



Australian Government

UETTD RIS70 Diagnose and rectify faults in electrical energy distribution systems

Release: 1

UETTDNIS70 Diagnose and rectify faults in electrical energy distribution systems

Modification History

Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package.

Application

This unit covers diagnosing and rectifying faults in networks supplying electrical energy to consumers. The unit encompasses safe working practices, interpreting diagrams and technical data, applying knowledge of energy supply and reticulation systems to logical fault-finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

The application of the skills and knowledge described in this unit requires a licence/registration to practice in the workplace subject to regulations for undertaking of electrical work.

Other conditions may apply under state and territory legislative and regulatory licencing requirements which must be confirmed prior to commencing this unit.

Pre-requisite Unit

Common Unit Group

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

UETTDNIS67 Solve problems in energy supply network equipment

UETTDNIS68 Solve problems in energy supply network protection equipment and systems

UETTDNIS69 Diagnose and rectify faults in energy supply apparatus

Competency Field

Industry Specific Cross Discipline

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to diagnose and rectify faults

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** Work health and safety (WHS)/occupational health and safety (OHS) procedures for a given work area are identified, obtained and understood
 - 1.2** Established WHS/OHS risk control measures and procedures in preparation for the work are followed
 - 1.3** Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel
 - 1.4** The extent of faults is determined from reports and other documentation and from discussions with appropriate personnel
 - 1.5** Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the worksite
 - 1.6** Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety
- 2 Diagnose and rectify faults**
- 2.1** WHS/OHS risk control measures and procedures for carrying out the work are followed
 - 2.2** The need to test or measure live work is determined in strict accordance with WHS/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 with WHS/OHS requirements and procedures
 - 2.4 Logical diagnostic methods are applied to diagnose energy supply apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements
 - 2.5 Suspected fault scenarios are tested as being the source of system problems
 - 2.6 Source of fault is identified and appropriately competent person/s engaged to rectify the fault where it is outside the scope of the control system
 - 2.7 Faults in the apparatus components are rectified to raise energy supply apparatus to its operation standard
 - 2.8 System is tested to verify that it operates as intended and to specified requirements
 - 2.9 Decisions for dealing with unexpected situations are made from discussions with appropriate personnel and job specifications and requirements
 - 2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes
 - 2.11 Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus, the surrounding environment or services using sustainable energy practices
- 3 Complete and report fault diagnosis and rectification activities**
- 3.1 WHS/OHS work completion risk control measures and procedures are followed
 - 3.2 Worksite is made safe in accordance with established safety procedures
 - 3.3 Rectification of faults is documented in accordance with established procedures
 - 3.4 Appropriate person/s is notified in accordance with established procedures that the system faults have been rectified

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to UETTDRIS70A Diagnose and rectify faults in electrical energy distribution systems.

Links

UET Training Package Companion Volume Implementation Guide is found in VETNet - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7>

Assessment Requirements for UETTDRIS70 Diagnose and rectify faults in electrical energy distribution systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least two separate occasions and include:

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including the use of risk control measures
- applying sustainable energy principles and practices
- diagnosing and rectifying faults in electrical energy distribution systems including:
 - applying logical diagnostic methods
 - using fault scenarios to test the cause of system faults
 - identifying faults and competency needed to rectify them
 - rectifying faults in system controls
 - verifying that the system operates correctly
 - documenting fault rectification
 - dealing with unplanned events on at least one occasion.

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

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- distribution system overview encompassing:
 - regulatory conditions of supply and utilisation
 - compliance with Australian Standards
 - reticulation system, including overhead/underground, urban/rural, high voltage (HV) customers and high-rise building systems
 - methods used to ensure continuity of supply
 - types of substations in current use

- systems of distribution used, (primary and secondary)
- voltage levels, power factor, wave-form distortion and transient loading
- supply quality
- load curve profiles (residential/industrial/commercial)
- types of feeders
- distribution systems (urban, rural single-phase systems, single wire earth return (SWER), spur, parallel and ring systems)
- overhead lines and installation encompassing:
 - industry and safety regulations
 - overhead conductors
 - conductor material
 - current rating factors (heating, voltage drops and power losses)
 - aerial bundled cables (HV and low voltage (LV))
 - covered conductors - characteristics of lines and cables, including the calculation of R, X and B for different arrangements of conductor; typical values for actual lines; transposition; models based on line length; voltage and line regulation
 - overhead line poles
 - types (wood, concrete and steel)
 - installation of poles (tooling, rake, life, labelling and sinking)
 - maintenance of poles (above and below ground)
 - pole strength and loads
 - crossarms
 - types and standard sizes
 - insulators
 - insulation types
 - types (pin, suspension or disc and shackle)
 - creepage and necessary clearances
 - arcing horns and insulator mounting
 - structure types
 - mechanical properties (working strength, maximum tension and limiting size)
 - interpretation of stringing charts
 - determination of sag (by calculations or measurement and/or tension measurement)
 - sight and wave sagging, and sag correction
 - stays
 - components and anchorage
- use of design schedules encompassing:
 - sample design problems - common design practice line, voltage, structure types used, line deviation, span sag, cross-arms, insulators and stays, wind loading and line deviation loading basic surveying
 - measurement of levels, deviation angle and compass bearings

- perform survey of short distribution line extension of produce field notes
- underground cables encompassing:
 - cable types, ratings, core material, design considerations, cable dielectrics, insulating materials and abbreviations, electric stress, cable voltage drop and voltage drop calculations, cable termination, joints and installation
 - induction and eddy currents
 - cable testing and cable fault location
 - cable drawing
- voltage regulations of feeders and associated equipment encompassing:
 - terminology used - 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 - inductance, capacitance and reactance of distribution lines, and transformers
 - methods of voltage control - off-load, on-load tap changers, voltage regulating relays, line drop compensation and different types of voltage regulators
 - voltage profiles - principles, effect on voltage profiles, limits of voltage, voltage drops due to LV mains transformers, tap-settings feeder and service lines
 - determining voltage drops for components within the profile
- control of voltage - conditions leading to voltage collapse and system disintegration; effects on the system of HV/LV; and voltage control devices encompassing:
 - voltage regulators applied to generators and synchronous phase modifiers
 - electromagnetic voltage regulators
 - series and parallel capacitors
 - on-load tap changer (OLTC) transformers and static VAR compensations (SVCs)
- range of devices covered by SVCs encompassing:
 - saturated reactor (SR) compensations
 - thyristor controlled reactor (TCR) compensators
 - combined TCR/TSCs
 - production of wave-form distorting harmonics and control devices
- importance of the location in the system of voltage control devices
- types of communication systems encompassing:
 - telephone, power line carrier, dedicated cable, micro-wave links and fibre optics
 - quantities and signals to be communicated
 - advantages and disadvantages of the various systems
 - equipment requirements
- transient over-voltages in power systems encompassing:
 - switching and lightning over-voltages and their effect on different plant items
 - transient over-voltage control and reduction using surge diverters, shield wires and CB control
 - insulation systems, insulation coordination, insulation grading in plant items, bushings

and capacitor bushings

- the principles of operation, voltage and current range, breaking capacity and field of use of circuit breakers - bulk oil, small oil volume, air break, vacuum and SF6 (double pressure and puffer types)
- the types of isolators in use, such as duo-roll, blade and scissor type
- circuit breaker auxiliary systems encompassing:
 - direct current (d.c.) systems, including battery types, charging and protection systems and earth fault detection systems
 - SF6 conditioning, storage and handling systems.

Assessment Conditions

Links

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