

Title	Demonstrate knowledge of electromotive force (e.m.f.) production		
Level	2	Credits	3

Purpose	<p>This unit standard covers knowledge of electromotive force (e.m.f.) production which underpins all technical careers in the electrical and electronic industries.</p> <p>People credited with this unit standard are able to demonstrate knowledge of:</p> <ul style="list-style-type: none"> – methods for electromotive force (e.m.f.) production; and – electrochemistry.
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Classification	Electrical Engineering > Core Electrical
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Available grade	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 standard 29470 together meet the assessment requirements of ERAC EPC 4.
This unit standard and unit standards 25072, 29470, 29476, and 29477 together meet the assessment requirements of ERAC CEPC 8.
- 3 This unit standard is one of three designed to cover knowledge of magnetism and electricity, the others being Unit 25070, *Explain the properties of conductors, insulators, and semiconductors and their effect on electrical circuits* and Unit 25072, *Demonstrate knowledge of electromagnetism theory*.
- 4 Definitions
e.m.f. – electromotive force.
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.
Outline – to indicate the main features of a topic or sequence of events possibly setting them in a clear framework to show how they interrelate.
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)*.

- 5 Range
- a Conventional current flow direction (positive to negative) is implied. Trainees should be aware of the opposite direction of electron flow.
 - b Candidates may refer to current legislation and Standards during assessment.
 - c Demonstration of safe working practices and installation in accordance with *safe and sound practice* are essential components of assessment of this unit standard.
 - d 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.
- 6 Recommended skills and knowledge:
Unit 25070, *Explain the properties of conductors, insulators, and semiconductors and their effect on electrical circuits*, or demonstrate equivalent knowledge and skills.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of methods for e.m.f. production.

Range chemical, magnetic, friction, piezoelectric, photoelectric, thermocouple.

Performance criteria

- 1.1 Describe methods of producing an e.m.f. in terms of how it is achieved and the relative magnitude of the voltage produced.
- 1.2 State an example of a common device using each method of generation.

Outcome 2

Demonstrate knowledge of electrochemistry.

Performance criteria

- 2.1 Describe the construction and operation of a primary cell and of a lead-acid battery with the aid of labelled sketches.
 - Range the descriptions and diagrams should reflect an understanding of the terms – primary cell, secondary cell, battery, electrolyte, specific gravity, electrodes, cathode, anode, charging, discharging; details of chemical reactions are not required.
- 2.2 Define battery capacity in terms of current and time.

- 2.3 Outline characteristics and typical applications of cells in terms of practical aspects and safety.

Range cells may include but are not limited to – lead-acid, deep-cycle lead-acid, lithium iron phosphate, mercury, nickel-cadmium, nickel-iron, nickel metal hydride;
practical aspects – voltage, capacity, charge/discharge characteristics;
safety – charge/discharge characteristics, disposal;
evidence for four cells required.

- 2.4 Outline precautions that ensure safe charging of lead-acid batteries in accordance with industry practice.

- 2.5 Outline situations where electrical energy creates a chemical effect.

Range electroplating, corrosion, battery charging.

- 2.6 Describe electrochemical corrosion in terms of electrode potentials between metals and electrolytic action of surroundings.

- 2.7 Outline methods of reducing corrosion.

Range methods – alloying, protective coatings, cathodic protection, neutralising of environment.

Replacement information	This unit standard, unit standard 25070, and unit standard 25072 replaced unit standard 15843.
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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	22 August 2008	31 December 2021
Rollover and Revision	2	15 March 2012	31 December 2021
Revision	3	15 January 2014	31 December 2021
Review	4	21 July 2016	31 December 2027
Revision	5	16 March 2017	31 December 2027
Review	6	25 May 2023	31 December 2027

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