

<b>Title</b>	<b>Apply knowledge of theory and legislation for electrical service technicians (EST)</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>4</b>

<b>Purpose</b>	<p>This unit is designed to meet the practical competencies of the EWRB <i>Teaching Guidelines for Electrical Service Technicians</i>, which is a requirement for registration as an Electrical Service Technician (EST).</p> <p>Achievement of this unit standard alone does not entitle trainees to legally perform prescribed electrical work without supervision. Until registered and licensed under the Electricity Act 1992, trainees are assisting, and must work under supervision when carrying out prescribed electrical work.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> <li>– make up single-phase and three-phase extension leads;</li> <li>– replace fixed wire fittings protected by RCDs;</li> <li>– connect single-phase appliances to the supply using flexible cords;</li> <li>– test and connect induction motors;</li> <li>– reinstate circuit protection after operation of fuses;</li> <li>– disconnect and re-connect single-phase appliances connected to fixed wiring, and test appliances for safety and compliance;</li> <li>– perform supply voltage and current tests on portable single-phase appliances;</li> <li>– disconnect and reconnect three-phase sub-circuits;</li> <li>– identify electrical fittings and accessories, flexible cords, and cable types; and</li> <li>– demonstrate and apply knowledge of heating control circuits.</li> </ul>
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<b>Classification</b>	Electrical Engineering > Electrical Service Technicians
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<b>Available grade</b>	Achieved
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**Guidance Information**

- 1 This unit standard is intended for use by technicians for electrical engineering, electronic engineering, or telecommunications courses at certificate level.
- 2 It is recommended that candidates have been assessed against Unit 31830, *Demonstrate knowledge of electrical theory and legislation for electrical service*

*technicians (EST)*, or can demonstrate equivalent knowledge and skills, prior to assessment against this unit standard.

### 3 References

AS/NZS 3000:2018, *Electrical Installations (known as the Australian/New Zealand Wiring Rules)*;  
AS/NZS 3760:2010, *In-service safety and inspection of electrical equipment*;  
AS/NZS 5761:2011, *In-service safety inspection and testing – Second-hand electrical equipment prior to sale*;  
AS/NZS 5762:2011 *In-service safety inspection and testing – Repaired electrical equipment*;  
Electricity (Safety) Regulations 2010;  
Electricity Act 1992;  
EWRB *Rules of the Board and Teaching Guidelines* available at [www.ewrb.govt.nz](http://www.ewrb.govt.nz);  
Health and Safety at Work Act 2015;  
The New Zealand Electrical Codes of Practice (WorkSafe, ISSN 0114-0663);  
and all subsequent amendments and replacements.

### 4 Definitions

*BC* – bayonet cap lamp holder fitting

*Current regulations and standards* – refers to the requirements of the above legislation and standards, applied to the context in which the term is used.

*ES* – edison screw lamp holder fitting

*HRC* – high rupturing capacity.

*Industry conventions* – a set of agreed, specified, or generally accepted standards.

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

*MIMS* – mineral insulated metal-sheathed.

*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)*.

*PCU* – permanent connection unit.

*RCD* – residual current device.

*SWA* – steel-wire armoured.

*Terminate* – in this unit standards means connecting a cable or cord to a device such as a fitting, plug top or appliance.

*TPS* – tough plastic-sheathed.

*TRS* – tough rubber sheath.

### 5 Range

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 EWRB Rules of the Board;
- vi safe and sound practice;
- vii applicable site, company and industry practice, and industry conventions;
- viii where appropriate or applicable, environmental requirements, manufacturer instructions, specifications, data sheets and manufacturer, supplier and company

health and safety procedures.

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## Outcomes and performance criteria

### Outcome 1

Make up single-phase and three-phase extension leads.

Range two single-phase using different types of plug-tops and cord connector fittings;  
one three-phase (industrial type) cord extension set.

### Performance criteria

- 1.1 Terminate flexible cord at plug and cord connector.
- 1.2 Test manufactured leads for continuity, polarity, and insulation resistance, and record results in accordance with current regulations and standards.

### Outcome 2

Replace fixed wire fittings protected by RCDs.

### Performance criteria

- 2.1 Replace and terminate 10 amp and 15 amp flat pin socket outlet fittings connected to single-phase TPS sub-circuits protected by RCDs to comply with AS/NZS 3000.
- 2.2 Replace fittings connected to RCD protected sub-circuits, and connect fluorescent light fittings to existing ceiling roses and TPS wiring.  
  
Range one-way, two-way and intermediate switching of ES and BC lamp holders and ceiling roses.
- 2.3 Test operation of RCD for operating time and tripping current.

### Outcome 3

Connect single-phase appliances to the supply using flexible cords.

Range evidence of six appliances is required.

### Performance criteria

- 3.1 Confirm, and test appliance is isolated from the supply.  
  
Range Class 1 appliance, Class 2 appliance.
- 3.2 Select flexible cord to match the appliance electrical load and operating conditions.

- 3.3 Prepare and terminate flexible cord at both ends and to appliance.
- Range termination methods must include two of – nut, bolt, screw terminal, tunnel terminal, crimped lug; and one of – solder tag, lug or pin, through-hole solder to printed circuit board; evidence of the use of two types of crimp connectors is required.
- 3.4 Complete visual check, electrically test, and record results for earthing, continuity, polarity, and insulation resistance to confirm that it is safe to reconnect the supply.
- 3.5 Connect appliance to the supply, confirm operation of the appliance, and remove the tag.
- Range evidence of at least one appliance to three-pin plug, and one appliance to permanent wired connection point is required.

#### Outcome 4

Test and connect induction motors.

Range single-phase induction motor, three-phase induction motor.

#### Performance criteria

- 4.1 Confirm that the motor is safe to connect to the supply in accordance with safety inspection and testing requirements of AS/NZS 3760.
- Range polarity, continuity of earthing, continuity of windings, on/off switching.
- 4.2 Connect motor to the electricity supply using direct on line or motor starter.
- 4.3 Confirm safe motor operation using observation, electrical testing, and test run.
- Range tests – live rated-voltage, no-load current, full-load current, comparison with name plate values; observation – direction of motor rotation, smooth and quiet running, operation of centrifugal starter switches where appropriate.
- 4.4 Isolate motor from supply, re-terminate to reverse direction of rotation of the motor and test run.

#### Outcome 5

Reinstate circuit protection after operation of fuses.

**Performance criteria**

- 5.1 Turn off and disconnect defective appliance and turn off main switch before removal of protective device if possible.
- 5.2 Locate, identify, withdraw and replace fuse wire in rewirable fuse carrier and reinsert to base.
- Range fuse carrier is cleaned of fragments of old fuse wire, fuse wire matches the current rating marked on the carrier, fuse carrier is free of protruding ends of fuse wire and is fully seated in its base.
- 5.3 Locate, identify, withdraw and replace HRC fuse in carrier and reinsert to base.
- Range fuse cartridge is replaced in carrier with one of same size, characteristic, and rating; fuse carrier is fully seated in its base.

**Outcome 6**

Disconnect and re-connect single-phase appliances connected to fixed wiring, and test appliances for safety and compliance.

- Range connection – fixed wired, flexible cord to PCU;  
 appliances – Class 1; Class 2;  
 evidence of at least one non-compliant appliance is required.

**Performance criteria**

- 6.1 Switch off supply to appliance, test in preparation to disconnect single-phase fixed wired electrical appliances and apply safety tags.
- 6.2 Complete visual inspections and safety checks.
- 6.3 Disconnect and complete electrical tests.
- Range electrical tests may include but is not limited to – earth continuity, polarity where appropriate and accessible, insulation resistance or earth current leakage;  
 evidence of at least one earth current leakage test is required.
- 6.4 Record test results and affix required test labels.
- 6.5 Reconnect single phase fixed wired electrical appliance to supply.
- 6.6 Remove labels or tags.

**Outcome 7**

Perform supply voltage and current tests on portable single-phase appliances.

- Range evidence of two Class 1, and one Class 2 appliances is required.

**Performance criteria**

- 7.1 Connect to supply and switch on appliance and carryout voltage, load current measurements and record the results.
- 7.2 Confirm measurements are within acceptable norms for the type of appliance, and in accordance with values on the manufacturer's plate.
- 7.3 Apply appliance tag and complete test sheet for portable appliance.

**Outcome 8**

Disconnect and reconnect three-phase sub-circuits.

Range combination of two disconnections and one reconnection, or one disconnection and two reconnections.

**Performance criteria**

- 8.1 Locate, identify, isolate, test, tag, disconnect, and reconnect three-phase sub-circuits.
- Range may include but is not limited to – TPS or TRS, cables enclosed in metal or plastic conduit, neutral screen, copper braided sheath, MIMS or SWA; evidence of two different cable types is required.
- 8.2 Connect to supply and switch on appliance, and carry out voltage, load current measurements, earth fault loop impedance values, and record the results.

**Outcome 9**

Identify electrical fittings and accessories, flexible cords, and cable types.

Range evidence of 10 identifications is required.

**Performance criteria**

- 9.1 Identify flexible cords and cable types and specify the current rating and a typical application for each type.
- 9.2 Identify electrical fittings and accessories and describe application for each.

**Outcome 10**

Demonstrate and apply knowledge of heating control circuits.

Range energy regulator (simmerstat), three heat switching, electronic control. evidence of at least two is required.

**Performance criteria**

- 10.1 Design heating control circuit in accordance with industry conventions.
- 10.2 Make up an operational heating control circuit.
- 10.3 Test operation of heating control circuit for safety and compliance.

<b>Planned review date</b>	31 December 2024
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**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	26 September 2019	N/A

<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>.

**Comments on this unit standard**

Please contact The Skills Organisation [reviewcomments@skills.org.nz](mailto:reviewcomments@skills.org.nz) if you wish to suggest changes to the content of this unit standard.