

1. Module details**Module name****Substations: Panels, Wiring, Protection and Instrumentation****Module duration**

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 – 40 hours.

Module code

NUE247

Discipline code

0703130

2. Module purpose

This module provides the learner with a basic understanding of circuitry, control and instrumentation within a switchgear substation system and enable them to assemble and wire panels and remote equipment.

3. PrerequisitesNE162 Electrical Principles 3.
NE31 Electrical Drawing Interpretation and Connections.**4. Relationship to competency standards**

This module addresses Unit 3.14 of the E.S.I. National Competency Standards for Overhead Line Work and Cable Jointing.

5. Content**Interpretation of schematics, other drawings and basic substation circuitry****Panel assembly****Cables and wiring****Instrument transformers****Transducers****6. Assessment strategy****Assessment methods**Short answer questions (written, oral or graphic or computer based).
Suitable practical exercises which assess the skills required of each learning outcome.**Conditions of assessment**Theory room for written tests together with practical field observation.
Learners must demonstrate competence in all learning outcomes to the standard described by the assessment criteria and perform all activities in a safe manner in accordance with State Occupational Health and Safety Acts and Regulations, Codes of Practice and Work Procedures when applicable.

7. Learning outcome details

Learning outcome 1

Interpret schematic and other drawings, and explain basic operation of circuitry for major plant items.

Assessment criteria

- 1.1 Identify and select correct drawings and schematic diagrams.
- 1.2 Identify symbols and relate to the physical components installed.
- 1.3 Identify and explain accurately the basic operation of associated equipment from drawings and diagrams.

Learning outcome 2

Assemble a control/instrumentation panel.

Assessment criteria

- 2.1 Install a panel.
- 2.2 Check multicore installation diagrams and schedules.
- 2.3 Modify existing circuitry.
- 2.4 Attach identification labels.

Learning outcome 3

Fit panel wiring and multicore cables.

Assessment criteria

- 3.1 Peruse multicore diagrams and schedules.
- 3.2 Run multicores and fix in position.
- 3.3 Fit cores and mark cables as specified.
- 3.4 Test cables.

Learning outcome 4

Fit transducers.

Assessment criteria

- 4.1 Identify transducer types and insulation medium.
- 4.2 Locate, read and interpret work instructions, work procedures and manufacturer's specifications and recommendations for specific transducers.
- 4.3 Perform HV switching and LV isolation in accordance with current work instructions and procedures when appropriate.

- 4.4 Complete a Electrotechnology, Printing, Information Technology and Communication Industry Training Board, Incsual examination of a transducer.
- 4.5 Install transducers and connect all cables and apparatus in accordance with work instructions and manufacturer’s recommendations.
- 4.6 Implement precommissioning tests and procedures and record results.
- 4.7 Test, commission and operate transducers electrically and mechanically.

Learning outcome 5

Install and maintain instrument transformers.

Assessment criteria

- 5.1 Identify instrument transformer types and explain the function and operation of each type.
- 5.2 State the safety hazards related to each type of instrument transformer.
- 5.3 Perform HV switching in accordance with current work instructions and procedures.
- 5.4 Install and connect instrument transformer in accordance with current work instructions, work procedures and manufacturer’s recommendations.
- 5.5 Perform pre-commissioning checks and tests.

Learning outcome 6

Interpret electrical drawings and connections.

Assessment criteria

- 6.1 Identify and read electrical diagrams.
- 6.2 Design and connect basic switching circuits.
- 6.3 Identify and read architectural drawings.
- 6.4 Describe the constructional sequence for commonly used building construction methods.

8. Delivery of the module

Delivery strategy

Delivery strategies must be suitable for both theoretical and/or practical learning and module purpose. It is recommended that learning and assessment be facilitated in a holistic manner which may require a learning sequence other than indicated in the body of this module descriptor.

Resource requirements

Enterprise substation construction manual
 Enterprise substation maintenance manual
 Enterprise substation design manual
 Enterprise operation manual
 Enterprise equipment labelling manual
 Relevant Australian standards
 Enterprise work manuals and standard instructions
 Relevant manufacturers' equipment manuals
 Electricity Supply Industry Acts and Regulations

Occupational health and safety requirements

Learners should be made aware of Occupational Health and Safety issues in all situations and be expected to demonstrate safe working practices at all times. Electrical safety must be emphasised. It should be noted that this module addresses substation installation and is not designed for electrical installations in other situations where licensing may apply.