



Australian Government

**UEERL0007 Disconnect-reconnect 3.3 kV
electric propulsion components of
self-propelled earth moving vehicles**

Release: 2

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

Modification History

Release 2. Update to wording within the application, performance and knowledge evidence sections to correct omission of the wording 'up to' 3.3kV.

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

Application

This unit involves the skills and knowledge required to isolate, disconnect and reconnect high voltage (HV) electric propulsion components on engine driven, self-propelled earth moving vehicles under the restrictions of designated electrical equipment and conditions specified, operating up to 3,300 volts (V).

It includes working safely, identifying circuit and isolation arrangements, following isolation procedures, selecting and using HV testing and measuring devices, terminating and connecting HV cables and conductors, safety testing and reporting.

The skills and knowledge described in this unit require a licence or permit to practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 V alternating current (a.c.) or 120 V direct current (d.c.).

Competency development activities in this unit are subject to regulations directly related to licensing. Where a licence or permit to practice is not held, a relevant contract of training, such as an Australian Apprenticeship, may be required.

Additional and/or other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

Pre-requisite Unit

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

Competency Field

Restricted Licensing

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare for disconnection or reconnection

PERFORMANCE CRITERIA

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

- 1.1** Designated HV electric propulsion components to be replaced are identified and purpose of the work is verified with relevant person/s
- 1.2** WHS/OHS requirements and workplace procedures are followed in accordance with relevant industry standards
- 1.3** Work clearances are obtained, and isolation and disconnection are followed in accordance with workplace procedures

2 Disconnect designated HV electric propulsion components

- 2.1** Relevant electrical characteristics and protection specifications are identified in accordance with workplace procedures
- 2.2** On-board cables are identified and marked, and connection sequence recorded
- 2.3** Designated HV electric propulsion components are inspected for damage and conclusions verified with relevant person/s
- 2.4** Visual inspections and checks of the designated HV electric propulsion components and associated wiring are carried out in accordance with workplace procedures to detect any abnormal or obvious damage or fault
- 2.5** Isolated equipment is confirmed as de-energised
- 2.6** Approval is obtained in accordance with workplace procedures from relevant person/s before any contingencies are implemented
- 2.7** On-board cables are disconnected, where appropriate, without damage to terminals or components
- 2.8** Designated HV electric propulsion component/s are dismantled, removed and/or replaced in accordance with relevant industry standards
- 2.9** Designated HV electric propulsion components parts and/or associated components are stored appropriately to

		protect against damage
	2.10	Repairs to the removed equipment are in accordance with relevant industry standards and workplace procedures
3 Reconnect designated HV electric propulsion components	3.1	Cables are re-connected without damage to terminals or components
	3.2	Connections are checked and tested to confirm correct polarity and continuity
	3.3	Designated HV electric propulsion components are assembled and checked in accordance with relevant industry standards
	3.4	Designated HV electric propulsion components are inspected and tested for safety and correct operation
4 Prepare for return to service	4.1	Isolation devices are removed and work clearance is released in accordance with workplace procedures
	4.2	Documentation is completed in accordance with workplace procedures
	4.3	Relevant person/s is notified when designated HV electric propulsion components are ready for return to service in accordance with workplace procedures

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 UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Disconnecting and reconnecting of HV electric propulsion components on engine driven, self-propelled earth moving vehicles operating up to 3,300 V must not include the following:

- associated electrical work other than to disconnect and reconnect of HV electric propulsion components of off-road HV electric propulsion components on engine driven, self-propelled earth moving vehicles

operating up to 3,300 V

- competencies associated with fixed wiring
- on complex electrical work
- where high fault currents are possible

Unit Mapping Information

This unit replaces and is equivalent to UEENEEP022A Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

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

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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 up to 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 up to 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 electric propulsion components up to 3.3 kV, including:
 - identification of the type and arrangement of circuits supplying electric propulsion components that is to be disconnected from a supply of up to 3.3 kV
 - 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 electric propulsion components up to 3.3 kV, 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 supply of up to 3.3 kV
 - 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 supply of up to 3.3 kV
- 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 3.3 kV electric propulsion components of self-propelled earth moving vehicles
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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