22557VIC

Course in
Safe Work Practices for Testing Low and High Voltage Distribution Power Cables

Version 1.1 September 2023

This course has been accredited under Part 4.4 of the Education and Training Reform Act 2006.

Accredited for the period 1 May 2020 to 30 April 2025

Version History:		Date
Version 1.1	Department of Education and Training (DET) details and contact information updated with Department of Jobs, Skills Industries and Regions (DJSIR) details in Section A	September 2023

© State of Victoria (Department of Jobs, Skills, Industries and Regions) 2020.

Copyright of this material is reserved to the Crown in the right of the State of Victoria. This work is licenced under a Creative Commons Attribution-No Derivatives 4.0 International licence (more information is available on the *Creative Commons website*). You are free to use, copy and distribute to anyone in its original form as long as you attribute Department of Jobs, Skills, Industries and Regions (DJSIR) as the author, and you licence any derivative work you make available under the same licence.

Disclaimer

In compiling the information contained in and accessed through this resource, DJSIR has used its best endeavours to ensure that the information is correct and current at the time of publication but takes no responsibility for any error, omission or defect therein.

To the extent permitted by law, DJSIR, its employees, agents and consultants exclude all liability for any loss or damage (including indirect, special or consequential loss or damage) arising from the use of, or reliance on the information contained herein, whether caused or not by any negligent act or omission. If any law prohibits the exclusion of such liability, DJSIR limits its liability to the extent permitted by law, for the resupply of the information.

Third party sites

This resource may contain links to third party websites and resources. DJSIR is not responsible for the condition or content of these sites or resources as they are not under its control.

Third party material linked from this resource is subject to the copyright conditions of the third party. Users will need to consult the copyright notice of the third party sites for conditions of usage.

Table of contents:

Section A: Copyright and course classification information

1. Copyright owner of the course	Copyright of this material is reserved to the Crown in the right of the State of Victoria on behalf of the Department of Jobs, Skills, Industries and Regions (DJSIR) Victoria. © State of Victoria (DJSIR) 2020
2. Address	Executive Director Higher Education and Workforce Skills and Employment Department of Jobs, Skills, Industries and Regions (DJSIR) GPO Box 4509 MELBOURNE VIC 3001 **Organisational contact** Manager, Training and Learning Products Unit Higher Education and Workforce Skills and Employment Telephone: 131 823 Email: *course.enquiry@djsir.vic.gov.au* **Day-to-day contact** Curriculum Maintenance Manager (CMM), Engineering Industries Box Hill Institute Private Bag 2014 Box Hill Vic. 3128 Telephone: (03) 9286 9934 Email: *steven.bryant@boxhill.edu.au*
3. Type of submission	Accreditation
4. Copyright acknowledgement	Copyright of this material is reserved to the Crown in the right of the State of Victoria. © State of Victoria (DJSIR) 2020
5. Licensing and franchise	Copyright of this material is reserved to the Crown in the right of the State of Victoria. © State of Victoria (DJSIR) 2020 This work is licensed under a Creative Commons Attribution-No Derivatives 4.0 International licence (see Creative Commons for more information). You are free to use, copy and distribute to anyone in its original form if you attribute the State of Victoria (DJSIR) as the author and you licence any derivative work you make available under the same licence.

	Request for other use should be addressed to: Executive Director Higher Education and Workforce Skills and Employment Department of Jobs, Skills, Industries and Regions (DJSIR) Email: course.enquiry@djsir.vic.gov.au Copies of this publication can be downloaded free of charge from the Victorian government website.	
6. Course accrediting body	Victorian Registration and Qualifications Authority	
7. AVETMISS information	**ANZSCO code**	312312 Electrical Engineering Technician
	ASCED Code	0313 Electrical and Electronics Engineering and Technology
	National course code	22557VIC
8. Period of accreditation	1 May 2020 – 30 April 2025	

Section B: Course information

1. Nomenclature	*Standard 1 AQTF Standards for Accredited Courses*
1.1 Name of the qualification	Course in Safe Work Practices for Testing Low and High Voltage Distribution Power Cables
1.2 Nominal duration of the course	50 - 80 hours
2. Vocational or educational outcomes	***Standard 1 AQTF Standards for Accredited Courses***
2.1 Purpose of the course	The purpose of this course is to provide qualified electrical tradespersons, technicians and engineers with the knowledge and skills to work safely with low and high voltage distribution power cables. The course also includes units which provide the knowledge and skills to identify, spike, and test low and high voltage distribution power cables
3. Development of the course	***Standards 1 and 2 AQTF Standards for Accredited Courses***
3.1 Industry/enterprise/community needs	Citipower/Powercor, Jemena, United Energy and Aust Net Services collectively referred to as Victoria's Distribution Network Service Providers (DNSPs) own, manage and maintain the infrastructure that supplies electrical power to residences and businesses across Victoria. The infrastructure includes many hundreds of kilometres of low and high voltage underground distribution power cabling. The service providers through the Victorian Electricity Supply Industry (VESI) have indicated there is a shortage of electrical tradespersons and technicians with the required level of knowledge and skills to safely carry out accessing, identifying and testing of low and high voltage distribution power cables. Through their representatives on the Victorian Skill Commissioner's (VSC) Sector Advisory Group (SAG), services providers have advised there is a need to train 120 electrical personnel over the next 24 months to provide them with the required safety knowledge and skills for this critical work. SAG members also indicated that the demand for skills in locating and testing low and high voltage distribution power cabling will increase through the growth of underground services and connections to residential estates and the supply connection from new energy sectors such as wind and solar farms. In addition, it was noted that the rail transport system also has the need for significant amount of cable testing as part its ongoing network maintenance requirements. Service providers representatives have advised that the unit of competency - UETTDRIS59A - Conduct high

potential testing of power system underground power cables from the UET – Transmission, Distribution and Rail Sector Training Package is currently not fit for purpose, as it does not cover all aspects of distribution power cable testing. Further, the unit has pre-requisite requirements (16 units) which create an unnecessary barrier to entry.

The SAG collectively agreed that the development of a short course primarily focussed on the knowledge and skills to apply safe work practices when testing and/or spiking low or high voltage distribution power cables was the way forward.

A Subject Matter Experts (SME) group was formed and met with the CMM – Engineering Industries to develop a knowledge and skills profile and suggested structure for a short course (refer Appendix 1).

To guide the ongoing development of the course curriculum, a Project Steering Committee (PSC) was formed from the membership of both the SAG and SME.

Members of the PSC are:

Robert Foord	United Energy (DNSP industry representative)
John Vasilpoulos	Jemena (DNSP industry representative)
Loc Vuong	Energy Safe Victoria (Victorian electrical safety regulator representative)
Pam O'Neill	Citipower/Powercor (DNSP industry representative)
Michael Collins	Electrical Trades Union (ETU representative)
Alex Newman	Future Energy Skills (Electrotechnology industry association representative)

In attendance:

George Adda	CMM – Engineering Industries (Project co-ordinator)
Oana Cochrane	Future Energy Skills (Meeting minutes)
Trevor Lange	CMM – Engineering Industries (course writer)

This proposed course:

- does not duplicate, by title or coverage, the outcomes

	of an endorsed training package qualification • is not a subset of a single training package qualification that could be recognised through one or more statements of attainment or a skill set • does not include units of competency additional to those in a training package qualification that could be recognised through statements of attainment in addition to the qualification • does not comprise units that duplicate units of competency of a training package qualification.
3.2 Review for re-accreditation	Not applicable
4. Course outcomes	***Standards 1, 2, 3 and 4 AQTF Standards for Accredited Courses***
4.1 Qualification level	**Reference: Standards 1, 2 and 3 AQTF Standards for Accredited Courses** This 'Course in' meets an identified industry need, but does not have the breadth, depth or volume of learning of a qualification.
4.2 Employability skills	**Reference: Standard 4 AQTF Standards for Accredited Courses** Not applicable
4.3 Recognition given to the course (if applicable)	**Reference: Standard 5 AQTF Standards for Accredited Courses** Not applicable
4.4 Licensing/ regulatory requirements (if applicable)	**Reference: Standard 5 AQTF Standards for Accredited Courses** Not applicable
5. Course rules	***Standards 2, 6, 7 and 9 AQTF Standards for Accredited Courses***
5.1 Course structure To receive the Statement of Attainment for the *Course in Safe Work Practices for Testing Low and High Voltage Distribution Power Cables,* graduates must successfully complete three (3) units consisting of: – core unit *plus* – two (2) elective units Course participants who successfully complete one or two units will receive a Statement of Attainment for the unit/s completed.	

Unit of competency code	Field of Education code (six-digit)	Unit of competency title	Pre-requisite	Nominal hours
Core unit				
VU22928	031399	Work safely with low and high voltage distribution power cables	None	20
Elective units				
VU22929	031399	Inspect and test high voltage (HV) distribution power cables	VU22928	40
VU22930	031399	Identify and spike high voltage (HV) underground cables	VU22928	20
VU22931	031399	Inspect and test low voltage (LV) underground cables	VU22928	10
			Total nominal hours	**50-80**

5.2 Entry requirements	**Reference: Standard 9 AQTF Standards for Accredited Courses** To meet industry requirements the minimum essential qualification level to enter this course is an AQF Certificate III qualification in *power systems* or *electrotechnology.* Examples qualifications are: – UET30819 - Certificate III in ESI - Power System – Distribution Cable Jointing, – UEE30811 - Certificate III in Electrotechnology Electrician. It is also recommended that applicants have language, literacy and numeracy skills equivalent to Level 3 of the Australian Core Skills Framework (ACSF). Information about the ACSF can be found on the website *https://www.education.gov.au/australian-core-skills-framework* Applicants who have a lower level of language and literacy may require additional support to undertake the course.
6. Assessment	***Standards 10 and 12 AQTF Standards for Accredited Courses***
6.1 Assessment strategy	**Reference: Standard 10 AQTF Standards for Accredited Courses**

	All assessment, including Recognition of Prior Learning (RPL), must be compliant with the requirements of:
	• Standard 1 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 4.1 and 4.2 of the VRQA Guidelines for VET Providers,
	or
	• the Standards for Registered Training Organisations 2015 (SRTOs),
	or
	• the relevant standards and Guidelines for RTOs at the time of assessment.
	• Assessment strategies must therefore ensure that:
	  • all assessments are valid, reliable, flexible and fair
	  • learners are informed of the context and purpose of the assessment and the assessment process
	  • feedback is provided to learners about the outcomes of the assessment process and guidance given for future options
	  • time allowance to complete a task is reasonable and specified to reflect the context in which the task takes place.
	• Assessment strategies should be designed to:
	  • cover a range of skills and knowledge required to demonstrate achievement of the course aims
	  • collect evidence on a number of occasions to suit a variety of contexts and situations
	  • be appropriate to the knowledge, skills, methods of delivery, and needs and characteristics of learners
	  • assist assessors to interpret evidence consistently
	  • recognise existing skills
	  • be equitable to all learners.
	• Assessment methods are included in each unit of competency and may include:
	  • direct observation of processes and procedures
	  • oral and/or written questioning
	  • testimony from a competent person e.g. electrical engineer/supervisor
	  • inspection of final process outcomes
	  • documented work-based evidence
	  • demonstration of practical skills.
	A holistic approach to assessment is encouraged by combining the assessment of the core unit with the elective units to better replicate on the job work

	practices and to reduce the potential for over assessment. Units of competency maybe assessed on-the-job, off-the-job or a combination of both. Where assessment is conducted off-the-job, then an appropriate simulation must be used where the range of conditions reflects realistic worksite situations.
6.2 Assessor competencies	**Reference: Standard 12 AQTF Standards for Accredited Courses** Assessment must be undertaken by a person or persons in accordance with: • Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 3 of the VRQA Guidelines for VET Providers, or • the *Standards for Registered Training Organisations 2015* (SRTOs), or • the relevant standards and Guidelines for RTOs at the time of assessment.
7. Delivery	***Standards 11 and 12 AQTF Standards for Accredited Courses***
7.1 Delivery modes	**Reference: Standard 11 AQTF Standards for Accredited Courses** This course is suitable for either full or part-time delivery. Providers should endeavor to be flexible in the way the training is delivered to ensure they meet the needs of the client group. Units of competency maybe delivered on-the-job, off-the-job or a combination of both. Where delivery is off-the-job, conditions should reflect realistic worksite situations to address potential safety hazards. The primary objective of the course is to develop competence in safe work practices when testing LV/HV or spiking HV distribution power cables. Practical demonstrations followed by opportunity for application will provide the best strategy to reflect the objectives of the course. Other delivery methods may include: • classroom presentation • case study analyses • practical exercises • project work

	Program delivery should allow for self-directed learning and development together with independent judgement and accountability for outputs. It is recommended that the delivery of the core unit is integrated with the delivery of the selected elective units for the most effective outcome.
7.2 Resources	**Reference: Standard 12 AQTF Standards for Accredited Courses** General facilities, equipment and other resources required to deliver this course include: • training facilities and relevant testing and measurement equipment, sample power cabling, spiking and cutting tools • OHS/WHS legislation, procedures and guidelines, LV and HV service guidelines, Australian standards and codes of practice • access to relevant hand tools and hand held power tools, materials and consumables • access to site plans, drawings and work instructions • test and spiking equipment manufacturer manuals • worksite environment or simulated worksite environment appropriate to the assessment tasks. Training must be undertaken by a person or persons in accordance with: • Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guideline 3 of the VRQA Guidelines for VET Providers, or • the *Standards for Registered Training Organisations 2015* (SRTOs), or • the relevant standards and Guidelines for RTOs at the time of assessment.
8. Pathways and articulation	***Standard 8 AQTF Standards for Accredited Courses***
	There is no formal articulation or credit transfer arrangements from this course into other VET or higher education qualifications. If arranging articulation providers should refer to the: *AQF 2nd Edition, 2013 Pathways Policy*
9. Ongoing monitoring and evaluation	***Standard 13 AQTF Standards for Accredited Courses***

	Ongoing evaluation and validation of this course is the responsibility of the Curriculum Maintenance Manager (CMM) - Engineering Industries. A review committee will be established no later than mid-way through the accreditation period to monitor and evaluate the course. It will include representatives from: • Distribution Network Service Providers (DNSPs) • electrical union • course providers • course graduates With the support and guidance of the CMM the committee will: • review the implementation of the course • provide advice about changing program requirements • monitor and evaluate course standards, delivery and assessment • assess the continuing need for the course should appropriate units of competency be incorporated into a nationally endorsed training package qualification. Recommendations for significant changes will be reported through the CMM - Engineering Industries to the VRQA.

Appendix 1

Knowledge and Skills Profile:

Proposed title:

Inspect and test Low and High voltage Distribution Power cables

Target group:

- Cable jointers
- Electricians
- Protection and Control tester
- Engineers (electrical)

Proposed knowledge and skills profile:

The proposed course will provide participants with the knowledge and skills to be able to test low and high voltage distribution power cables to a maximum voltage of 66KV. This includes:

- Safety risk management plan/job safety analysis (JSA)
- Interpreting detailed drawings of electrical and physical design
- Receiving, interpreting and checking access authority, e.g. Sanction for test, electrical access permit/test permits
- Performing onsite checks to establish isolation points, earthing and labelling of equipment
- Removing and reconnecting apparatus and earths
- Selecting the most suitable test location/s
- Erecting warning signs and barricades
- Identifying and spiking underground cables
- Performing low and high voltage testing procedures including phase identification, continuity and insulation resistance
- Recording test measurements and interpreting results

Suggested course content:

General information:

The aim of testing low and high voltage cables is to:

a) Prove newly installed or repaired cables are fit for purpose
b) Identify and locate faults in power cables

Specific tests requirements are included for commissioning, after repairs and modifications.

- Types of cables include but not limited to:
  - Single core
  - Multi core
  - XLPE
  - HV Arial Bundled Cable
  - Paper insulated lead cable
  - HSL
  - Oil filled
- HV testing requirements:
  - Conductor resistance test
  - Continuity check
  - Core identification check

- Characterise and locate faults in metallic cables (Cable Time Domain Reflection) (TDR)
- Cross bonding/current injection test Dielectric Dissipation Factor (DDF)
- partial discharge (PD) measurement ‘on line and offline’
- Low and High voltage test (VLF, 50hz, DC)
- Insulation resistance (IR) test
- Phase identification
- Sequence impedance measurements
- Serving Test - Sub-transmission cables and High voltage cables (testing the integrity of the cable outer sheath)
- Sheath or screen resistance test
- Sheath voltage limiters (SVL)
- Cable faults
- Testing Oil Alarms (Oil filled cables)
- Taking Oil Samples for DGA testing

- LV testing requirements:
  - pre-energising tests
    - insulation resistance
    - continuity
    - Phasing
  - equipment functionality tests
  - polarity, voltage and phase sequence tests
  - neutral and phase identification tests
  - neutral integrity tests
  - Live cable Identification
  - Live phasing of PLY cables
- For each of the test options the following points should be considered:
  - Statutory regulations standards
  - Test purpose
  - Testing conditions
  - Test equipment
  - Test procedures
  - Interpreting test results

Standards - electrical safety:

- Victorian Electricity Supply Industry (VESI). Electrical safety rules for the VESI distribution networks (The Green Book)
- Energy Safe Victoria. Code of Practice on electrical safety for the work on or near H.V. electrical apparatus (The Blue Book)
- AS2067, AS1429.1 and AS1824. Manufacturer specifications

Section C—Units of competency

VU22928	Work safely with low and high voltage distribution power cables
VU22929	Inspect and test high voltage (HV) distribution power cables
VU22930	Identify and spike high voltage (HV) underground cables
VU22931	Inspect and test low voltage (LV) underground cables

OFFICIAL

Unit code	**VU22928**
Unit title	**Work safely with low and high voltage distribution power cables**
Unit Descriptor	This unit describes the performance outcomes, skill and knowledge required for participants to work safely when handling low and high voltage distribution power cables to a maximum voltage of 66KV. The unit includes knowledge of the hierarchy of documentation for electrical safety, safety terminology, process of ensuring a safe work environment, identification of safety hazards, application of safety equipment, reporting of safety related issues. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Pre-requisite Unit(s)	N/A
Application of the Unit	This unit of competency applies to any person employed or contracted by a Distribution Network Service Provider (DNSP) or other organisations responsible for the maintenance and repair of low and high voltage distribution power cables.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.
1. Access and interpret safe work documentation	1.1 ***Hierarchy of documentation for electrical safety*** is identified and individual documents are accessed and interpreted 1.2 Safety terminology is clarified and correctly applied 1.3 Non-compliance with safety processes and procedures is recognised and action/s are determined to comply to the safety processes
2. Prepare to work with or in the vicinity of high or low voltage distribution power cables	2.1 ***Work documentation*** is obtained and discussed with ***appropriate personnel*** 2.2 Work team is assembled and person with first aid responsibilities is identified 2.3 ***Potential safety hazards*** are identified and risk control measures are determined for onsite application 2.4 ***Operations/network controller*** is notified of the work task and location

		2.5 All equipment and tools required for the work task are obtained in accordance with enterprise procedures and checked for safe working operation
		2.6 ***Safety devices*** and equipment for the work task is accessed and checked for correct operation
		2.7 ***Personnel protective equipment (PPE)*** is accessed according to enterprise procedure and checked for safety and compliance for the work task
3.	Work safely with or in the vicinity of high or low voltage distribution power cables	3.1 Worksite is located and risk control measures are devised and implemented for any safety hazards not previously identified
		3.2 Safe approach distances are determined and signs and safety barriers are erected
		3.3 Appropriate Access Authority is checked against the task being undertaken
		3.4 Safety observer is appointed, briefed on responsibilities and posted in required position
		3.5 Access trench to exposed cables is prepared and checked for conformance with entry requirements
		3.6 All cables, related components and other energy assets within the worksite are identified and any inconsistencies with the site plan are noted
		3.7 Safe work practices are employed at all times when working with or in the vicinity of distribution power cables
		3.8 Actions for dealing with an ***unexpected situation*** are applied with the safety of the work team and public as the first priority
4.	Complete work with or in the vicinity of high or low voltage distribution power cables	4.1 Completed work is checked against job instructions and any non-compliance or anomalies are documented
		4.2 Tools and equipment are cleaned, checked and stored in accordance with enterprise procedures
		4.3 Operations/network controller is advised that the cable work is completed, notified of any change and cables are fit for service
		4.4 Works completion records/report forms are accurately completed in accordance with enterprise procedures
		4.5 Any anomalies, safety issues or safety related instances at the worksite are recorded on the job safety analysis documentation and reported in accordance with enterprise procedures

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Accessing, interpreting and applying relevant safety standards, regulations, codes of practices, rules and site plans that apply when working with or in the vicinity of low and high voltage distribution power cables
- Completing job safety analysis documentation including identifying potential safety hazards at the worksite and determining appropriate risk control measures
- Checking and using relevant safety equipment including personal protective equipment (PPE)
- Responding to unexpected safety hazards at a worksite in accordance safety procedures

Required knowledge:

- Hierarchy of electrical safety documentation
- Safety terminology
- Safety equipment including personal protective equipment (PPE)
- Actual and potential safety hazards and control measures when working with or in the vicinity of low and high voltage distribution power cables
- Issues which may impede a person's ability to work safely in an electrical environment
- Safe approach distances
- Victim rescue and first aid requirements

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Hierarchy of documentation for electrical safety means:	– Acts and regulations – codes of practice and safety rules – organisational procedures – organisational work instructions
Work documentation may include but is not limited to:	– work permit – access authority

	– design and construction drawings – work/job instructions – job safety analysis – toolbox check list
Appropriate personnel may include but is not limited to:	– service provider network controller – safety officer – works manager – plant distribution manager – operational delivery risk manager – team leader/supervisor – tester in charge – permit recipients – LV/HV operator – other team members involved in the work task
Potential safety hazards may include but are not limited to:	– electrical shock/burns – road traffic – pedestrian traffic – other nearby assets – flooding – vegetation interference – road works – weather and environmental conditions – damage or vandalism to the work site – incorrectly identified cable/s or undocumented cable/s – wild life
Operations/Network controller includes:	– asset owner – controller/operator of an electricity network
Safety devices may include but are not limited to:	– LV/HV insulated sticks – insulated sheets and mats – earthing and bonding clamps and leads – approved tapes and other measuring devices

Personnel protective equipment (PPE) may include but is not limited to:	– safety head wear – safety footwear – ankle to wrist natural fibre or arc rated protective clothing – insulated gloves approved for live work – face/eye protection (shield) approved for live work
Unexpected situation may include but is not limited to:	– injured team member – unauthorised person/s entry into work zone – sudden weather change – equipment failure – LV/HV cable/s and/or other underground assets inconsistent with the site plan – unexpected LV/HV cable damage

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the associated performance criteria. Specifically they must be able to:

- demonstrate a knowledge of the safety regulations, codes of practice and rules that apply when working with or in the vicinity of LV or HV distribution power cables
- implement safe work practices at all times when working with or in the vicinity of LV or HV distribution power cables
- apply appropriate safety procedures when dealing with an unexpected worksite safety hazard.

Context of and specific resources for assessment

Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions. Where simulation is used, it must reflect real working conditions by modelling industry operating conditions and contingencies.

Assessment must ensure candidate has access to:

- jobsite safety documentation
- equipment manuals
- cable location plans and diagrams

- job instruction and relevant work place procedures
- approved tools and tested test equipment
- safety equipment including PPE

The competencies covered by this unit can be demonstrated by an individual working alone or as part of a team.

Method of assessment

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

- direct observation of the candidate working safely with or in the vicinity of distribution power cables in a real worksite or simulated worksite environment
- demonstration of safety procedures for a simulated emergency or unexpected situation
- written and oral questioning to test underpinning knowledge of safe work procedures and practices when working with or in the vicinity of distribution power cables
- review of portfolio of evidence and third-party workplace reports of on-the-job performance by the candidate.

Unit code	**VU22929**
Unit title	**Inspect and test high voltage (HV) distribution power cables**
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to enable a person to safely inspect and test high voltage (HV) distribution power cables within a voltage range of 1kV up to and including 66kV. The unit includes safe work practices, risk control measures, documentation, checking and calibrating testing equipment, accessing HV cables, inspecting and testing procedures in accordance to a test plan, interpreting results, recording test measurements, and return cables fit for purpose. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.'
Employability Skills	This unit contains Employability Skills.
Pre-requisite Unit	VUXXX01- Work safely with low and high voltage distribution power cables
Application of the Unit	This unit of competency applies to any person employed or contracted by a Distribution Network Service Provider (DNSP) or other organisations responsible for the maintenance and repair of low and high voltage distribution power cables.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.
1. Prepare to carry out inspection and test plan	1.1 Relevant Occupational Health and Safety/Workplace, Health and Safety (OHS/WHS) requirements for the work task are determined and followed. 1.2 ***Potential safety hazards*** are identified and risk control measures devised for implementation at the worksite 1.3 ***Documentation*** relevant for the inspection and test plan is obtained and discussed with ***appropriate personnel*** 1.4 Toolbox checklist is completed and equipment needed for the ***inspection and test plan*** is obtained in accordance with enterprise procedures 1.5 Testing equipment is checked and recalibrated where necessary in accordance to manufacturer's guidelines

		1.6	Safety equipment including ***personal protective equipment (PPE)*** is obtained and checked in accordance to enterprise procedures
2.	Inspect and prepare worksite prior to testing	2.1	***HV operations/network controller*** is notified of the work task and location
		2.2	Safety hazards not previously identified are responded to and risk control measures devised and implemented
		2.3	Appropriate signs and barrier are erected to create a work area exclusion zone
		2.4	Safety observer, if required is appointed, briefed on responsibilities and emergency procedures and posted in required position
		2.5	Ground trench is excavated if required and work area checked for conformance with entry requirements
3.	Undertake inspection and test plan procedures	3.1	Cable layout, terminals and any other components are checked against diagrams, site plans and specifications and any variations are recorded
		3.2	Condition of cable sheath/insulation, connections are checked for deterioration, interference or physical damage and recorded in accordance with enterprise procedure
		3.3	Appropriate Access Authority is obtained for the task being undertaken
		3.4	Where cables are terminated through a current transformer, ground conductors are checked for correct placement and that shields are correctly terminated
		3.5	Cable/s to be tested are correctly identified and tagged and the most suitable testing location is identified
		3.6	Test equipment is set up in accordance with manufacturer's requirements and tests are performed in accordance with the test plan and testing specifications
		3.7	Results of each test are verified and recorded in accordance with enterprise requirements
4.	Confirm completion of inspection and test plan	4.1	Completed test procedures are checked against test plan and testing specifications to confirm all required tests have been completed
		4.2	Service provider network controller is notified that the test plan is completed and cables are returned fit for purpose
		4.3	Any cable and/or component damage or non-conformance issues identified in the inspection and

tests is reported in accordance with enterprise procedures

4.4 Testing equipment and tools are cleaned, checked for damage and returned in accordance with enterprise procedures

4.5 Completed HV cable inspection, test plan and results are documented and reported in accordance with enterprise requirements

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- obtaining, interpreting and following: HV cable test plan, cable plans, diagrams and drawings of assets, relevant equipment set up and service instructions, tool box checklist, job safety analysis documentation
- applying relevant personal and worksite safety precautions when working with or in the vicinity of HV underground cable
- assessing the excavated cable access trench and establishing a safe work environment
- identifying HV distribution power cables, related components and other underground service assets
- setting up, calibrating and operating approved HV cable test equipment
- interpreting and recording test results in accordance to enterprise requirements
- recognising HV cable deterioration and faults
- planning, completing and documenting a HV distribution power cable test

Required knowledge:

- safe work practices when testing HV distribution power cables
- HV cable types and identification
- HV cable tests and associated equipment
- information sources related to working with HV distribution power cables
- training and authorisation requirements together with the roles and responsibilities of testing team members
- hierarchy of documentation for electrical safety
- potential worksite hazards and hazard control measures

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Potential safety hazards may include but are not limited to:

- electrical shock and burns
- road traffic
- pedestrian traffic
- other nearby assets
- flooding

- vegetation interference
- road works
- weather and environmental conditions
- damage or vandalism to the work site
- incorrectly identified cable/s or undocumented cable/s
- wild life

Documentation may include but is not limited to:

- design and construction drawings
- work/job instructions
- test plan
- access permit
- as built plans
- Victorian Electricity Supply Industry (VESI) - Electrical Safety Rules for the VESI Distribution Networks (Green Book)
- Energy Safe Victoria (ESV) - Code of Practice on electrical safety for the work on or near high voltage electrical apparatus (Blue Book)
- VESI standards
- VESI Fieldworker Handbook
- current enterprise documentation

Appropriate personnel may include but is not limited to:

- safety officer
- works manager
- plant distribution manager
- operational delivery risk manager
- team leader/supervisor
- tester in charge
- permit recipients
- others team members involved with carrying out the test plan

Inspection and test plan may include but is not limited to the following:

- continuity test check
- cross bonding/current injection test
- Dielectric Dissipation Factor (DDF) and Partial Discharge (PD) measurement
- high voltage test
- Insulation Resistance (IR) test
- phase identification test
- remote energisation testing
- sequence impedance measurements
- serving test

	– sheath or screen insulation resistance test – Sheath Voltage Limiter (SVL) test
Personnel protective equipment (PPE) may include but is not limited to:	– safety head wear – safety footwear – ankle to wrist natural fibre or arc rated protective clothing – insulated gloves approved for live work – face/eye protection (shield) approved for live work
HV operations/network controller means:	– owner, controller or operator of an electricity network – asset owner

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the associated performance criteria. Specifically they must be able to: – implement safe work practices when testing HV distribution power cables – safely carry out and complete a HV distribution cable inspection and a test plan on at least two occasions each in a different context.
Context of and specific resources for assessment	Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions. Where simulation is used, it must reflect real working conditions by modelling industry operating conditions and contingencies, as well as, using suitable facilities, tools and a range of typical HV cable testing equipment and personal protective equipment. Assessment must ensure candidate has access to: – jobsite safety documentation – equipment manuals – cable location plans and diagrams – test plan and relevant work place procedures The elements and performance criteria in this unit should be demonstrated within a work team environment
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the candidate performing cable

identification, inspection and test procedures in a real workplace setting or simulated environment

- written and oral questioning to test underpinning knowledge of safety work practices, HV cable identification, inspections and test procedures
- review of a portfolio of documented evidence
- third-party workplace reports of on-the-job performance by the candidate.

Unit code:	**VU22930**
Unit title:	**Identity and spike high voltage (HV) underground cables**
Unit Descriptor	This unit of competency describes the knowledge and skills required to safely identify and spike high voltage (HV) underground cables within a range of 1kV up to and including 66kV. The unit includes creating a safe work environment, personal safety requirements, identification of cables and other underground service assets and operating spiking equipment. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Prerequisite Unit	VU22928-Work safely with low and high voltage distribution power cables
Application of the Unit	This unit of competency can be applied to any person employed or contracted by an energy Distribution Network Service Provider (DNSP) or other organisations responsible for the maintenance and repair of low and high voltage distribution power cables.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.
1. Prepare for HV underground cable spiking task	1.1 Relevant Occupational Health and Safety/Workplace Health and Safety (OHS/WHS) requirements are determined in preparation for the work task
	1.2 ***Potential safety hazards*** are identified and risk control measures devised for implementation at the worksite
	1.3 ***Documentation required for the task*** is obtained and discussed with ***appropriate personnel*** and others involved in the work task
	1.4 Toolbox checklist is completed and tools and equipment required for the work task are obtained in accordance with enterprise procedures
	1.5 ***Equipment required for the task*** is individually tested in accordance to manufacturer's guidelines
	1.6 Safety equipment including ***personal protective equipment (PPE)*** is obtained and checked in accordance to enterprise procedures

2.	Set up worksite in preparation for cable spiking tasks	2.1	***HV operations/network controller*** is notified of the work task and location
		2.2	Work area is located and appropriate signs and barriers are erected to create a work area exclusion zone
		2.3	Safety hazards not previously identified are responded to, risk is assessed and control measures devised and implemented
		2.4	Safety observer is appointed if required, briefed on responsibilities and emergency procedures and posted in required position
		2.5	Cable access area is located from cable plans and as built information and if required excavated to expose mechanical protection
3.	Prepare to carryout HV cable spiking	3.1	Cable identifier is set up and cable to be spiked is identified and tagged in accordance with enterprise procedure
		3.2	All underground cables in the vicinity of the work area are identified using the cable identifier and/or cable location plans and diagrams
		3.3	Measures to protect the integrity of adjacent cables and electrical apparatus are undertaken
		3.4	Where practicable the auto reclose function on these cables is disabled in conjunction with the HV operations/network controller
		3.5	Other underground assets such as gas, water and telecommunications are identified and their integrity is protected
4	Carryout HV cable spiking	4.1	Cable spiking equipment is fitted to tagged cable and loaded with appropriate charge in accordance to manufacturer's requirements
		4.2	HV operations/network controller is advised that the cable is to be spiked
		4.3	All persons including other work team members are cleared ten (10) meters from the work area
		4.4	Cable spiking equipment is discharged in accordance with operating procedure and any trapped gas allowed to escape
		4.5	Safety procedure is followed in the event of a misfire and before spiking equipment is recharged
		4.6	Spiking-equipment is removed from the cable in accordance to operating procedure
		4.7	Cable spiking equipment is dismantled in a suitable location and cleaned in accordance to manufacturers' requirements

5	Complete cable spiking task	5.1	Service provider HV operations/network controller is contacted and advised the cable spiking process has been completed
		5.2	Any cable and/or component damage or non-conformance issues identified during the spiking procedures are reported in accordance with enterprise procedures
		5.3	Spiking equipment, tools and equipment are cleaned, checked for damage and returned in accordance to enterprise procedures
		5.4	Completed work is documented and reported in accordance to enterprise requirements

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- accessing and interpreting job instructions, cable plans and drawings of underground assets, relevant equipment set up and service instructions, tool box checklist, job safety analysis documentation
- identifying HV underground cables and other underground service assets
- setting up, operating, dismantling and cleaning cable spiking equipment
- applying relevant safety precautions when working with or in the vicinity of HV underground cables

Required knowledge:

- safe work practices when spiking HV underground power cables
- HV cables and other underground assets identification
- types of HV cables
- equipment and procedures used to spike HV underground cables
- hierarchy of documentation for electrical safety
- potential worksite hazards and hazard control measures

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Potential safety hazards may include but are not limited to:

- electrical shock and burns
- road traffic
- pedestrian traffic
- other nearby assets
- flooding
- vegetation interference

	– road works – weather and environmental conditions – damage or vandalism to the work site – incorrectly identified cable/s or undocumented cable/s – wild life
Documentation required for the task includes but is not limited to:	– work task/job instructions, – jobsite safety analysis – access permit – tool checklist – as built drawings and information – Victorian Electrical Supply Industry (VESI) - Electrical Safety Rules for the VESI Distribution Networks (Green Book) – Energy Safe Victoria (ESV) - Code of Practice on electrical safety for the work on or near high voltage electrical apparatus (Blue Book) – Victorian Electrical Supply Industry (VESI) standards: – Victorian Electrical Supply Industry (VESI) Fieldworker Handbook – Services and Installations rules (SIRs)
Appropriate personnel may include but is not limited to:	– safety officer – works manager – plant distribution manager – operational delivery risk manager – team leader/supervisor – tester in charge – electrical engineers – other team members involved in the work task
Equipment required for the task includes:	– cable identifier – cable spiking equipment and charge – approved hand tools – approved hand held power tools
Personnel protective equipment (PPE) may include but is not limited to:	– safety head wear – safety footwear – ankle to wrist natural fibre or arc rated protective clothing

- insulated gloves approved for live work
- face/eye protection (shield) approved for live work

HV operations/network controller means:

- controller and/or operator of a distribution network
- asset owner

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the associated performance criteria. Specifically they must be able to:

- implement safe work practices when working with or in the vicinity of HV underground cables
- safely identify HV cable to be spiked and other underground assets
- safely set up and operate cable spiking equipment to spike HV underground cables on at least three occasions each in a different context.

Context of and specific resources for assessment

Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions. Where simulation is used, it must reflect real working conditions by modelling industry operating conditions and contingencies, as well as, using suitable facilities, tools and equipment such as:

- cable identifier
- cable spiking equipment and charge
- hand tools and hand held power tools
- personal protective equipment (PPE)

Assessment must ensure candidate has access to:

- jobsite safety documentation
- equipment manuals
- cable location plans and diagrams
- Job instructions and relevant work procedures

The elements and performance criteria in this unit should be demonstrated within a work team environment

Method of assessment

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

- direct observation of the candidate performing cable identification and spiking procedures in a real

workplace setting or simulated environment

- written and oral questioning to test underpinning knowledge of underground HV cable identification, and spiking equipment operations
- review of portfolio documented evidence
- third-party workplace reports of on-the-job performance by the candidate.

Unit code	**VU22931**
Unit title	**Inspect and test low voltage (LV) underground cables**
Unit Descriptor	This unit describes the performance outcomes, skill and knowledge required to enable a person to safely undertake an inspection and complete a test plan on low voltage (LV) underground cables within a voltage range of 240V up to and including 1000V. The unit includes safe work practices, risk control measures, documentation, checking and calibrating testing equipment, accessing LV cables, inspecting and testing procedures in accordance to a test plan, recording test measurements, interpreting results and returning cables fit for purpose. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.'
Employability Skills	This unit contains Employability Skills.
Pre-requisite Unit	VU22928-Work safely with low and high voltage distribution power cables
Application of the Unit	This unit of competency applies to any person employed or contracted by a Distribution Network Service Provider (DNSP) or other organisations responsible for the maintenance and repairs of low and high voltage underground cable networks.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.
1. Prepare to carry out inspection and test plan	1.1 Relevant Occupational Health and Safety/Workplace, Health and Safety (OHS/WHS) requirements for the work task are determined and followed. 1.2 ***Potential safety hazards*** are identified and risk control measures are devised for implementation at the worksite 1.3 ***Documentation*** relevant for the inspection and test plan is obtained and discussed with ***appropriate personnel*** 1.4 Toolbox checklist is completed and equipment needed for the ***inspection and test plan*** is obtained in accordance with enterprise procedures 1.5 Testing equipment is checked and recalibrated where

		necessary in accordance to manufacturer's guidelines
	1.6	Safety equipment including ***personal protective equipment (PPE)*** is obtained and checked in accordance with enterprise procedures
2. Inspect worksite prior to testing	2.1	***Operations/network controller*** is notified of the work task and location
	2.2	Safety hazards not previously identified are responded to, risk is assessed and control measured are devised and implemented
	2.3	Appropriate signs and barriers are erected to create a work area exclusion zone
	2.4	Ground trench is excavated and work area checked for conformance with confined space entry requirements
3. Undertake inspection and test plan procedures	3.1	Cable layout, terminals and any other components are checked against diagrams, plans and specifications and any variations are recorded
	3.2	Condition of cable sheath/insulation and connections are checked for deterioration, interference and physical damage
	3.3	Appropriate Access Authority is checked against the task being undertaken
	3.4	Where cables are terminated through a current transformer, ground conductors are checked for correct placement and that shields are correctly terminated
	3.5	Cable/s to be tested are correctly identified and tagged and the most suitable testing location is identified
	3.6	Test equipment is set up in accordance with manufacturer's requirements and tests are performed in accordance to the test plan and testing specifications
	3.7	Results of each test are verified and recorded in accordance with enterprise requirements
4. Confirm completion of inspection and test plan	4.1	Completed test procedures are checked against test plan and testing specifications to confirm all required tests have been completed
	4.2	Access trench is filled in and work site is restored in accordance to enterprise requirements
	4.3	Service provider network controller is notified that the test plan is completed and cables are returned fit for purpose
	4.4	Any cable and/or component damage or non-conformance issues identified in the inspection and

test procedures is reported in accordance with enterprise procedures

4.5 Testing equipment and tools are cleaned, checked for damage and returned in accordance to enterprise procedures

4.6 Completed LV cable inspection, test plan and results are documented and reported in accordance to enterprise requirements

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- obtaining, interpreting and following: LV cable test plan, cable plans, diagrams and drawing of underground assets, relevant equipment set up and service instructions, tool box checklist, job safety analysis documentation
- applying relevant personal and worksite safety precautions when working with or in the vicinity of LV underground cable
- assessing the excavated cable access trench and establishing a safe work environment
- identifying LV underground cables, related components and other underground service assets
- planning, completing and documenting a LV underground cable test
- setting up, calibrating and operating approved LV cable test equipment
- interpreting and recording test results in accordance to enterprise requirements
- recognising LV cable deterioration and faults

Required knowledge:

- safe work practices when testing LV underground cables
- LV cables types and identification
- LV cable tests and associated equipment
- information sources related to working with LV underground cables
- training and authorisation requirements together with roles and responsibilities of testing team members
- hierarchy of documentation for electrical safety
- potential worksite hazards and hazard control measures

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Potential safety hazards may include but are not limited to:

- electrical shock and burns
- road traffic
- pedestrian traffic
- other nearby assets
- flooding

	– vegetation interference – road works – weather and environmental conditions – damage or vandalism to the work site – incorrectly identified cable/s or undocumented cable/s – wild life
Documentation may include but is not limited to:	– design and construction drawings – work/job instructions – test plan – access permit – as built drawings and information – VESI - Electrical Safety Rules for the VESI Distribution Networks (Green Book) – ESV - Code of Practice on electrical safety for the work on or near high voltage electrical apparatus (Blue Book) – VESI standards: – VESI Fieldworker Handbook – Services and Installations Rules (SIR's) – current enterprise documentation
Appropriate personnel may include but is not limited to:	– safety officer – works manager – plant distribution manager – operational delivery risk manager – team leader/supervisor – tester in charge – permit recipients – safety observer – others team members involved with carrying out the test plan
Inspection and test plan may include but is not limited to the following:	– physical damage – pre-energising tests - insulation resistance and continuity test – equipment functionality tests – polarity, voltage and phase sequence tests – neutral and phase identification tests – neutral integrity test – meter function test

Personnel protective equipment (PPE) may include but is not limited to:	– safety head wear – safety footwear – ankle to wrist natural fibre or arc rated protective clothing – insulated gloves approved for live work – face/eye protection (shield) approved for live work
Operations/network controller means:	– controller/operator of an electricity network – asset owner

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the associated performance criteria. Specifically they must be able to: – implement safe work practices when working with or in the vicinity of low voltage underground cables – safety carry out and complete a LV underground cable inspection and a test plan on at least two occasions each in a different context.
Context of and specific resources for assessment	Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions. Where simulation is used, it must reflect real working conditions by modelling industry operating conditions and contingencies, as well as, using suitable facilities, tools and a range of typical HV cable testing equipment and personal protective equipment. Assessment must ensure candidate has access to: – jobsite safety documentation – equipment manuals – cable location plans and diagrams – test plan and relevant work place procedures The elements and performance criteria in this unit should be demonstrated within a work team environment
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the candidate performing cable identification, inspection and testing procedures in a real workplace setting or simulated environment

- written and oral questioning to test underpinning knowledge of safety work practices, LV cable identification, inspections and testing procedures
- review of a portfolio of documented evidence
- third-party workplace reports of on-the-job performance by the candidate.