

Title	Demonstrate knowledge of safety, protection, and testing for Electrical Service Technicians – A		
Level	3	Credits	2

Purpose	<p>'Electrical Service Technician – A' (EST – A) refers to a class of electrical registration for people who need to service electrical appliances and equipment designed to connect to a single-phase supply by flexible cord and plug, and rated at no more than 230 volts, 10 amps. Registration is the responsibility of the Electrical Workers Registration Board.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> – demonstrate knowledge of electrical safeguards for portable appliances; – demonstrate knowledge of circuit protection; – describe the dangers and requirements when working on and near live electrical equipment; and – demonstrate knowledge of electrical appliance testing.
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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, together with Unit 10933, *Demonstrate knowledge of electrical theory for Electrical Service Technicians – A*, Unit 10935, *Demonstrate knowledge of regulations and codes of practice for Electrical Service Technicians – A*, and Unit 10936, *Demonstrate practical skills required for Electrical Service Technicians – A*, and their prerequisites, are designed to meet the *Safety instruction, theory examination, and practical assessment* requirements for registration as an Electrical Service Technician 'A' (EST – A). For details of additional registration requirements, that is, work experience, candidates should contact the Electrical Workers Registration Board, PO Box 10156, Wellington, telephone: 0800 661 000.
- 3 Training courses designed to prepare candidates for credit in this unit standard must meet the requirements of the *Electricity Regulations 1997, Schedule 2*, and the *Teaching Guidelines for Electrical Service Technician 'A'*, issued by the Electrical Workers Registration Board.
- 4 Candidates seeking credit for this unit standard will find much useful information in the booklet *Electrical Service Technician 'A' Handbook*, issued by the Electrical Workers Registration Board.

- 5 Assessment against this unit standard must be in accordance with the associated Assessment Guide issued by The Skills Organisation.
- 6 Definition
Industry practice – practice used and recommended by organisations involved in the electrotechnology industry.
- 7 References
Electricity Act 1992;
Electricity Regulations 1997;
The New Zealand Electrical Codes of Practice (Ministry of Economic Development, ISSN 0114-0663);
AS/NZS 3000:2007, *Electrical installations (known as the Australian/New Zealand Wiring Rules)* (AS/NZS 3000:2007);
AS/NZS 3008.1.2:1998, *Electrical installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – Typical New Zealand installation conditions* (AS/NZS 3008.1.2:1998);
AS/NZS 3019:2007, *Electrical installations – Periodic verification*;
AS/NZS 3760:2003A1, *In-service safety inspection and testing of electrical equipment: Amendment A1* (AS/NZS 3760:2003A1);
Electrical Service Technician 'A' Handbook, Electrical Workers Registration Board; and all subsequent amendments and replacements.
- 8 Recommended: Unit 6402, *Provide basic life support*; Unit 1178, *Follow safe practices in an electrical workplace*; or demonstrate equivalent knowledge and skills.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of electrical safeguards for portable appliances.

Performance criteria

- 1.1 Demonstration includes descriptions of safeguards and situations requiring safeguards, in accordance with Electricity Regulation 77.
- 1.2 Demonstration includes an explanation of the operation of a residual current device (RCD), with the aid of a circuit diagram.
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| Range | explanation includes – construction, operating principle, protection afforded, electrical connection between the electricity supply and the portable appliance, fault current path through user, maximum operating time, minimum residual current, and requirement for regular testing. |
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- 1.3 Demonstration includes an explanation of the operation of an isolating transformer, with the aid of a circuit diagram.

Range explanation includes – construction, operating principle, protection afforded, electrical connection between the electricity supply and the portable appliance, fault current path, connection for use with one appliance and when used with two or more appliances simultaneously.

1.4 Demonstration includes an explanation of the construction of a double insulated appliance, and identification of the symbol for double insulation.

1.5 Testing requirements for electrical safeguards are described in accordance with AS/NZS 3760:2003A1 and AS/NZS 3000:2007.

Range isolating transformer, double insulated appliance;
RCD – installation test, regular operational testing.

Outcome 2

Demonstrate knowledge of circuit protection.

Performance criteria

2.1 Excess-current faults are described in terms of type and effect of the energy dissipated.

Range faults – overload, short circuit;
energy – electromechanical energy, heat energy;
effects – electric shock hazard, damage to property, damage to cables, explosion, overheating, fire.

2.2 Terms associated with circuit protection are explained in accordance with the Electricity Regulations, AS/NZS 3000:2007, and AS/NZS 3008.1.2.1998.

Range voltage rating, rated current, fusing current, fusing factor, tripping factor, cut-off characteristic, time vs. current characteristic, category of duty, discrimination, back-up protection, coarse and close excess-current protection, rupturing capacity, prospective short circuit current.

2.3 Excess-current protection devices are described in terms of function, construction, operating characteristics, and class of protection, and an application for each is stated, in accordance with the Electricity Regulations.

Range fuses – rewirable, cartridge, and high rupturing capacity (HRC);
miniature circuit-breaker (MCB) – thermal tripping, magnetic tripping, combined thermal and magnetic tripping;
internal protection devices – thermal overload relays, magnetic overload relays, fuses including miniature glass cartridge type, fusible links.

2.4 Demonstration includes description of the conditions that affect the operation of protection devices.

Range conditions – underrated fuse, overrated fuse, incorrectly sized fuse link, overloaded circuit, short-circuit in fixed wiring or appliance, short-circuit to earth, mechanical overload, and excessive earth leakage.

Outcome 3

Describe the dangers and requirements when working on and near live electrical equipment.

Performance criteria

- 3.1 Description includes the effects of short circuit faults on equipment.
- Range effects – flash-over and arcing, energy released as heat, damage to tools and equipment.
- 3.2 Description includes the effects of short circuit faults and electric shock.
- Range burns, eye damage, injuries from splattered material, trauma, electric shock, effect on heart rate and beat.
- 3.3 Description includes factors causing and influencing the degree of electric shock.
- Range simultaneous contact with phase and neutral or phase and earth, peak supply voltage, peak fault current, current path through the body, contact duration, skin moisture, and atmospheric humidity.
- 3.4 Description includes the effects of incorrect isolation in terms of the safety hazard to people and damage to equipment.
- Range failure to isolate correct circuit or all conductors, removal of a live fuse still carrying current.
- 3.5 Description includes time limits for a temporary disconnection, and the person responsible for setting them, in accordance with the Electricity Regulations.

Outcome 4

Demonstrate knowledge of electrical appliance testing.

Range single-phase plug-in appliances, maximum rating of 230 volts 10 amps.

Performance criteria

- 4.1 The legal requirements for appliance testing according to Electricity Regulation 38 and AS/NZS 3760:2003A1 are identified.
- 4.2 Mechanical, electrical, or physical damage is visually identified in accordance with AS/NZS 3760:2003A1.

- 4.3 Tests to be made, instruments used, and acceptable results for each test, are described in accordance with the Electricity Regulations and AS/NZS 3760:2003A1.
- 4.4 Demonstration includes an explanation as to why a multimeter cannot be used for insulation resistance tests.
- 4.5 The safety procedures to be followed when using instruments to test 'live' circuits are described in accordance with industry practice.

Range not energising a circuit until appropriate instrument connections have been made, maintaining adequate insulation and clearances between instrument clips, probes, or leads, avoiding personal contact with either live conductors or earth while using instruments on live circuits.

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	25 June 1997	31 December 2022
Revision	2	3 April 2001	31 December 2022
Revision	3	14 August 2002	31 December 2022
Rollover and Revision	4	25 February 2008	31 December 2022
Review	5	28 January 2021	31 December 2022

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>.