Australian Government

Assessment Requirements for UETDRRC007 Solve problems in electrical network apparatus in a very remote community

Release: 1

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Modification History

Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package Release 2.0.

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 legislation, regulations, standards, codes of practice and organisational workplace requirements, including:
  - work health and safety (WHS)/occupational health and safety (OHS)
- identifying hazards, assessing risks, identifying, applying and monitoring control measures
- obtaining, inspecting and using relevant personal protective equipment (PPE)
- preparing to enter the workplace, including the use of work permits, clearances and isolation permissions
- confirming network electrical apparatus circuit is isolated
- determining the operating parameters of a circuit within the electrical network apparatus
- using established methodical processes to solve electrical problems in accordance with workplace requirements, including:
  - choosing correct instruments and ranges for testing and measuring values
  - connecting instruments to measure and calculate values in circuits within the electrical network apparatus
- identifying at least three (3) of the following problems:
  - high voltage (HV)/low voltage (LV)
  - high resistance
  - low resistance
  - fault current (fuses)
  - kilowatt hour meter faults (no supply, reverse polarity etc)
  - public lighting faults
- working from at least one (1) of the following:
  - elevated work platform (EWP)
  - platform
  - ladder
- connecting and testing electrical network apparatus to determine correct operation
- dealing with an unplanned event on at least one (1) occasion

- completing relevant work records, reporting and documentation.

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:

- relevant legislation, regulations, standards, codes of practice and organisational workplace requirements, including:
  - WHS/OHS
  - wiring rules requirements – continuity test and insulation resistance test
- hazard, risk assessment and risk control requirements, including potential hazards
- types and application of PPE
- safe use of plant, tools and equipment
- application, purpose and types of permits
- safe use, care and storage of electrical instruments
- parallel circuits, including:
  - schematic diagram of a single-source direct current (d.c.) parallel circuit
  - major components of a parallel circuit (power supply, loads, connecting leads and switch)
  - applications where parallel circuits are used in the remote community electricity supply industry (ESI)
  - characteristics of a parallel circuit (load connection, current paths, voltage drops, power dissipation, and effects of an open circuit in a parallel circuit)
  - relationship between currents entering a junction and currents leaving a junction
  - calculation of the total resistance of a parallel circuit
  - calculation of the total current of a parallel circuit
  - calculation of the total voltage of a parallel circuit
  - single-source d.c. parallel circuit set-up and connection
  - resistance, voltage and current measurements in a single-source parallel circuit
  - voltage, current, resistance or power dissipated from measured values of any of these quantities
- series/parallel circuits, including:
  - schematic diagram of a single-source d.c. series/parallel circuit
  - major components of a series/parallel circuit (power supply, loads, connecting leads and switch)
  - applications where series/parallel circuits are used in the remote community ESI
  - characteristics of a series/parallel circuit (load connection, current paths, voltage drops, power dissipation, and effects of an open circuit in a series/parallel circuit)
  - calculation of the total resistance of a series/parallel circuit
  - calculation of the total current of a series/parallel circuit
  - calculation of the total voltage and the individual voltage drops of a series/parallel circuit
  - setting up and connecting a single-source d.c. series/parallel circuit

- resistance, voltage and current measurements in a single-source d.c. series/parallel circuit
- voltage, current, resistances or power dissipated from measured values of any two of these quantities

- factors affecting resistance, including:
  - four factors that affect the resistance of a conductor (type of material, length, cross-sectional area and temperature)
  - affect the change in the type of material (resistivity) has on the resistance of a conductor
  - effect the change in length has on the resistance of a conductor
  - effect the change in cross-sectional area has on the resistance of a conductor
  - effects of temperature change on the resistance of various conducting materials
  - effects of resistance on the current-carrying capacity and voltage drop in cables
- effects of meters in a circuit, including:
  - meters in terms of units to be measured, range, loading effect, accuracy and safety category of meters for a given application
  - instruments used in the field to measure voltage and current, and the typical circumstances in which they are used
  - hazards involved in using electrical instruments and the safety control measures that should be taken
  - operating characteristics of analogue and digital meters
  - correct techniques to read the scale of an analogue meters and how to reduce the 'parallax' error
  - types of voltmeters used in the ESI – bench type, clamp meter and multimeter
  - purpose and characteristics (internal resistance, range, loading effect and accuracy) of a voltmeter
  - types of voltage indicator testers (e.g., light-emitting diode (LED), neon, solenoid, volt-stick and series tester) and the purpose of each voltage indicator tester
  - various types of ammeters used in the ESI (bench, clamp meter and multimeter)
  - purpose and characteristics of an ammeter and the correct connection (series) of an ammeter into a circuit
  - loading effect of various voltmeters when measuring voltage across various loads
- resistance measurement, including:
  - identification of instruments used in the field to measure resistance (including insulation resistance (IR)) and the typical circumstances in which they are used
  - purpose of an IR tester
  - parts and functions of various analogue and digital IR tester (selector range switch, zero ohms adjustment, battery check function, scale and connecting leads)
  - reasons why the supply must be isolated prior to using the IR tester
  - where and why the continuity test would be used in an ESI systems
  - where and why the insulation resistance test would be used in an ESI system
  - voltage ranges of an IR tester and where each range may be used. e.g. 250 V d.c, 500 V d.c & 1000 V d.c
  - IR tester calibration requirements

  - measurement of low values of resistance using an IR tester continuity functions
  - measurement of high values of resistance using an IR tester insulation resistance function
  - volt-ammeter (short shunt and long shunt) methods of measuring resistance
  - calculation of resistance values using voltmeter and ammeter reading (long and short shunt connections)
- capacitors and capacitance, including:
  - basic construction of standard capacitor, highlighting the plates, dielectric and connecting leads
  - types of dielectric material and each dielectric's relative permittivity
  - identification of various types of capacitors commonly used in the ESI
  - circuit symbol of various types of capacitors - standard; variable, trimmer and polarised
  - terms: capacitance (C), electric charge (Q) and energy (W)
  - unit of capacitance (Farad), electric charge (Coulomb) and energy (Joule)
  - factors affecting capacitance and how factors are present in all circuits to some extent
  - how a capacitor is charged in a d.c. circuit
  - behaviour of a series d.c. circuit containing resistance and capacitance components - charge and discharge curves
  - term: time constant and its relationship to the charging and discharging of a capacitor
  - calculation of quantities from given information - capacitance (Q = VC); energy (W =½CV2); voltage (V = Q/C)
  - connection of a series d.c. circuit containing capacitance and resistor to determine the time constant of the circuit
- capacitors, including:
  - hazards involved in working with capacitance effects and the safety control measures that should be taken
  - safe handling and the correct methods of discharging various size capacitors
  - dangers of a charged capacitor and the consequences of discharging a capacitor through a person
  - effects of capacitors connected in parallel
  - effects on the total capacitance of capacitors connected in series
  - common faults in capacitors
  - testing of capacitors to determine serviceability
  - application of capacitors in the ESI
- magnetism, including:
  - magnetic field pattern of bar and horse-shoe magnets
  - magnets attraction and repulsion when brought in contact with each other
  - common magnetic and non-magnetic materials and groupings (diamagnetic, paramagnetic and ferromagnetic materials)
  - principle of magnetic screening (shielding) and its applications
  - practical applications of magnets
- electromagnetism, including:

- conventions representing direction of current flow in a conductor
- magnetic field pattern around a single conductor and two adjacent conductors carrying current
- right hand rule to determine the direction of magnetic field around a current-carrying conductor
- direction of force between adjacent current-carrying conductors
- effect of current, length and distance apart on the force between conductors (including forces on bus bars during fault conditions)
- magnetic field around an electromagnet
- right hand rule to determine the direction of magnetic field around a current-carrying coil
- magnetomotive force (m.m.f.) and its relationship to the number of turns in a coil and the current flowing in the coil
- practical applications of electromagnets

- electromagnetic induction, including:
  - principle of electromagnetic induction (Faraday's law of electromagnetic induction)
  - Fleming's right hand rule to a current-carrying conductor under the influence of a magnetic field
  - calculation of induced electromagnetic force (e.m.f). in a conductor given the conductor length, flux density and velocity of the conductor
  - calculation of induced e.m.f. in a coil given the number of turns in a coil and the rate of change of flux
  - calculation of force on a conductor given the flux density of the magnetic field, length of the conductor and the current being carried by the conductor
  - Lenz's law
  - applications of electromagnetic induction
- inductance, including:
  - construction of an inductor, including a bifilar winding inductor
  - Australian Standard circuit diagram symbol for the four types of inductor
  - effect of physical parameters on the inductance of an inductor
  - common types of inductor cores
  - applications of the different types of inductors
  - definition of terms self-induction, inductance and mutual inductance
  - calculation of value of self-induced e.m.f. in a coil
  - mutual induction occurs between two coils
  - practical applications for the effects of self and mutual induction
  - undesirable effects of self and mutual induction
- magnetic devices, including:
  - construction, operation and applications of relays
  - construction, operation and applications of contactors
  - magnetic methods used to extinguish the arc between opening contacts
  - construction, operation and applications of Hall effect devices

  - construction, operation and application of magnetic sensing devices
- events constituting an unplanned event or incident
- procedures for responding to an unplanned event or incident.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in workplace operational situations, where it is appropriate to do so.

Where this is not appropriate, assessment must occur in simulated conditions involving realistic and authentic activities that replicate operational workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- relevant and appropriate materials, tools, facilities, equipment and PPE currently used in industry for solving problems in electrical network apparatus in a very remote community
- applicable documentation, including workplace requirements, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

Links

Companion Volume Implementation Guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7