Australian Government

Assessment Requirements for UEERL0007 Disconnect-reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles

Release: 1

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Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Performance Evidence

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

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including:
  - hazard identification
  - using risk control measures
- dealing with unplanned events in accordance with problem-solving techniques and workplace procedures
- disconnecting and reconnecting 3.3 kilovolts (kV) electric propulsion components of self-propelled earth moving vehicles
- disconnecting of high voltage (HV) electric propulsion components
- preparing of HV electric propulsion components for return to service
- preparing to disconnect or reconnect of HV electric propulsion components of operating at 3,300 volts (V)
- providing status report/s
- reconnecting of HV electric propulsion components
- repairing in accordance with workplace procedures.

Knowledge Evidence

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

- basic electrical circuits, including:
  - elements of a simple electric circuit (supply, control switch, protection device and load)
  - definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current and resistance
  - types of electrical load
  - need for devices to afford electrical protection and the mechanisms used in protection

devices, including resetting
    - symbols for the components of a basic electrical circuit
    - connection of the circuit from the schematic diagram
    - alternating current (a.c.) supply (both single and three phase) and direct current (d.c.) supply
    - correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
    - need for isolating, testing and tagging electrical circuits
    - isolation, testing and tagging accessories in a simulated environment
    - connecting a simple electrical circuit including supply, control switch and load
    - measuring voltage and current within a simple circuit
- relationships in an electrical circuit, including:
    - relationship between voltage, current and resistance
    - connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm s Law relationship
    - predicting changes in circuit parameters for altered values of voltage, current and resistance
    - definition of power in electrical terms (for d.c. or resistive a.c. circuits)
    - using circuit readings determine power using the appropriate equations, symbols and unit abbreviations, including the use of multiples and sub-multiples
- electrical diagrams, including:
    - symbols used for fuse, circuit breaker, isolator, normally open contacts, normally closed contacts, coil, energy meter, a.c. motor and transformer
    - using a block diagram as means of developing concepts and understanding
    - producing a block diagram of a simple circuit
    - function of single line diagrams, including their application in three phase systems
    - definition of a circuit or schematic diagrams
    - wiring diagrams
    - connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
    - producing the wiring diagram of the connections used in following the schematic diagram
    - connecting a simple circuit following a wiring diagram
    - producing a schematic diagram from the wiring diagram
- test equipment selection and care, including:
    - fault currents and the implications of incorrectly connecting a meter to a high fault current source
    - category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work
    - regulatory requirements in regard to the maintenance and testing of test instrumentation
    - steps and procedures for the safe use, care and storage of electrical instruments

    - selecting test equipment for given situations
- test equipment - voltage measurement, including:
    - voltage measurement- meters connected in parallel
    - operation of series test lamps
    - construction of a set of series test lamps with emphasis on safety requirements
    - using a set of series test lamps
    - operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
    - operation and limitations of voltage probes, including their limitations
    - using an analogue multimeter for voltage measurement ensuring the following - setting zero, correct scale; a.c or d.c., polarity and magnitude, avoiding parallax error and estimating between division readings
    - using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth
- test equipment - resistance measurement, including:
    - voltmeter-ammeter method of resistance measurement
    - measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
    - measuring resistance in a simple circuit using an analogue multimeter ensuring the following - setting zero, selecting correct range and estimating of between division readings
    - measuring resistance using a digital multimeter
    - insulation resistance and list the required minimum values for insulation resistance for low voltage (LV) wiring and LV equipment (insulation resistance between active and earth the value for appliances incorporating heating elements)
    - insulation resistance needs to be measured at higher than supply voltage and the voltages to be used
    - conducting insulation resistance tests using a handheld tester after checking for zero and meter calibration
    - continuity and what a continuity tester does
    - checking the polarity of a three-core extension cord using a continuity tester
- test equipment - current measurement, including:
    - advantages of the clip-on method of current measurement
    - measuring current in a simple circuit using a multimeter on the correct current range and why a series connection must be used
    - measuring current using a clip-on (tong tester) taking each circuit conductor in turn
- cable connections, including:
    - construction of typical power cables
    - principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered
    - cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply

    - terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools, including the correct size soldering equipment
- protection for safety, including:
    - dangers associated with earth-faults
    - protection of persons against electric shock from earth-faults
    - maintaining a low earth-fault current path resistance
    - components in an earth-fault current path
    - testing the resistance of a fault current path
    - regulatory issues/requirements/limitations relating to working live
- safety testing preparation and procedures, including:
    - faulty earth-fault current paths
    - using safe working practices when carrying out fault-finding work
    - identification of earthing system components
    - unsatisfactory resistance of a fault current path
    - actions to rectify unsatisfactory resistance of an earth-fault current path or insulation
- isolating supplies, including:
    - regulatory requirements relating to working de-energised, and ensuring and maintaining isolation
    - reasons for advising all personnel likely to be affected
    - preventing others wanting to remake supply
    - reason for isolation and approximate time of outage to allow planning of alternate activities
    - identification the type and arrangement of circuits supplying equipment that is to be disconnected
    - availability of supply is tested at components about to be disconnected
    - locating isolation device/s, e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the appliance
    - determining the method of isolation to be used and which available device
    - isolating a supply at a fuse, the fuse wedge is removed only after the components is turned off and why the empty wedge is replaced once the fusible link has been removed
    - tests to determine if a component is turned off when isolating at a fuse/circuit breaker
    - use of and reason for danger tags at the point of isolation
    - reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation
- disconnecting 3.3 kV electric propulsion components, including:
    - identification of the type and arrangement of circuits supplying electric propulsion components that is to be disconnected from a 3.3 kV supply
    - procedures that ensure the safe isolation of the supply to electric propulsion components which is to be disconnected
    - disconnection of isolated electric propulsion components from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of

conductor connection sequence
    - termination practices relating to disconnected wiring
- reconnecting 3.3 kV electric propulsion components, including:
    - importance of checking the new electric propulsion components nameplate details against those of the electric propulsion components being replaced
    - need to visually inspect and test the electric propulsion components electrical characteristics using suitable test equipment to ensure electric propulsion components are safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate ingress protection (IP) rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place
    - compliance testing of the fixed electric propulsion components, i.e. insulation resistance and continuity
    - testing the disconnected electric propulsion components for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth-faults), and any unsatisfactory test results obtained
    - procedures for electric propulsion components with unsatisfactory results - unsuitability for reconnection
    - identification of the type and arrangement of circuits supplying electric propulsion components that are to be reconnected to a 3.3 kV supply
    - procedures ensuring isolation of supply
    - process to establish the integrity of the circuit to which the disconnected electric propulsion components are to be connected
    - testing the resistance between the protective earthing conductor and neutral conductor as applicable is sufficiently low, i.e. not greater than 2 ohms
    - insulation resistance of the active conductors is greater than 1 megohm
    - engaging appropriately qualified person to rectify any non-compliance
    - appropriate cable termination practices
    - reconnection of electric propulsion components to fixed wiring with minimal damage to wiring system
    - continuity between exposed conductive parts of the electric propulsion components and the main earth or metal switchboard enclosure
    - restoring supply after ensuring correct connections, and all safety requirements have been met
    - testing the supply at electric propulsion components
    - restoring all mechanical protection, e.g. terminal covers
    - checking operation of reconnected electric propulsion components
- documentation and reports, including:
    - need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads
    - production of reports and documents to use a suitable procedure to safely disconnect a component from a 3.3 kV supply
    - content required in reports and documents used to safely determine the suitability of a

component for reconnection to supply
    - producing reports and documents for the safe reconnection/commissioning of a component to the supply
- enterprise reporting and recording system, including:
    - purpose and extent of maintaining work activities records in an enterprise
    - types of records for maintaining work activities in an enterprise
    - methods for recording and maintaining work records
    - work records for regulation requirements
    - producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply
- disconnection and reconnection HV electric propulsion components on off-road earth moving trucks
- electrical circuit
- electrical diagrams
- isolating supplies
- protection for safety
- relationships in an electrical circuit
- relevant manufacturer specifications
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures
- risk mitigation processes
- safety inspecting and testing preparation and procedures
- working de-energised and ensuring and maintaining isolation regulatory requirements.

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 suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable workplace operational situations that replicate 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:

- a range of relevant exercises, case studies and/or simulations
- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment (PPE) currently used in industry
- resources that reflect current industry practices in relation to disconnecting and reconnecting

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- applicable documentation, including workplace procedures, 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=b8a8f136-5421-4ce1-92e0-2b50341431b6