



Australian Government

**UETTD RIS73 Develop engineering
solutions for energy supply power
transformer problems**

Release: 1

UETTDRI573 Develop engineering solutions for energy supply power transformer problems

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 developing engineering solutions to resolve problems with energy supply system protection. It encompasses working safely, applying extensive knowledge of energy supply power transformer operation and their application, gathering and analysing data, applying problem-solving techniques, and developing and documenting solutions and alternatives.

Typical transformer problems are those encountered in meeting performance requirements and compliance standards, revising a transformer operating parameters and dealing with transformer malfunctions

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

All competencies in the Common Unit Group must have been completed, plus all competencies in one (1) of the identified Pathway Unit Group(s).

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

UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits

UEENEEE126A Provide solutions to basic engineering computational problems

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

UEENEEG149A Provide engineering solutions to problems in complex polyphase power circuits

UETTDRIS67 Solve problems in energy supply network equipment

UETTDRIS68 Solve problems in energy supply network protection equipment and systems

UETTDRIS69 Diagnose and rectify faults in energy supply apparatus

Distribution Pathway Unit Group

UETTDRIS70 Diagnose and rectify faults in electrical energy distribution systems

Transmission Pathway Unit Group

UETTDRIS71 Diagnose and rectify faults in electrical energy supply transmission systems

Distributed Generation Pathway Unit Group

UETTDRIS72 Diagnose and rectify faults in distributed generation systems

Competency Field

Industry Specific Cross Discipline

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to develop engineering solution for energy supply power transformer problems

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) processes and 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** The extent of the transformer problem is determined from performance specifications and situation reports and in consultation with relevant personnel
- 1.4** Activities are planned to meet scheduled timelines in consultation with others involved in the work

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|---|------------|--|
| | 1.5 | Effective strategies are formed to ensure solution development and implementation is carried out efficiently |
| 2 Develop engineering solutions for energy supply power transformer problems | 2.1 | WHS/OHS risk control measures and procedures for carrying out the work are followed |
| | 2.2 | Knowledge of supply power transformer arrangements, operation, device characteristics and applications are applied to developing solutions to supply power transformer problems |
| | 2.3 | Parameters, specifications and performance requirements in relation to each transformer problem are obtained in accordance with established procedures |
| | 2.4 | Approaches to resolving supply power transformer problems are analysed to provide most effective solutions |
| | 2.5 | Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policies |
| | 2.6 | Quality of work is monitored against personal performance agreement and/or established organisational or professional standards |
| 3 Test, document and implement engineering solution for energy supply power transformer problems | 3.1 | Solutions to transformer problems are tested to determine their effectiveness and modified where necessary |
| | 3.2 | Adopted solutions are documented, including instruction for their implementation that incorporates risk control measures to be followed |
| | 3.3 | Appropriately competent and qualified person(s) required to implement solutions to supply power transformer problems is coordinated in accordance with regulatory requirements and enterprise policy |
| | 3.4 | Justification for solutions used to solve supply power transformer problems is documented for inclusion in work/project development records in accordance with professional standards |

Note: A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c

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 UETTDRIS73A Develop engineering solutions for energy supply power transformer problems.

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 UETTDRIS73 Develop engineering solutions for energy supply power transformer problems

Modification History

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

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
- developing engineering solutions for energy supply power transformer, including:
 - understanding the extent of the transformer problems
 - forming effective strategies for solution development and implementation
 - obtaining transformer parameters, specifications and performance requirements appropriate to each problem
 - testing and finding solutions to transformer problems
 - documenting instruction for implementation of solutions that incorporate risk control measure to be followed
 - documenting justification of solutions implemented in accordance with professional standards
 - 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:

- transformer construction and operating principles encompassing:
 - various types of lamination style and core construction used in single phase, three phase, double wound and auto transformers
 - different winding styles/types used in transformers

- how input current is limited on no-load and how power is transferred from primary to secondary when a load is connected
- using the transformation ratio to determine an unknown quantity of V, I and VA
- significance of nameplate data items
- operation of a transformer under load/no-load conditions
- the reason any particular type of transformer is used in a specific application
- safety features specified in regulatory standards with respect to transformers
- safety features specified in regulatory standards with respect to isolating transformers
- basic insulation resistance, continuity and winding identification tests
- transformer parameters encompassing:
 - the percentage impedance of a transformer by test
 - percentage impedance of a transformer by calculation
 - the equivalent circuit of a transformer
 - calculation of voltage regulation
 - losses that occur in a transformer
 - tests to determine losses
 - efficiency and state typical values
 - the all-day efficiency of a transformer
- cooling methods encompassing:
 - methods of natural and forced cooling
 - properties of transformer oil
 - tests performed on transformer oil
 - auxiliary equipment
 - the purpose and operation of the types of auxiliary equipment used on transformers - bushings, explosion vents, surge diverters, tap changers, conservator, breathers and desiccants, gas relays and temperature indicators
- instrument transformers encompassing:
 - construction of current transformers
 - uses and ratings of current transformers
 - construction of voltage transformers
 - uses and ratings of voltage transformers
 - safety techniques when using instrument transformers
- transformer connections encompassing:
 - vector group of a transformer from a connection diagram
 - connections of a three phase transformer to create a particular vector group
 - reasons for using the different vector groups
 - purpose of tertiary windings
 - consequences/effect of an incorrect connection
- parallel operation encompassing:
 - polarity markings for the windings of a transformer

- conditions/restrictions for parallel operation of transformers
- calculation of loading on transformers operating in parallel
- connection of transformers in parallel to supply a common load
- the consequences/effect of an incorrect connection
- harmonics in transformers encompassing:
 - how harmonics are generated in transformers
 - problems caused by harmonics in transformers
 - measurement of the harmonics in a transformer
 - methods/equipment used to overcome harmonics in transformers
- high voltage (HV) isolation encompassing:
 - the term HV
 - procedures for isolating HV apparatus
 - regulations with respect to access permits
 - clearances to be observed with respect to HV up to 33 kV
 - the term ‘step’ and ‘touch’ potential.

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:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

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