Australian Government

UETTDRIS33A Solve electrical problems in remote community network systems

Release: 2

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UETTDRIS33A Solve electrical problems in remote community network systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the underpinning skills and knowledge and the application of this skills and knowledge to provide solutions to predictable problems on remote community network systems. It encompasses working safely, diagnoses and problem solving procedures, including the use of voltage, current and resistance measuring devices to providing solutions derived from measurements and calculations to predictable circuit/systems problems.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level

employment based programs incorporated in approved

contracts of training.

Licensing/Regulatory Information

License to practice **3)**

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

© Commonwealth of Australia, 2013 EE-Oz Training Standards

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

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

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

Common Unit Group

Unit Code	Unit Title
UEENEEE103A	Solve problems in extra-low voltage single path circuits
UETTDRIS32A	Solve electrical problems in remote community network apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

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

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability

© Commonwealth of Australia, 2013 EE-Oz Training Standards

Employability Skills **5)**

Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve electrical problems on remote community network systems.	1.1	Occupational Health and Safety procedures for a given work area are identified, obtained and understood.
	1.2	Occupational Health and Safety 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 coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are identified and accessed 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.

© Commonwealth of Australia, 2013 EE-Oz Training Standards

ELEMENT	PERFORMANCE CRITERIA	
2 Solve electrical problems on remote community network systems.	2.1	Occupational Health and Safety risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with Occupational Health and Safety requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance Occupational Health and Safety requirements and procedures.
	2.4	Established methods are used to solve electrical system problems from measured and calculated values as they apply to remote community network systems
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, and systems, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	Occupational Health and Safety 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 appropriate person(s) notified in accordance with established procedures.

© Commonwealth of Australia, 2013 EE-Oz Training Standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) 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 Occupational Health and Safety practices in the workplace.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS33A Remote area network systems

Evidence shall show an understanding of remote area network systems to an extent indicated by the following aspects:

T1 Alternating Current Quantities encompassing:

- sine, cosine and tangent ratios of a right angle triangle
- Pythagoras Theorem to a right angle triangle.
- use of the CRO to measure d.c. and a.c. voltage levels
- sinusoidal voltage generated by a single turn coil rotated in a uniform magnetic fields
- terms 'period', 'maximum value', 'peak-to-peak value', 'instantaneous value', 'average value', 'root-mean-square (r.m.s.) value', in relation to a sinusoidal waveform.
- calculation of the instantaneous value of induced voltage of a generated sinusoidal waveform.
- measurement of instantaneous, peak, peak-to-peak values and the period of a sinusoidal waveform.
- calculation of root-mean-square (r.m.s.) value and frequency of a sinusoidal waveform from values of peak voltage and period.

T2 Phasors Diagrams encompassing:

- purpose of phasor diagrams
- 'in-phase', 'out-of-phase', 'phase angle'' lead' and 'lag'.
- 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.
- drawing phasor diagrams to show the relationship between two or more a.c. values of voltage and/or current.
- determination of phase relationship between two or more sinusoidal waveforms from a given diagram and measurements..

T3 Single Element a.c. circuits encompassing:

- setting up and connect a single-source resistive a.c. circuit and take voltage and current measurements to determine the resistance

© Commonwealth of Australia, 2013 EE-Oz Training Standards

REQUIRED SKILLS AND KNOWLEDGE

- determining the voltage, current resistances from measure of given values of any tow of these qualities.
- relationship between voltage drops and current in resistive a.c. circuit
- applications of resistive a.c. circuits
- defining 'inductive reactance'.
- calculation of inductive reactance for a given inductor and the relationship between inductive reactance and frequency.
- applying Ohm's Law to determine voltage, current of inductive reactance in a purely inductive a.c. circuit given any two to these quantities.
- applications of inductive a.c circuits.
- calculation of capacitive reactance
- applying Ohm's Law to determine voltage, current or capacitive reactance in a purely capacitive a.c circuit given any two of the quantities.
- applications of capacitive a.c circuits

T4 Impedance a.c. circuits encompassing:

- impedance' and impedance triangle.
- determining the impedance, current and voltages for a series a.c circuit.
- drawing and labelling the impedance triangle for a series RC circuit
- examples of capacitive components in power circuits and systems and the effect on the phase relationship between voltage and current.
- drawing the equivalent circuit of a practical inductor
- examples of inductive components in power circuits and systems and describe their effect on the phase relationship between voltage and current

T5 Power in an a.c. circuit encompassing:

- difference between true power, apparent power and reactive power and the units in which these quantities are measured.
- drawing the power triangle to show the relationships between true power, apparent power and reactive power
- defining the term "power factor" and phase angle.
- methods used to measure single phase power, energy and demand.

T6 Power Factor Improvement encompassing:

- effects of low power factor.
- requirements for power factor improvement.
- methods used to improve low power factor of a installation.
- local supply authority and AS/NZS 3000 wiring rules requirements regarding the power factor of an installation and power factor improvement equipment.

T7 Harmonics Effect in a.c. Systems encompassing:

- 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

© Commonwealth of Australia, 2013 EE-Oz Training Standards

REQUIRED SKILLS AND KNOWLEDGE

overcome.

- methods and test equipment used to test for harmonics
- methods used to reduce harmonics in a.c. power system

T8 Three Phase Systems encompassing:

- features of a multiphase system.
- comparison of voltages generated by single and multiphase alternators.
- reasons for the adoption of three phases for power systems.
- how three phases is generated in a single alternator.
- Calculation of r.m.s. value of voltage generated in each phase given the maximum value.
- relationship between the phase voltages generated in a three phase alternator and the conventions for identifying each.
- term "phase sequence" (also, referred to as "phase rotation").
- determining the phase sequence of a three phase supply

T9 Three phase star-connections encompassing:

- connecting a three phase star-connection load.
- phase relationship between line and phase voltages and line and phase currents of a star-connected system.
- determining the r.m.s. value of line and phase voltage given any one of these quantities.
- determining the r.m.s. value of line and phase current given any one of these quantities.
- terms "balanced load" and "unbalanced load".
- example of balanced and unbalanced loads in typical power systems.

T10 Three phase four wire systems encompassing:

- purpose of the neutral conductor in a three phase four wire systems.
- determining the effects of an high impedance in the neutral conductor of a three phase four wire system supplying an unbalanced load where MEN earthing is employed.

T11 Three phase delta-connections and Interconnected systems encompassing:

- connecting three phase delta loads.
- phase relationship between line and phase voltages and line and phase currents of a delta-connected system.
- determining the r.m.s. value of line and phase voltage given any one of these quantities.
- determining the r.m.s. value of line and phase current given any one of these quantities.
- limitations and uses of open delta connections
- example of loads in typical power systems.
- drawing the typical combinations of three phase interconnected systems using

© Commonwealth of Australia, 2013 EE-Oz Training Standards

REQUIRED SKILLS AND KNOWLEDGE

star-connections and a delta-connection.

- relationship between line and phase voltages and line and phase currents in the typical interconnected systems using star-connections and delta-connections.

T12 Fault Loop Impedance encompassing:

- term fault loop impedance of a a.c. power system
- measuring fault loop impedance of typical circuits
- procedures for testing fault loop impedance

Evidence Guide

EVIDENCE GUIDE

9) 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 component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

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.

© Commonwealth of Australia, 2013 EE-Oz Training Standards

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

9.2)

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 – UET09". 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;
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range;
  - 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;
  - Demonstrate an appropriate level of employability skills;

© Commonwealth of Australia, 2013 EE-Oz Training Standards

and

- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
  - Demonstrated performance across a representative range of contexts from the prescribed items below:
    - Apply Occupational Health and Safety practices in the workplace as described in 8) and including:
    - Applying work procedures and instructions as they apply to risk control measures

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

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

    - Preparing to enter the workplace including, the use of work permits and clearances and isolation permissions.
    - Show evidence that all aspects of the range statement are demonstrated on two occasions
    - Dealing with accidents and emergencies within the scope of responsibility.
    - Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed 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

9.3)

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

- Occupational Health and Safety policy and work procedures and instructions.

© Commonwealth of Australia, 2013 EE-Oz Training Standards

- Suitable work environment, facilities, equipment and materials to undertake actual installation of poles and or structures and their associated hardware.

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 **9.4)**

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 associated skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

This unit shall be assessed concurrently, as it relates to other units undertaken in a possible skill clusters or 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

© Commonwealth of Australia, 2013 EE-Oz Training Standards

Range Statement

RANGE STATEMENT

10) 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 solving electrical problems in remote community network apparatus:

(a) Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards present in remote communities are followed.

(b) Accepted industry workplace procedures and instructions for remote communities are followed.

(c) Determine the correct operation of remote community network systems.

(d) Diagnose and provide solutions as they apply to remote community network systems.

Predictable problems within remote community network systems may include the following:

(a) Hi/Low volts

(b) Phase-in-balance

(c) High resistance

(d) MEN faults (High resistivity earth electrodes, Spurious voltages)

(e) Fault Current (Fuses)

(f) Kilowatt hour meter faults (No supply, reverse polarity, etc)

(g) Streetlight faults

In relation to the following remote community electrical problems on at least two occasions:

(a) Using voltage, current and resistance measuring devices.

(b) Providing solutions derived from measurements and calculations to electrical problem in remote communities.

(c) Altering an existing circuit to comply with specified operating parameters.

Generic terms 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.

Unit Sector(s)

Not applicable.

© Commonwealth of Australia, 2013 EE-Oz Training Standards

Competency Field

Competency Field **11)**

Industry Specific Cross-Discipline Units

© Commonwealth of Australia, 2013 EE-Oz Training Standards