

<b>Title</b>	<b>Demonstrate knowledge of the New Zealand national electricity grid and associated electrical protection</b>		
<b>Level</b>	<b>3</b>	<b>Credits</b>	<b>2</b>

<b>Purpose</b>	<p>This unit standard covers the generation, transmission, distribution, and electrical protection as applied in New Zealand national grid and is intended for people working in the electrical and related trades.</p> <p>People credited with this unit standard are able to demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>– the New Zealand electricity generation, transmission, and distribution system;</li> <li>– the MEN system of supply;</li> <li>– alternate earthing systems;</li> <li>– national grid electrical circuit protection; and</li> <li>– the causes and effects of faults on distribution networks.</li> </ul>
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<b>Classification</b>	Electrical Engineering > Core Electrical
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<b>Available grade</b>	Achieved
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### Guidance Information

- 1 This unit standard has been developed for learning and assessment off-job.
- 2 This unit standard and unit standards 25071, 25072, 29470, and 29476 together meet the assessment requirements of ERAC CEPC 8.  
This unit standard and unit standards 1204, 2016, 29473, and 29477 together meet the assessment requirements of ERAC CEPC 16.  
This unit standard and unit standard 1204 and 2016 together meet the assessment requirements of ERAC CEPC 17.
- 3 Definitions  
*a.c.* – Alternating current.  
*d.c.* – direct current.  
*CEPC* – Critical Essential Performance Capability.  
*ERAC* – Electrical Regulatory Authorities Council.  
*EWRB* – Electrical Workers Registration Board.  
*HV* – high voltage, voltages above LV.  
*Industry practice* – those practices that competent practitioners within the industry recognise as current industry best practice.  
*LV* – low voltage, voltages above 50v a.c. or 120v ripple free d.c. but not above 1000v a.c. and 1500v d.c.;  
*MEN* – multiple earthed neutral.

*Safe and sound practice* – as it relates to the installation of electrical equipment is defined in AS/NZS 3000:2007, *Electrical Installations (known as the Australian/New Zealand Wiring Rules)*.

SWER – single wire earth return.

#### 4 Range

- a Candidates may refer to current legislation and Standards during assessment.
- b Demonstration of safe working practices and installation in accordance with *safe and sound practice* are essential components of assessment of this unit standard.
- c All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with:
  - i legislation;
  - ii policies and procedures;
  - iii ethical codes;
  - iv Standards – may include but are not limited to those listed in Schedule 2 of the Electricity (Safety) Regulations 2010;
  - v applicable site, enterprise, and industry practice; and,
  - vi where appropriate, manufacturers' instructions, specifications, and data sheets.

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## Outcomes and performance criteria

### Outcome 1

Demonstrate knowledge of the New Zealand electricity generation, transmission, and distribution system.

#### Performance criteria

- 1.1 Describe generation methods used in New Zealand's national grid.

Range hydro, thermal, geothermal, wind, solar.

- 1.2 Using fully labelled diagrams explain the New Zealand electricity generation, transmission, and distribution system from power station to consumer.

Range diagram shows – alternator, transformers, transmission lines, switching stations, substations, distribution lines, typical voltages before and after transformation, protective equipment, control equipment, connection details for single-phase, two-phase, and three-phase consumers, phase, neutral, and earth conductors, line voltages, phase voltages.

- 1.3 Explain the reason for using the various voltages in the national grid.

- 1.4 Explain two reasons for using alternating current (a.c.) for generation, transmission, and distribution to end users.

- 1.5 Describe three advantages of three-phase over single-phase supply systems.

- 1.6 Identify locations where d.c. is used in the national grid and give two reasons for using d.c.

**Outcome 2**

Demonstrate knowledge of the MEN system of supply.

**Performance criteria**

- 2.1 With the aid of diagrams showing a typical distribution system from supply transformer to consumer's main switchboard explain the MEN system of supply.
- 2.2 State four reasons for earthing the neutral at multiple points.
- 2.3 Outline SWER systems of reticulation and why it is no longer permitted in New Zealand.
- 2.4 Explain the need for a neutral conductor on an unbalanced star connected load.
- 2.5 Draw a phasor diagram for a star connected load and calculate neutral current for a pure resistive load.

**Outcome 3**

Demonstrate knowledge of an alternate earthing system.

**Performance criteria**

- 3.1 Explain an alternative earthing method with the aid of diagrams showing a typical distribution system from supply transformer to consumer's main switchboard.
- 3.2 State where the selected alternative earthing system would be used and outline the advantages and disadvantages of the selected earthing systems and the MEN earthing system.
- 3.3 Describe multiple electricity supplies.  
  
Range voltage between lines, not applicable on single-phase installations (U), voltage between line and earth (U<sub>0</sub>).

**Outcome 4**

Demonstrate knowledge of national grid electrical circuit protection.

**Performance criteria**

- 4.1 Explain circuit protection.
- 4.2 Explain the need for circuit protection in power cables.
- 4.3 With the aid of diagrams showing construction and operating principles describe in simple terms three protection devices used for HV and three protection devices used for LV power cables.

4.4 Summarise the dangers around replacing distribution fuse links.

### Outcome 5

Demonstrate knowledge of the causes and effects of faults on distribution networks.

### Performance criteria

5.1 Describe causes of faults that can occur on distribution networks.

5.2 Describe the effects of faults on network primary and secondary equipment.

<b>Replacement information</b>	This unit standard replaced unit standard 15856.
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**This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.**

### Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	21 July 2016	31 December 2027
Revision	2	16 March 2017	31 December 2027
Review	3	25 May 2023	31 December 2027

<b>Consent and Moderation Requirements (CMR) reference</b>	0003
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.