



Australian Government

UEEEL0038 Design switchboards rated for high fault levels (greater than 400 A)

Release: 2

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Modification History

Release 2. Minor Change. Typographic error in prerequisites corrected.

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 design switchboards rated for high fault levels (greater than 400 ampere (A)).

It includes preparing and developing switchboard design and obtaining approval for switchboard design. It also includes designing schemes for protection of persons and property; correct functioning and compatibility with the supply; and arrangement of circuits. It also includes determination of fault levels, effective switchgear, control gear, and protection against over-current, over and under-voltage, and wiring based on calculations to meet required safety and performance standards and functional requirements.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

UEEEL0059 Plan low voltage switchboard and control panel layouts

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

UEECD0019 Fabricate, assemble and dismantle utilities industry components

UEECD0020 Fix and secure electrotechnology equipment

UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications

UEEEL0003 Arrange circuits, control and protection for general electrical installations

UEEEL0020 Solve problems in low voltage a.c. circuits

UEEEL0023 Terminate cables, cords and accessories for low voltage circuits

UEEEL0018 Select wiring systems and cables for low voltage general electrical installations

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0021 Solve problems in electromagnetic devices

UEEEL0008 Evaluate and modify low voltage heating equipment and controls

UEEEL0009 Evaluate and modify low voltage lighting circuits, equipment, and controls

UEEEL0010 Evaluate and modify low voltage socket outlets circuits

UEEEL0024 Test and connect alternating current (a.c.) rotating machines

UEEEL0025 Test and connect transformers

and

UEECD0043 Solve problems in direct current circuits

or

UEECD0044 Solve problems in multiple path circuits

UEECD0046 Solve problems in single path circuits

and

UEEEL0062 Provide engineering solutions to problems in complex polyphase power circuits

UEECD0036 Provide engineering solutions for problems in complex multiple path circuit

UEECD0039 Provide solutions to basic engineering computational problems

and

UEECD0041 Solve electrotechnical engineering problems

or

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0021 Solve problems in electromagnetic devices

or

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0021 Solve problems in electromagnetic devices

or

UEEEC0074 Troubleshoot resonance circuits in an electronic apparatus

Competency Field

Electrical

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

PERFORMANCE CRITERIA

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

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| 1 Prepare to design switchboards | 1.1 Work health and safety (WHS)/occupational health and safety (OHS) processes and workplace procedures for a given work area are identified, obtained and applied |
| | 1.2 Scope of the switchboard is identified from design brief |
| | 1.3 Switchboard safety and regulatory requirements are identified, obtained and applied |
| | 1.4 Design development work is planned in consultation with relevant person/s involved with the work to meet scheduled timelines |
| 2 Develop switchboard design | 2.1 Relevant performance standards, compliance methods and electrical equipment are applied to switchboard design in accordance with relevant industry standards |
| | 2.2 Alternative switchboard design/s is developed in accordance with the design brief |
| | 2.3 Safety, functional and budgetary considerations are incorporated in switchboard design |
| | 2.4 Switchboard design draft is checked in accordance with design brief and relevant industry standards |
| | 2.5 Switchboard design is documented for submission to relevant person/s for acceptance and approval |
| | 2.6 Unplanned situations are dealt with in accordance with workplace procedures |
| 3 Obtain approval for installation design | 3.1 Switchboard design is documented and presented to client representative and/or relevant person/s |
| | 3.2 Requests for alterations to the design are negotiated with relevant person/s in accordance with workplace procedures |
| | 3.3 Final design is documented and approval obtained from relevant person/s |
| | 3.4 Quality of work is monitored in accordance with workplace procedures and relevant industry standards |

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.

Designing a > (greater than) 400 A three phase, 20 kilowatt (kw) fault level switchboard must include at least the following:

- control for essential and general supply
- metering
- sub-main controls
- local final sub-circuit distribution board
- fault indicators

Unit Mapping Information

This unit replaces and is equivalent to UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A).

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 UEEEL0038 Design switchboards rated for high fault levels (greater than 400 A)

Modification History

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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, performance criteria and range of conditions on at least one occasion and include:

- developing outlines of alternative designs
- developing the design within the safety and functional requirements and budget limitations
- documenting and presenting design effectively
- successfully negotiating design alteration requests
- obtaining approval for final design
- dealing with unplanned events
- applying performance standards, compliance methods and electrical equipment to switchboard design
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- consulting with relevant person/s in planning design work
- identifying scope of switchboard design brief
- monitoring quality of work
- planning to meet scheduled timelines
- preparing to design switchboards.

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:

- switchboard design of low voltage (LV) switchboards rated for high fault currents, including:
 - trade calculations encompassing:
 - mathematical techniques
 - relevant calculations
 - linear measurement, areas, volumes and ratios

- engineering mechanics encompassing:
 - base physical quantities
 - concepts, principles, International System of Units (SI) units, their applications in engineering calculations in relation to physical quantities and associated formulae
 - mass, velocity, acceleration, force, weight, density and angles
 - energy/work/power
 - moments/torque
 - centre of gravity
 - mechanical advantage
 - levers
 - pulley blocks
 - efficiency
 - friction
 - vectors
 - resolution of forces
 - forces in strung conductors
 - forces on poles and towers
 - determination of sag
 - pressure/stress
 - elementary fluid mechanics
- engineering materials encompassing:
 - classification
 - ferrous and non-ferrous metals
 - steels and alloys
 - properties
 - tensile strength
 - temperature and expansion in metals
 - stress and strain
 - ductility
 - applications
 - corrosion
 - galvanic corrosion
 - hardwoods and soft woods
- fault current calculations encompassing:
 - calculation of fault currents
 - calculation/determination of positive, negative and zero sequence impedances
 - determination of fault current breaking and let-through energy capacities of protection devices
 - the influence of fault/arc impedances
 - impedances operative for phase-to-phase and phase-to-earth faults

- calculation of fault currents for phase-to-phase and phase-to-earth faults
- approximation calculations by selecting the components with the major impedance
- problem-solving techniques
- relevant manufacturer specifications and operating instructions
- relevant job safety assessments or risk mitigation processes
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace quality, instructions, policies and procedures.

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 and equipment currently used in industry
- resources that reflect current industry practices in relation to designing switchboards rated for high fault levels
- 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>