

Title	Demonstrate knowledge of electric circuit design, control, and protection		
Level	3	Credits	6

Purpose	<p>This unit standard is for electricians and related trades, who need to design, draw, and understand electrical installation, control, and electrical protection diagrams.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> – design, draw, and explain control circuits; – design, draw, and explain circuits used to protect electrical circuits from static electricity and magnetic interference; – design, draw, and explain electrical protection circuits; – design, draw, and explain lighting circuits; and – prepare electrical functional drawings for an electrical installation to a given specification.
----------------	---

Classification	Electrical Engineering > Core Electrical
-----------------------	--

Available grade	Achieved
------------------------	----------

Explanatory notes

- 1 This unit standard has been developed for learning and assessment off-job.
- 2 This unit standard and unit standards 5932, 15848, 15855, 17602, 29429, and 29465 together meet the assessment requirements of ERAC CEPC 10.
This unit standard and unit standards 5932, 15848, 15855, 29443, and 29444 together meet the assessment requirements of ERAC EPC 12.
This unit standard and unit standard 1204 and 16415 together meet the assessment requirements of ERAC CEPC 20.
This unit standard and unit standards 5931, 5932, 15848, 15855, 29419, and 29430 together meet the assessment requirements of ERAC CEPC 23.
This unit standard and unit standards 5931, 5932, 15848, 15855, 29419, 29430, 29440, and 29471 together meet the assessment requirements of ERAC CEPC 24.
This unit standard and unit standards 15870 and 29419 together meet the assessment requirements of ERAC CEPC 27.
This unit standard and unit standards 29419, 29422, 29472, and 29481 together meet the assessment requirements of ERAC EPC 41.
This unit standard and unit standards 29443 and 29444 meet the assessment requirements of ERAC EPC 52.
- 3 Definitions
CAD – computer aided design.

CEPC – Critical Essential Performance Capability.

EPC – Essential Performance Capability.

ERAC – Electrical Regulatory Authorities Council.

EWRB – Electrical Workers Registration Board.

Industry practice – those practices that competent practitioners within the industry recognise as current industry best practice.

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)*.

4 Range

- a Both hand drawing and CAD are to be used during assessment.
- b Standard symbols to be used for all assessments.
- c Candidates may refer to current legislation and Standards during assessment.
- d Demonstration of safe working practices and installation in accordance with *safe and sound practice* are essential components of assessment of this unit standard.
- e All activities and evidence presented for all outcomes and evidence requirements 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.

Outcomes and evidence requirements

Outcome 1

Design, draw, and explain control circuits.

Range control circuits – three-heat switch, energy regulator (simmerstat), thermostat, direct on-line motor starter, lighting control with light sensor and timer, direct current circuits.

Evidence requirements

- 1.1 Design control circuits for four different types of equipment requiring control.
- 1.2 Draw diagrams to represent the circuit.
- 1.3 Explain circuit operation logically with reference to the purpose of each component and the time sequence of events.

Outcome 2

Design, draw, and explain circuits used to protect electrical circuits from static electricity and magnetic interference.

Evidence requirements

- 2.1 Design circuits used to protect electrical circuits from static electricity and magnetic interference.
- 2.2 Draw diagrams to represent the circuit.
- 2.3 Explain circuit operation logically with reference to the purpose of each component and the time sequence of events.

Outcome 3

Design, draw, and explain electrical protection circuits.

Evidence requirements

- 3.1 Design circuits that include electrical protection devices for four different types of equipment requiring protection.

Range protection devices – rewirable, cartridge and high rupturing capacity (HRC) fuses, miniature circuit-breaker (mcb), magnetic and thermal overload relays, fuses (including miniature glass cartridge type), fusible links.
- 3.2 Draw diagrams to represent the circuit.
- 3.3 Explain circuit operation logically with reference to the purpose of each component, why the type of protection was selected, and the time sequence of events.

Outcome 4

Design, draw, and explain lighting circuits.

Evidence requirements

- 4.1 Design lighting circuits.

Range one-way, two-way two strap, two-way three strap, intermediate switching, electrical protection.
- 4.2 Draw diagrams to represent the circuit.
- 4.3 Explain circuit operation and protection logically with reference to the purpose of each component.

Outcome 5

Prepare electrical functional drawings for an electrical installation to a given specification.

Range evidence is required of a set of related drawings using standard symbols and labelling techniques, with symbol legend, for one installation.

Evidence requirements

- 5.1 Prepare diagrams that are electrically functional and meet specification requirements.
- 5.2 Draw site plan.
- Range diagram includes at least – meter board, switchboard, distribution board if specified, mains entry point, protection, main earth location, mains cable route, control.
- 5.3 Draw location diagram.
- Range diagram includes at least – main switchboard, protection, control, lights, light switches, power outlets, fixed wired appliances, water heating, security alarm components, smoke detectors.
- 5.4 Draw power distribution line diagram.
- Range diagram includes at least – mains cable, submains if specified, subcircuits, protection, switches, revenue meters, off-peak power control. All cables must be labelled for size and type.

Replacement information	This unit standard and unit standard 29479 replaced unit standard 15845 and unit standard 15854.
--------------------------------	--

Planned review date	31 December 2019
----------------------------	------------------

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	21 July 2016	N/A
Revision	2	16 March 2017	N/A

Consent and Moderation Requirements (CMR) reference	0003
--	------

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Please note

Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

Comments on this unit standard

Please contact The Skills Organisation at reviewcomments@skills.org.nz if you wish to suggest changes to the content of this unit standard.