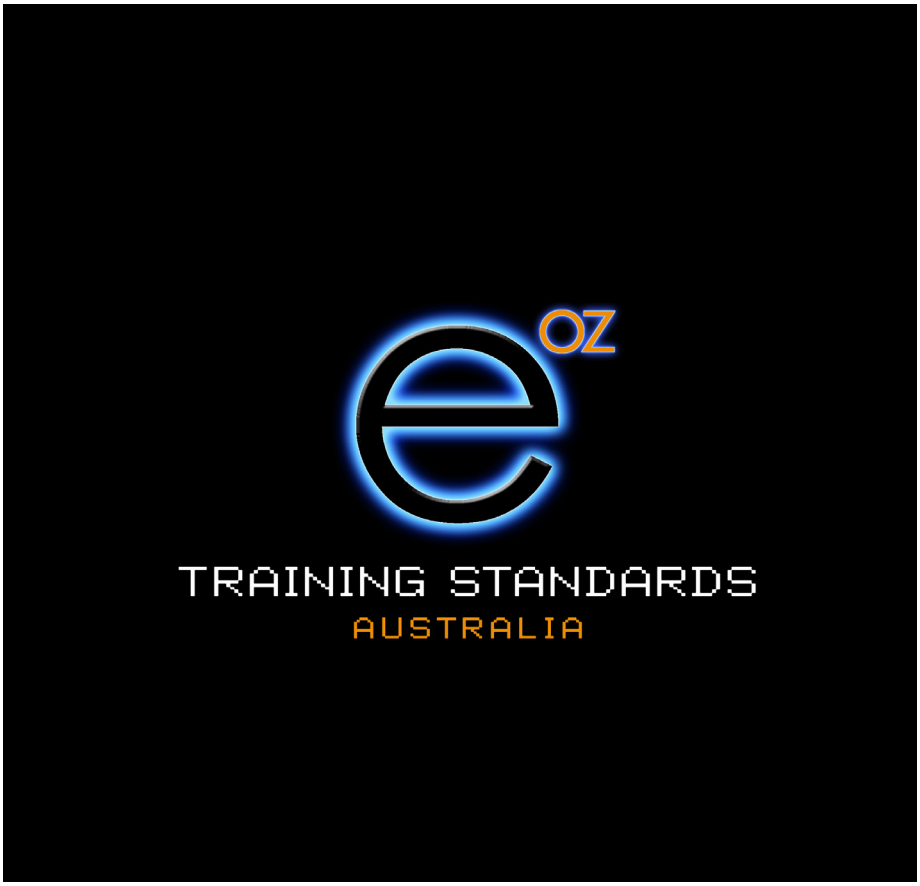
f) Optical fibre safety encompassing:

- Coherent optical sources and joining procedures
- Laser safety class 3a devices or their replace

g) Safety, selection, use, maintenance and care of test equipment encompassing:

- Safety characteristics of electrical testing devices,
- Chemical cleaning solvents, glues and joining wastes used in electronics,
- Safe use of electrical testing device, and
- Checks and storage methods for maintaining the safety of testing devices.

Language, Literacy and
Numeracy



UET06
Electricity Supply Industry
Transmission, Distribution and Rail Sector
Training Package

Volume 2 — Part 3
Language, Literacy and Numeracy

Volume 2 of 2

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Volume 2 Part 3

3.1 Language, Literacy and Numeracy

The reading, writing and numeracy skills/competencies in each Competency Standard Unit describe the recommended prerequisite entry requirements typically needed to successfully achieve the competency. A nationally-recognised language, literacy and numeracy framework has been used to provide advice as to the relevant entry level required.

The information has been derived from the National Reporting System report, *A mechanism for reporting outcomes of adult English language, literacy and numeracy programs*. The Australian National Training Authority (ANTA) and the Department of Employment Education and Training (DEET), 1994-5, jointly funded the report. Australian Training Products Ltd (ATP) distributes it for and on behalf of Language Australia Victorian Office. Stock code 3010A, ISBN: 0 7306 7493 2, April 1999.

The report:

- identifies adult English language, literacy and numeracy competencies in industry
- facilitates student pathways
- generates ideas for curriculum and assessment.

The report identifies a national framework of five vertical levels of competence related to complexity of language, literacy and numeracy competence. Six interrelated horizontal aspects of communication were found to apply in relation to differing orientations of social activity involving reading, writing, speaking, listening and/or numeracy. These were categorised as:

- procedural communication for performing tasks
- technical communication for using technology
- personal communication for expressing identity
- cooperative communication for interacting in groups
- systems communication for interacting in organisations
- public communication for interacting in the wider community.

The National Reporting System report should be referred to at all times for clarification, more detailed information and advice.

For the purposes of this Training Package writing, reading and numeracy competencies, have been selected from the five-level competence structure (using the Technical Communication aspect of the national framework), as a means of providing relevant entry-level advice. Registered Training Organisations should use this information to assist them in developing appropriate entry-level learning strategies and to assist learners to meet the entry-level requirements of respective Competency Standard Units.

Table 6 – Reading, Writing and Numeracy: Indicators of Competence

Note: It is important to note what the five levels of competence interrelated with six aspects of communication of the National Reporting System is not intended to be. It is not an assessment system. It is not curriculum. It is not a model of language acquisition. It is not a means for categorising students by a simple "level", nor is it a set of broad competency statements. It is not a recruitment instrument for employers. The NRS suggests that the "*report of a person's competence derives from the interplay between the chosen activity, the features of the text/task, and the context and level of support under which the activity is performed*".

Reading

Scale	IoC*	Indicators of Competence	Technical Communication
5	**5.1**	Reads and interprets structurally intricate texts in chosen fields of knowledge and across a number of genres, which involve complex relationship between pieces of information and/or propositions.	Defines the purpose and objectives for the use of a particular technology, e.g. writes a report, which includes a detailed analysis of technology as, applied in a particular workplace or environment. Draws on prior knowledge of the application of technology in researching the capacity of a new system, e.g. writes a briefing and recommends purchase or use of a particular system.
	5.2	Interprets subtle nuances, infers purpose of author and makes judgements about the quality of an argument.	Uses technological principles to reduce constraints presented by environmental or physical capacity, e.g. writes a report, which compares the effectiveness and efficiency of manual and computerised record management systems.
	5.3	Reads and critically evaluates texts containing data which includes some abstraction, symbolism, and technicality presented in graphic, diagrammatic, formatted or visual form.	Prepares a written or oral report, which critically evaluates the content, structure, and purpose of technical texts including graphic, diagrammatic or numerical information. Adapts task instructions to suit changes in technology, e.g. writes plain English instructions for the operation of a new machine based on the manufacturer's instructions. Draws from a number of sources and uses computer skills to prepare a report, e.g. CV and job application letter.
4	**4.1**	Reads and interprets structurally intricate texts in chosen fields of knowledge which require integration of several pieces of information for generating meaning.	Compares and contrasts views on technology in newspaper articles. Interprets the purposes and objectives for the use of technology after the reading a brochure or manual.
	4.2	Interprets texts, which include ambiguity, and inexplicitness where reader needs to distinguish fact from opinion and infer purpose. Interprets and extrapolates from texts containing data which includes some abstraction, symbolism,	Selects technological practices to conform with the guidelines for heath and safety, environmental impact and ethical practice, and uses them within those guidelines. Uses guidelines to ensure technological equipment is used to its full capacity. Uses a computer to prepare a typed report from a had-drafted report. Compares and contrasts different technologies and their impact, e.g. argues the case for new practices when using

Scale	IoC*	Indicators of Competence	Technical Communication
		and technicality presented in graphic, diagrammatic, formatted or visual form.	new technologies, reports on the effects of installation of new machinery. Writes a report on the impact of a particular technology for a specific audience, e.g. management committees, tri-partite committees. Reads a complex diagram to identify components and procedures for dealing with a technical fault or breakdown.
3	**3.1** **3.2** **3.3**	Reads and interprets texts of some complexity, integrating (where relevant) a number of pieces of information in order to generate meaning. Displays awareness of purpose of text, including unstated meaning. Interprets and extrapolates from texts containing data which is unambiguously presented in graphic, diagrammatic, formatted or visual form.	Reads a technical manual where the information is supported by diagrams, sufficiently well to be able to locate and comprehend particular information required, e.g. programs a VCR to record two programs in advance. Uses the author, title, key word and other search indexes of a library computer. Comprehends short summary information on computer-managed learning packages to choose a relevant package to suit own needs. Uses the word processing program on a computer to produce texts. Writes simple instructions for using familiar technology, e.g. how to use an automatic teller machine. Completes a formatted workplace test, e.g. damage or breakdown report. Writes a brief report on uses of technology, e.g. for classroom, workplace, domestic or community purposes.
2	**2.1** **2.2**	Reads and interprets short simple texts on a personally relevant topic. Locates specific information relating to familiar contexts in a test which may contain data in simple graphic, diagrammatic, formatted or visual form.	Reads short, relevant, explicit, clearly formatted texts related to technology, e.g. the author and title index of a library computer. Chooses a computer assisted learning package, having read short descriptions of one or two programs, to acquire a defined skill or area of knowledge. Writes a short description, e.g. describes a damaged part of a machine to facilitate repair. Extracts information from a list with language and numeracy components, e.g. price lists of components for computer systems. Records simple and routine information using the telephone, e.g. takes a phone message, on a form designed for this purpose. Interprets instructions, which combine pictorial and written information, e.g. directions on how to operate a piece of machinery safely.
1	**1.1** **1.2**	Reads and identifies letter of the alphabet in the context of whole words, numbers, signs and symbols relating to personal details and immediate environment.	Recognisees very short, explicit, pictorial texts, e.g. understands logos related to worker safety before using a piece of machinery, reads letters on a keyboard. Reads graphic instructions accompanying a new piece of technology to learn new information or skills about a technology or medium, e.g. uses an automatic teller machine by following instructions given graphically on the

Scale	IoC*	Indicators of Competence	Technical Communication
		Identifies specific information in a personally relevant text with familiar content, which may include personal details, location or calendar information in simple graphic, diagrammatic, formatted or visual form.	screen. Types own name or single words into a computer-assisted learning program.

Note: IoC* - Indicators of Competency sub-level

Writing

Scale	IoC*	Indicators of Competence	Technical Communication
5	**5.4** Demonstrates well-developed writing skills by selecting stylistic devices to express complex relationships between ideas and purposes. **5.5** Generates complex written texts with control over generic structure.		Defines the purpose and objectives for the use of a particular technology, e.g. writes a report, which includes a detailed analysis of technology as, applied in a particular workplace or environment. Draws on prior knowledge of the application of technology in researching the capacity of a new system, e.g. writes a briefing and recommends purchase or use of a particular system. Uses technological principles to reduce constraints presented by environmental or physical capacity, e.g. writes a report, which compares the effectiveness and efficiency of manual and computerised record management systems. Prepares a written or oral report, which critically evaluates the content, structure, and purpose of technical texts including graphic, diagrammatic or numerical information. Adapts task instructions to suit changes in technology, e.g. writes plain English instructions for the operation of a new machine based on the manufacturer's instructions. Draws from a number of sources and uses computer skills to prepare a report, e.g. CV and job application letter.
4	**4.4** Communicates complex relationships between ideas by matching style of writing to purpose and audience. **4.5** Generates written texts reflecting a range of genres and using appropriate structure and layout.		Compares and contrasts views on technology in newspaper articles. Interprets the purposes and objectives for the use of technology after the reading a brochure or manual. Selects technological practices to conform with the guidelines for heath and safety, environmental impact and ethical practice, and uses them within those guidelines. Uses guidelines to ensure technological equipment is used to its full capacity. Uses a computer to prepare a typed report from a had-drafted report. Compares and contrasts different technologies and their impact, e.g. argues the case for new practices when using new technologies, reports on the effects of installation of new machinery. Writes a report on the impact of a particular technology for a specific audience, e.g. management committees, tri-partite committees. Reads a complex diagram to identify components and procedures for dealing with a technical fault or breakdown.

Note: IoC* - Indicators of Competency sub-level

Writing - continued

Scale	IoC*	Indicators of Competence	Technical Communication
3	**3.4** Communicates relationships between ideas through selecting and using grammatical structures and notations, which are appropriate to the purpose. **3.5** Produces and sequences paragraphs according to purpose of text.		Reads a technical manual where the information is supported by diagrams, sufficiently well to be able to locate and comprehend particular information required, e.g. programs a VCR to record two programs in advance. Uses the author, title, key-word and other search indexes of a library computer. Comprehends short summary information on computer-managed learning packages to choose a relevant package to suit own needs. Uses the word processing program on a computer to produce texts. Writes simple instructions for using familiar technology, e.g. how to use an automatic teller machine. Completes a formatted workplace test, e.g. damage or breakdown report. Writes a brief report on uses of technology, e.g. for classroom, workplace, domestic or community purposes.
2	**2.3** Writes about a familiar topic using simple sentence structure and joining ideas through conjunctive links where appropriate. **2.4** Completes forms or writes notes using factual or personal information relating to familiar contexts.		Reads short, relevant, explicit, clearly formatted texts related to technology, e.g. the author and title index of a library computer. Chooses a computer assisted learning package, having read short descriptions of one or two programs, to acquire a defined skill or area of knowledge. Writes a short description, e.g. describes a damaged part of a machine to facilitate repair. Extracts information from a list with language and numeracy components, e.g. price lists of components for computer systems. Records simple and routine information using the telephone, e.g. takes a phone message, on a form designed for this purpose. Interprets instructions, which combine pictorial and written information, e.g. directions on how to operate a piece of machinery safely.
1	**1.3** Copies letters of the alphabet, numbers, and dates in order to convey personal details such as name, address, telephone number. **1.4** Writes basic personal details about self or others such as name, address, and signature. **1.5** Writes one or two phrases/simple sentences conveying an idea, message or opinion drawing from a modelled text.		Recognisees very short, explicit, pictorial texts, e.g. understands logos related to worker safety before using a piece of machinery, reads letters on a keyboard. Reads graphic instructions accompanying a new piece of technology to learn new information or skills about a technology or medium, e.g. uses an automatic teller machine by following instructions given graphically on the screen. Types own name or single words into a computer-assisted learning program.

Note: IoC* - Indicators of Competency sub-level

Numeracy

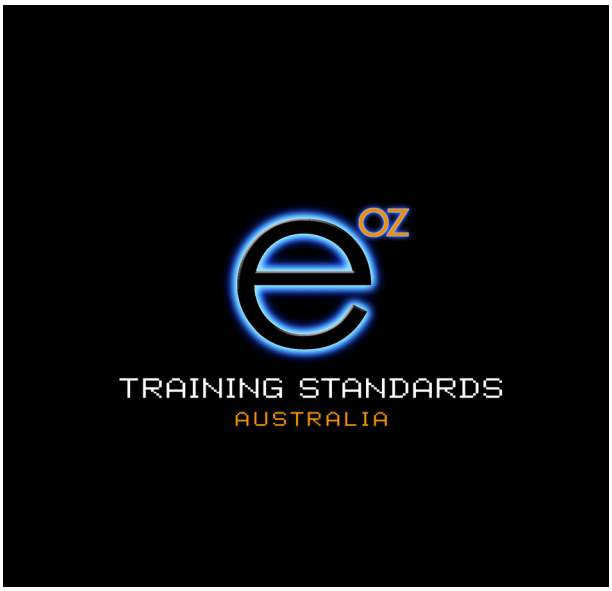
Scale	IoC*	Indicators of Competence	Technical Communication
5	**5.10**	Interprets, selects and investigates appropriate mathematical information and relationships highly embedded in an activity, item or text.	Calculates distance, length and location using the trigonometry and geometry of triangles in relevant situations, e.g. locates grid reference on a map for a boat travelling on an given bearing with time and speed specified; uses dimensions provided on a scaled plan of a roof to find the pitch or slope of the roof. Calculates quantities of materials to title the roof applying a 4% allowance for wastage. Plans and gathers information on a negotiated topic form a variety of sources including government, industry and media about relevant community or workplace issues. Organises information by grouping. Graphically represents and analyses information for a particular purpose. Presents, individually or in a team, a report expressing a viewpoint, which is substantiated by discussion of supporting statistical evidence. Interprets and applies metric quantities and numbers in scientific notation, e.g. calculates the amount of oil in litres spilled from a tanker if it covers a surface area of water of approximately 1200 hectares (1.2 x 107m2) to a thickness of 6 x 103mm. Uses financial formulae, e.g. simple and compound interest to calculate and contrast the interest incurred in borrowing money from financial institutions.
	5.11	Selects and applies a wide range of mathematical strategies flexibly to generate solutions to problems across a broad range of contexts.	
	5.12	Uses a wide range of oral and written informal and formal language and representation including symbols, diagrams and charts to communicate mathematically.	
4	**4.10**	Selects and investigates appropriate mathematical information and relationships embedded in an activity, item or text.	Uses ratio and scale to interpret dimensions on a basic plan. Applies similarity and ratio to estimate and calculate lengths, e.g. finds height of a building, a tree. Compares quality and costs of using imported vs Australian tiles, discount vs brand name paints. Presents information in appropriate graphical format to show different interpretations and influences, e.g. analysis of government spending on education. Applies formulae and interprets results relevant to a familiar practical situation, measuring the dimensions needed and substituting them into the formula, adjusting units where necessary, e.g. length of edging for circular garden or pond, capacity of a water tank or bath. Uses area and perimeter to calculate a range of options, e.g. given a certain length of fencing, plan a range of options for paddock dimensions, which meet specific area requirements. Calculates and contrasts monthly income from average sales, given a variety of salary options involving retainers and commission rates.
	4.11	Selects and applies an expanding range of mathematical strategies flexibly to solve problems in a variety of contexts.	
	4.12	Examines and questions the appropriateness, possible interpretations and implications of aspects of a mathematical activity.	
	4.13	Uses a range of oral and written informal and formal language and representation including symbols, diagrams and charts to communicate mathematically.	

Note: IoC* - Indicators of Competency sub-level

Numeracy - continued

Scale	IoC*	Indicators of Competence	Technical Communication
3	3.10	Selects appropriate mathematical information embedded in a real life activity, item or text.	Uses a distance scale to find the shortest route between two locations on a map and considers road terrain conditions in deciding preferred route.
	3.11	Selects and applies a range of mathematical strategies to solve problems in a number of contexts which are familiar and may be interrelated.	Expresses and calculates with metric quantities, e.g. interprets and costs quantities of cheese given different forms such as 350g, 0.35kg.
	3.12	Reflects on and questions reasonableness and appropriateness of the purpose, process and outcomes of a mathematical activity.	Measures common three-dimensional shapes, e.g. room, and represents the information on an appropriate diagram drawn to scale.
	3.13	Uses oral and written informal and formal language and representation including symbols and diagrams to communicate mathematically.	Calculates with common, fractions and metric measurements, e.g. adjusts the quantities in a recipe by halving or doubling to obtain the required amount.
			Uses a variety of methods to analyse advertising by comparing savings on a number of different items, e.g. at 12% off, 15% off, 1/3 off, price reduced by $10.
			Compares casual and permanent rates of pay over a given time span for work of the same nature.
2	2.9	Locates relevant mathematical information in a familiar real life activity text.	Compares measurements taken with estimated lengths of familiar objects, e.g. estimates and measures storeroom dimensions.
	2.10	Selects and uses straightforward mathematical actions in a familiar and predictable contexts.	
	2.11	Uses estimation and prior experience to examine purpose and check reasonableness of the process and outcomes of a mathematical activity.	
	2.12	Uses oral and written informal and formal language and representation some symbols and diagrams to communicate mathematically.	
1	1.10	Locates simple key mathematical information in a familiar real life activity text.	Estimates lengths of familiar objects using metric units, e.g. a person's height, height of doorway.
	1.11	Recognises and uses straightforward mathematical actions which relate to immediate contexts.	
	1.12	Uses rough estimation and prior experience to identify purpose and check reasonableness of the process and outcomes of a mathematical activity.	

Scale	IoC*	Indicators of Competence	Technical Communication
	1.13	Uses everyday informal oral language and representation including familiar symbols and diagrams to communicate mathematically.	



Electricity Supply Industry
Transmission, Distribution and Rail Training Package

UET06
Volume 2 — Part 4
Key Competencies

Volume 2 of 2

Volume 2 Part 4

4.1 Key Competencies

All Training Packages require the integration of Key Competencies either in each competency standard unit, or across a qualification, depending on industry needs and preferences.

The Key Competencies were first defined in 1992 in the project report, Putting General Education to Work: The Key Competencies Report (Mayer Committee 1992).The skills and knowledge they describe are essential for effective workplace participation and involve the sorts of capabilities commonly used by employers as selection criteria. They underpin the ability of employees to adapt to technological, organisational, societal and functional change.

The Key Competencies are generic, in that they apply to work in general, rather than to particular occupations or industries. They focus on the application of knowledge and skills in an integrated way in workplace situations.

A working example of how to use the key competencies in the ElectroComms and EnergyUtilities Industry has been developed by TAFE South Australia and has been included in this section for interested practitioners.

The seven Key Competencies are

1 Collecting, analysing and organising information

The capacity to locate information, sift and sort information in order to select what is required and present it in a useful way and evaluate both the information itself and the source and methods used to obtain it.

2 Communicating ideas and information

The capacity to communicate effectively with others using the range of spoken, written, graphic and other non-verbal means of expression.

3 Planning and organising activities

The capacity to plan and organise one's own work activities, including making good use of time and resources, sorting out priorities and monitoring one's own performance.

4 Working with others and in teams

The capacity to interact effectively with other people both on a one-to-one basis and in groups including understanding and responding to the needs of a client and working effectively as a member of a team to achieve a shared goal.

5 Using mathematical ideas and techniques

The capacity to use mathematical ideas such as number and space, and techniques such as estimation and approximation for practical purposes.

6 Solving problems

The capacity to apply problem-solving strategies in purposeful ways, both in situations where the problem and the desired solution are clearly evident and in situations requiring critical thinking and a creative approach to achieve an outcome.

7 Using technology

The capacity to apply technology combining the physical and sensory skills needed to operate equipment with the understanding of scientific and technological principles needed to explore and adapt systems.

Performance levels

Performance Level 1

Competence needed to undertake activities efficiently and with sufficient self-management to meet the explicit requirements of the activity and to make judgments about quality of outcome against established criteria.

Performance Level 2

Competence needed to manage activities requiring the selection, application and integration of a number of elements and to select from established criteria to judge quality of process and outcome.

Performance Level 3

Competence needed to evaluate and reshape processes, to establish and use principles in order to determine appropriate ways of approaching activities, and to establish criteria for judging quality of process and outcome.

4.2 Working Example of Key Competencies

A wring model of key competencies has been developed by TAFE South Australia. It provides, free of charge, on-line resource materials and tools. The online website called "LINKup Key Competencies" is designed for students, trainers, teachers, employers and anyone with a serious interest in practically assessing and nurturing the development of their own, or others', Key Competencies. Part of the site is built to entertain and made suitable for general interest and simple exploration of Key Competencies or Generic Skills. The remainder of the site is very comprehensive and suited to people with a serious interest in practical implementation of Key Competencies assessment and development.

The innovative website offers a comprehensive, proven practical way to assess and improve Key Competencies. It is based on 13 years of action research and development, has achieved national and international acclaim, is used by students, trainers, teachers and employers.

It covers four key areas:

1. Discover
This section provides an opportunity to just explore what Key Competencies are about.

2. Investigate
This section provides numerous resources to inform about the LINKup assessment process called *'Validated Self Assessment'*. This process is designed to give formal recognition for Key Competencies AND to help people improve these important personal skills.

3. Try
After 'Investigating' LINKup, individuals have a chance to try 'first-hand' a LINKup Key Competencies Assessment (via an online simulation) and to check their understanding of the 'Validated Self Assessment' process (via a short multiple-choice quiz). This also allows them to Register for free access to the complete package of LINKup resources.

4. Reflect
This section provides individuals with an opportunity to reflect on how LINKup could help them. Also, for educators or trainers it offers some suggestions on different ways to implement LINKup in training programs and for employers there are some suggestions for incorporating this strategy into Performance Management for all staff.

5. Resources
ALL LINKup resources are available FREE of charge upon successful registration. These can be accessed directly from the homepage via the 'resources' link.

Resources are listed in the following categories:

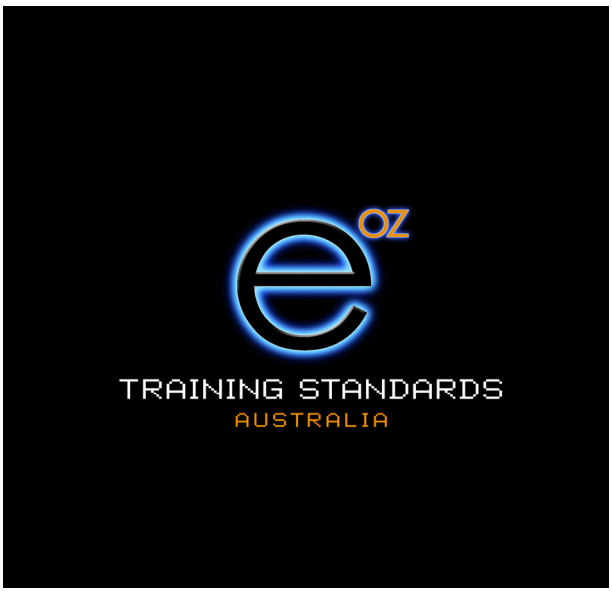
- **Online Resources**
  - Validated Self Assessment Sheets (including NEW interactive versions!)
  - Key Competencies Assessment (for Everyone)
  - Implementing Key Competencies Assessment (for Trainers)

- **Research Documents**
  - Key Competencies Assessment at Torrens Valley TAFE
  - Stories from the field

- **Complete Resource Pack**
  - Download ALL the LINKup resources in one convenient pack

The website address is: http://www.tvtafe.sa.edu.au/linkup/

- Download ALL the LINKup resources in one convenient pack



UET06
Electricity Supply Industry
Transmission, Distribution and Rail Training Package

Volume 2 — Part 5
Skills Enabling Employment

Volume 2 of 2

Volume 2 Part 5

5.1 Skills Enabling Employment

The Competency Standard Units incorporate a range of employment-based skills that are expected of individuals in a workplace.

The following skills for employment should be achieved and confirmed consistent with the application of each competency standard unit relative to the qualification to which it contributes. Assessment shall be applied holistically and confirm that the critical aspects of evidence have been demonstrated to an extent that it indicates understanding of the following aspects:

	Skill for employment	Critical aspect of evidence
1	Developing and using skills within a real workplace	Demonstrates an ability to develop and use spatial, dexterity and technology skills as well as health, safety and house keeping skills meaningful to a workplace environment.
2	Learning to learn in the workplace	Demonstrates an ability to access, confirm and learn, knowledge and culture related to, and used in, a workplace environment.
3	Reflecting on the outcome and process of work task	Demonstrates an ability to reflect on performance of the work task, its outcome and the process used in completing the task in a workplace environment.
4	Interacting and understanding of the context of the work task	Demonstrates an ability to interact in real work tasks, understand the context of the task within a work environment, and speak and write to related personnel/community at a standard expected of the workplace/industry sector.
5	Planning and organising the meaningful work task	Demonstrates an ability to prepare, organise and complete real workplace tasks to workplace standards, including selecting appropriate tools/equipment to complete tasks in a workplace environment and, the setting and achievement of personal goals.
6	Performing the work task in non-routine or contingent situations	Demonstrates an ability to seek and apply solutions to problems, using mathematical and cognitive skills relevant to a workplace environment, and/or seek advice from appropriate personnel when in doubt.