



Electrical Workers Registration Board

Teaching Guidelines for Electrical Inspector

**Written Examination Prescription
and
Practical Skill Assessments**

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1 Introduction

Under the Electricity Amendment Act 2006 the Electrical Workers Registration Board (the Board) has a responsibility to set the registration criterion and ensure that all persons applying for electrical registration are competent.

Electrical inspector examination prescriptions in this document has been prepared to assist tutors in the development and delivery of courses for trainees and candidates who need to complete any or all of the following to be eligible to apply for registration as an electrical inspector:

- capstone testing – pass the Electrical Inspectors Written Examination; and
- the Electrical Inspectors Practical Skill Assessment programme or Practical Examination.

Tuition provided for the Written Examination and Practical Skill Assessments must cover **ALL** of the subject matter in the relevant part of this document.

While the examination prescriptions in these guidelines are detailed, they do not however cover every aspect. For example, it should not be inferred that a particular subject should be limited to specific examples listed to adequately cover:

- all written examination subject matter.

2 Scope

The Written Examination Prescription is the capstone examination that incorporates subject matter relevant to the work of an electrical inspector.

Candidates undergoing tuition in accordance with this prescription should receive a comprehensive tuition course that incorporates theory subject matter, the Electricity Act 1992 and the Electricity (Safety) Regulations 2010 including Standards cited in Schedule 2 of those regulations by:

- satisfactorily completing a Board approved Electrical Inspectors training course; and
- satisfactorily completing training under an experience pathway in New Zealand which is satisfactory to the Board.

3 Electrical Inspector Registration Requirements

To be eligible for registration as an electrical inspector, under the “Rules of the Board” an applicant must provide evidence to the Board that they have:

- (a) satisfactorily completed a formal training course or courses of study for electrical inspector accredited by the Board or that the Board accepts is equivalent; and
- (b) passed the Board electrical inspector written examination as required by the Board; and
- (c) passed electrical inspector practical skill assessment, **or** a practical examination prescribed by the Board; and

- (d) been registered as an electrician for not less than three years and completed three years' practical experience which is satisfactory to the Board, or had the status of qualified engineer under the Electricity Act 1992 for not less than three years and completed three years' practical experience which is satisfactory to the Board, or been registered as an electrical engineer for not less than three years and completed three years' practical experience which is satisfactory to the Board
- (e) satisfactorily completed instruction in safe working practices, testing, basic first aid and cardiac-pulmonary resuscitation as approved by the Board.

4 Examination Prescription

Written examination – questions will cover any the aspects of this prescription. It will include aspects of underpinning electrical theory knowledge necessary to understand and apply the Electricity Act, Regulations and Standards.

For example, a sound understanding of electrical instrument testing procedures is required to carry out installation testing and inspections including in service testing of RCDs. Therefore questions will involve the Electricity (Safety) Regulations 2010, AS/NZS 3000:2007 and aspects of additional requirements of Companion Standards cited in regulation for specialised installations.

Electrical inspector training under the “Rules of the Board” is based on subject matter knowledge level ratings allocated letters “A”, “B”, “C” and “D” that appear in the right-hand margin. Designated knowledge levels that a candidate is expected to attain by completing Board accredited or Board approved courses of study are as follows.

- A Thorough knowledge
- B Good working knowledge
- C General knowledge
- D Basic understanding.

5 Practical Skill Assessments

To ensure that applicants for electrical inspector registration are competent, they are required to satisfactorily pass the **electrical inspector practical skill assessment programme** established by the Board.

6 Safety

Safety must be emphasised at all times, whether it be classroom tuition, carrying out practical exercises or practical skill assessments. Safety, not only of tutors, assessors and candidates, but also others who may in future depend on the candidate's standard of workmanship and competency.

7 Definitions

Unless the context otherwise requires, within these guidelines:

Act	means the Electricity Act 1992 and the Electricity Amendment Act 2006
Code or ECP	means New Zealand Electrical Code of Practice issued under Part IV of the Act
Regulation	means the Electricity (Safety) Regulations 2010
Standard	means, as the case may be: <ul style="list-style-type: none"> • AS/NZS3000:2007 and Companion Standards as cited in Schedule 2 of the Electricity (Safety) Regulations 2010, being: <ul style="list-style-type: none"> – a New Zealand Standard (NZS) – a Australian Standard (AS) – a joint Australian/New Zealand Standard (AS/NZS) • a British Standard (BS) • an International Electrotechnical Commission Standard (IEC) • an International Standards Organisation (ISO)
Section	means a section of the Electricity Act 1992 or the Electricity Amendment Act 2006.

Interpretations and terms are also defined in the Electricity Act 1992, Electricity (Safety) Regulations 2010 and AS/NZS 3000:2007 incorporating Amendment 1.

8 Reference Texts

The Electricity Act 1992 and the Electricity Amendment Act 2006.

The Electricity (Safety) Regulations 2010.

EWRB supervision procedures for Trainees (published 31 March 2010).

Standards cited in Schedule 2 and of the Electricity (Safety) Regulations 2010.

AS/NZS 3000/2007 incorporating Amendment 1.

Electricity (Safety) Regulations 2010 Schedule 2 Standards

Abbreviations used in regulations	Full title
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Abbreviations used in regulations	Full title
AS 4777.1	AS 4777.1:2005 Grid connection of energy systems via inverters – Installation requirements.
AS/NZS 1677.2	AS/NZS 1677.2:1998 Refrigeration systems – Safety requirements for fixed applications: including Amendment 2.
AS/NZS 2500	AS/NZS 2500:2004 Guide to safe use of electricity in patient care.
AS/NZS 3000	AS/NZS 3000:2007 Electrical Installations (known as the Australian/ New Zealand Wiring Rules) including Amendment 1.
AS/NZS 3001	AS/NZS 3001:2008 Electrical Installations – Transportable structures and vehicles including their site supplies: including Amendment A.
AS/NZS 3002	AS/NZS 3002:2008 Electrical Installations – Shows and carnivals, subject to variation that references to AS/NZS 3439.4 must be read as AS/NZS 3439.4:2009.
AS/NZS 3003	AS/NZS 3003:2003 Electrical Installations – Patient areas of hospitals, medical and dental practices and dialysing locations.
AS/NZS 3004.1	AS/NZS 3004.1:2008 Electrical Installations – Marinas and recreational boats – marinas.
AS/NZS 3004.2	AS/NZS 3004.2:2008 Electrical Installations – Marinas and recreational boats – recreational boats installations.
AS/NZS 3009	AS/NZS 3009:1998 Electrical Installations – Emergency power supplies in hospitals.
AS/NZS 3010	AS/NZS 3010:2005 Electrical Installations – Generating sets.
AS/NZS 3012	AS/NZS 3012:2003 Electrical Installations – Construction and demolition sites, subject to variation that references to AS/NZS 3439.4 must be read as references to AS/NZS 3439.
AS/NZS 3014	AS/NZS 3014:2003 Electrical Installations – Electric fences including Amendment 1.
AS/NZS 3016	AS/NZS 3016:2002 Electrical Installations – Electric security fences including Amendment 1.
AS/NZS 3112	AS/NZS 3112:2004 Approval and test specification – Plugs and sockets including Amendment 1.
AS/NZS 3190	AS/NZS 3190:2009 Approval and test specification – Residual current devices (current-operated earth leakage devices).
AS/NZS 3439	AS/NZS 3439.4:2009 Low-voltage switchgear and control gear assemblies – Particular requirements for assemblies for construction sites (ACS).
AS/NZS 3551	AS/NZS 3551:2004 Technical management programmes for medical devices including Amendment 1.
AS/NZS 3760	AS/NZS 3760:2003 In-service safety inspection and testing of electrical equipment including Amendment 1.
AS/NZS 3820	AS/NZS 3820:2009 Essential safety requirements for electrical equipment.

Abbreviations used in regulations	Full title
AS/NZS 3823	AS/NZS 3823:1998 Electrical Installations – Cold-cathode illumination systems.
AS/NZS 4509.1	AS/NZS 4509.1:2009 Stand alone power systems – Safety and installation.
AS/NZS 4701	AS/NZS 4701:2000 Requirements for domestic electrical appliances and equipment for reconditioning or parts recycling.
AS/NZS 5033	AS/NZS 5033:2005 Installation of photovoltaic (PV) arrays including Amendment 1.
AS/NZS 5761	AS/NZS 5761:2005 In-service safety inspection and testing – Second-hand electrical equipment prior to sale.
AS/NZS 5762	AS/NZS 5762:2005 In-service safety inspection and testing – Repaired electrical equipment.
AS/NZS 60079.14	AS/NZS 60079.14:2009 Explosive atmospheres – Electrical installations design, selection and erection.
AS/NZS 60079.17	AS/NZS 60079.17:2009 Explosive atmospheres – Electrical installations inspection and maintenance.
AS/NZS 60950	AS/NZS 60950.1:2003 Information technology equipment – Safety – General requirements including Amendments 1, 2 and 3.
AS/NZS 61000.3.2	AS/NZS 61000.3.2:2007 Electromagnetic compatibility (EMC) – Limits – Limits for harmonic current emissions (equipment input current less than or equal to 16 amperes per phase) including Amendment 1.
IEC 60050	IEC 60050: International Electrotechnical Vocabulary.
IEC/TS 60479-1	IEC/TS 60479-1 Ed 4.0 Effects of current on human beings and livestock – Part 1: General aspects.
IEC 61000-3-2	IEC 61000-3-2 Ed 3.2 Electromagnetic compatibility (EMC) – Limits – Limits for harmonic current emissions (equipment input current less than or equal to 16 amperes per phase) as amended by deviation in IEC 61000-3-2;2007 including Amendment 1.
IEC 61000-3-3	IEC 61000-3-3 Ed 2.0 Electromagnetic compatibility (EMC) – Part 3-3 Limits – Limits of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems with current less than or equal to 16 amperes per phase and not subject to conditional connection.
IEC 61000-3-4	IEC 61000-3-4 Ed 1.0 Electromagnetic compatibility (EMC) – Part 3-4 Limits – Limitation of emission of harmonic currents in low-voltage supply systems with rated current less greater than 16 amperes.
IEC 61000-3-5	IEC 61000-3-5 Ed 2.0 Electromagnetic compatibility (EMC) – Part 3-5 Limits – Limits of voltage fluctuations and flicker in low-voltage supply systems with rated current greater than 75 amperes.

Abbreviations used in regulations	Full title
IEC 61000-3-11	IEC 61000-3-11 Ed 1.0 Electromagnetic compatibility (EMC) – Part 3-11 Limits – Limits for harmonic currents produced by equipment connected to public low-voltage supply systems with input current greater than 16 amperes and less than or equal to 75 amperes per phase.
IEC 62128-1	IEC 62128-1 Ed 1.0 Railway applications – Fixed installation – Part 1 Protective provisions relating to electrical safety and earthing.
ISO/IEC 17050-1	ISO/IEC 17050-1 Conformity assessment – Supplier’s declaration of conformity – Part 1 General requirements.
NZS 3003.1	NZS 3003.1: (2003) Electrical installations – Patient areas of hospitals and medical and dental practices – Testing requirements.
NZS 6115	NZS 6115:2006 Electrical installations – Mobile electro-medical connectable installations: subject to the variation that references in this standard to NZS3019 must read as references to AS/NZS3001.
NZS 6116	NZS 6116:2006 Safe application of electricity in meat processing industry.
NZS 7901	NZS 7901:2008 Electricity and gas industries – Safety management system for public safety.

Codes of practice	Full title
ECP 34	New Zealand Electrical Code of Practice for Electrical Safety Distances (NZECP 34:2001).
ECP 35	New Zealand Electrical Code of Practice for Power Systems Earthing (NZECP 35:1993).
ECP 36	New Zealand Electrical Code of Practice for Harmonic levels (NZECP36:1993) issued on 4 February 1993.
ECP 41	New Zealand Electrical Code of Practice for Single Wire Earth Return Systems (NZECP41:1993) issued on 4 February 1993.
ECP 46	New Zealand Electrical Code of Practice for High Voltage Live Line Work (NZECP46:2003) issued on 12 October 2001.
ECP 50	New Zealand Electrical Code of Practice for Repair of Domestic Electrical Equipment (NZECP50:1993) issued on 4 February 1993.
ECP 51	New Zealand Electrical Code of Practice for Electrical Wiring Work in Domestic Premises (NZECP51:1993) issued on 4 February 1993.
ECP 60	New Zealand Electrical Code of Practice for Inspection, Testing and Certification of Low Voltage AC Railway Signalling Control Circuits (NZECP60:1997) issued on 6 July 1997.

9 Theory

9.1 Responsibilities of an electrical inspector

9.1.1 Limits of work

1. Understand that unless limited by the Board under Section 86 of the Act, an Electrical Inspector can carry out all prescribed electrical work in Schedule 1 of the Electricity (Safety) Regulations 2010. **A**
2. Be aware inspectors may not inspect electrical installation work that they: **A**
 - personally carried out, or
 - electrical work that they have certified, or
 - supervised someone else carrying out the work

[ER 71(3)]
3. Understand that inspectors may not carry out inspection work unless they are competent to do that work. **A**
4. Inspectors may not inspect work for payment and reward unless they hold a current practising licence that authorises the person to do the work. **A**
S98 E Amendment Act 2006

9.1.2 Inspection requirements – general

1. Understand that a person who inspects a **new** installation must ensure that he or she is given a signed copy of any **declaration of conformity** relating to the work, and must retain the declaration for **three years**. **A**
[ER 71(4)]
2. Understand that inspection of prescribed electrical work is for the purpose of ensuring that: **A**
 - (a) the thing on which the work has been done is, and will be when connected to a power supply, electrically safe; and
 - (b) the work has been done in accordance with the Act and the Electricity (Safety) Regulations 2010.

[ER 71(1)]
3. Be fully conversant with Section 114 (ER 72, 73, 74) which requires testing, certification and inspection to be carried out before that work is connected to a power supply. **A**
4. Understand that the inspector must ensure that the relevant signed declaration of conformity has been received prior to undertaking inspection work. **A**
In addition, the inspector must receive a signed Certificate of Compliance from the installer for the electrical work done on the installation required to be inspected.
5. Be aware and ensure that a domestic installation that has a maximum demand at or below 80 amperes single-phase or 50 amperes in multi-phase complies with Part 2 of AS/NZS3000 (ER 60). **A**
Therefore “Mains Work” for the domestic installation is to be inspected in accordance with Part 2 of AS/NZS3000.

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| 6. | Understand that the inspection work must be done in accordance with AS/NZS3000 and also the applicable Standards indicated in ER72(2)(a) to (e). | B |
| 7. | Understand the Grade A offence provisions for certifying non-compliant work or work that is in breach of ER 71(3). | B |

9.1.3 Inspection work – safety

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| 1. | Understand that inspection work is on fundamental safety aspects as related to personnel, property and electrical fittings. Candidates must therefore recognise any situation that will pose a danger, exposure to electric shock and fire that could result in personal injury, damage safety protective devices or electrical equipment when the electricity supply is connected or continues to be connected.

ERs 19, 20, 22, 23, 24 | A |
| 2. | Stress the need and benefits for equipment to be isolated for the purposes of testing and inspecting for compliance. | A |
| 3. | Explain how effective isolation can be achieved and the benefits of using a “Lock Out Tag Out System” to promote electrical safety. | A |
| 4. | Explain a written isolation procedure to ensure safety. | A |

9.1.4 Documentation

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| 1. | Define the term “Declaration of Conformity”.

[ER 4] | A |
| 2. | Explain the application of “Declarations of Conformity” in context to low voltage electrical installations.

[ER 58] | A |
| 3. | Understand that the electrical inspector is responsible for obtaining and retaining the documentation associated with inspection work undertaken on low voltage electrical installations that include but is not limited to: <ul style="list-style-type: none"> • declarations of conformity • certificates of compliance • electrical warrants of fitness • certificates of verification. | A |
| 4. | Understand that the person who inspects a new installation must ensure that they are given a copy of the declaration of conformity relating to the work and must retain the declaration for three years. | A |

9.1.5 Ethics

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| 1. | Be aware that inspectors have a statutory obligation whilst carrying out prescribed electrical work to report situations which present an immediate danger to life or property and shall as soon as practicable advise both the owner or occupier where that danger exists and the Secretary.

[ER 19(2)] | A |
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| 2. | Understand that it is a Grade A offence to fail to comply with subclause (2) of ER19. | B |
| 3. | Be aware that it is an offence to certify non-compliant work or work which has not been inspected.

[ER71(5)] | A |
| 4. | Understand that inspection work is subject to audit and the offence provisions of the regulations for certifying non-compliant work. | |
| 5. | Understand that an inspector can be subject to disciplinary action if as result of a complaint and investigation he or she is found guilty of a disciplinary offence by the Board. | A |
| 6. | Stress therefore that safety must not be compromised under any circumstances or as a result of employer/commercial pressures. | A |
| 7. | Be aware that inspectors have additional responsibilities in the role of an independent person to ensure that installations are safe to connect to the electricity supply. | A |
| 8. | Understand that inspectors have an obligation to provide mentoring and advisory roles in the interest of electrical safety and public safety. | B |

9.1.6 Certification

Certificate of compliance

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| 1. | Inspectors must be aware of the types of prescribed electrical work that is required to be certified on a certificate of compliance.

[ER 66] | A |
| 2. | Understand that by certifying prescribed electrical work means that person is satisfied on reasonable grounds that: <ul style="list-style-type: none"> • the installation, or part of the Installation, on which the work was done is electrically safe; and • the work has been done in accordance with the Act and regulations. [ER 67(1)] | A |
| 3. | Understand that the Certification of prescribed work must be done: <ul style="list-style-type: none"> • in the case of completed work, as soon as practicable after the work is completed and in no case later than three working days after completion; and • in any other case, no later than the end of the day after the day on which the contract for the work terminates. [ER67(4)] | A |
| | Every Certificate of Compliance must be given within 20 working days after its completion to: <ul style="list-style-type: none"> • the person for whom commissioned the work; or • the occupier of the premises where that work was carried out. A copy must be retained for three years by the person certifying the work and if the work has been inspected by the person inspecting the work.

[ER 68(1) and (2)] | A |

Understand the person certifying or inspecting the work retains a copy of the certificate and the person must **within 20 working days** after receiving a written request supply a copy of the certificate to the Board. **A**

[ER 68(3)]

4. Be aware that inspectors may not certify inspection work unless they are competent to do that work. **A**

5. Be aware that inspectors may not certify work for payment and reward unless they hold a current practising licence that authorises that person to do that work. **A**

Certificate of Verification (COV)

1. Define the applications and uses for a Certificate of Verification. **A**

[ER 73, 74, 75]

2. Understand that an installation that has been disconnected from the electricity supply for more than six months requires a certificate of issued in accordance with AS/NZS3019 by a person authorised to certify "mains work".

[ER74 (3)]

3. Understand that certain installations require periodic assessments to be undertaken to determine that they are electrically safe by an inspector and the results recorded on the form prescribed in the relevant Standard cited. Specifically: **A**

- low voltage installations in caravan parks: in accordance with AS/NZS3001, at intervals not exceeding five years
- low voltage installations in boat marinas: in accordance with AS/NZS3004.1, at intervals not exceeding five years
- low voltage installations at demolition and construction sites: in accordance with AS/NZS3012.

[ER75(2)]

4. Be aware that a copy of the form for a periodic assessment must be given to the person requesting the inspection and a copy of that record retained for three years by the person who did the inspection. **B**

Electrical Warrant of Fitness

1. Understand that any person proposing to supply a connectable installation must verify that the connectable installation has a current warrant of electrical fitness. **B**

[ER76]

2. Be aware that electrical warrant of fitness may be issued by person authorised to **inspect mains work**. **A**

[ER78(1)]

3. Be aware that in relation to a connectable installation that has been certified under regulation 66, the person who did the certification may issue a warrant of electrical fitness at the same time as the certification is done. **A**

4. Be aware that electrical warrants of fitness (ewof) must be issued in accordance with **AS/NZS3001** except that a ewof for a connectable installation: **A**
- in a **pleasure vessel** must be issued in accordance with **AS/NZS3004.2** and
 - in a **mobile medical facility** must be issued in accordance with **NZS6115**.
[ER78(2)]
5. Understand that the person who issues a ewof must: **A**
- give to the person who requests the warrant
 - keep a copy of the completed warrant for three years
 - complete a warrant of electrical fitness that is in the form prescribed by the Secretary, and
 - affix the sticker in a prominent place on the connectable installation.
6. Be aware that a warrant of electrical fitness for a connectable installation **expires four years** from its date of issue or in the case of a **mobile medical facility one year** from its date of issue. **B**
7. Be aware that every warrant of fitness must be on the form that is either: **B**
- the form prescribed by the relevant standard referred to in ER78(2), or
 - a form approved by the Secretary.
8. Be aware that it is a Grade B offence to issue a warrant of electrical fitness: **B**
- that is contrary to the regulations
 - for a connectable installation that is electrically unsafe
 - if the person is not authorised to issue a warrant of electrical fitness.

9.2 Inspection of prescribed electrical work

9.2.1 Work requiring inspection

Be fully conversant with types of electrical work requiring inspection and have a sound knowledge of the relevant Standards and Codes covering the work. Work requiring inspection is covered by regulation 70, 71, 72 and 73. **A**

9.2.2 Who may certify work requiring inspection

Understand that the electrical workers who can certify prescribed electrical work that requires inspection are listed under the "Rules of the Board" **A**

9.2.3 Who may inspect

1. Understand that wiring installation work detailed in regulations 71 to 73 must be inspected by a person authorised to Inspect "Mains Work", or those persons authorised under the employer licence issued by the Board. **A**
2. Be aware that any person authorised to undertake inspection work must be competent to carry out that work. **B**

9.2.4 System of supply

1. Candidates must understand the requirements of regulation 27 in regards to the connection of standard low voltage installations to a MEN system of supply. **A**
2. Be aware that an installation must have at least one MEN switchboard and that the switchboard located electrically closest to the point of supply must be a MEN switchboard. **A**

9.2.5 Low voltage electrical installations

1. Understand that a domestic installation that has a maximum demand at or below 80 amperes single-phase or 50 amperes per phase multi-phase must comply with Part 2 of AS/NZS3000. **A**
[ER60]
2. Be aware that every low voltage installation on which prescribed electrical work is done must be tested in accordance with AS/NZS3000. **A**
[ER65]
3. Be aware that prescribed electrical work (PEW) as detailed in Schedule 1 that involves placing, replacing or positioning of conductors or fittings must be certified on a Certificate of Compliance in accordance with the requirements of regulation 67. **B**
4. Understand that a signed declaration of conformity must be issued in accordance with regulation 58 by the installation designer or alternatively may be issued by the installation installer – prior to the commencement of the work. **A**
5. Be aware of the specific safety rules for installations under Part 1 of AS/NZS3000. **A**
[ER 59]
6. Be aware that certain installations must be installed in accordance with Part 2 of AS/NZS3000 and also the standards as indicated. **A**
[ER 60(2) and (3)]

9.2.6 Home owners electrical work – inspection

1. Understand the requirements for work done by a **home owner** under the exemption Section 79 of the Electricity Amendment Act 2006 and regulation 64(2)(b)(ii). Specifically, that the work is required to be tested and certified in accordance with **Part 2 of AS/NZS3000** before being connected to a power supply by a person authorised to inspect “mains work”. **A**
2. The difference between the testing work that a homeowner is permitted to carry out under NZECP 50 and 51 – compared to tests required of an electrical inspector who is checking appliance repairs or electrical installation wiring work carried out by the homeowner to ensure that it is safe to connect to a power supply. **A**
3. Be aware that the homeowner must comply with the Electricity (Safety) Regulations 2010 and that defective work or non-compliant work must not be either certified or connected to a power supply by the inspector. **A**
[ER 64 and 67]

9.2.7 High voltage

1. Understand that prescribed electrical work on installations that operate at high voltage must be certified and inspected. A
[ER 70]
2. Be aware that the person who inspects a high voltage installation must verify that the installation complies with NZECP34 and also with regulations 34, 41(1), 42(1), 43(1), and 44(1) as referred to works. A
[ER73(3)]
3. Be fully aware of the dangers associated with testing and inspecting high voltage installations with respect to step and touch voltages, clearances and earthing requirements with reference to regulations 13 to 17 and NZECP34. A
4. Be aware of that to inspect high voltage installations the person must be competent.

9.2.8 Medical electrical

1. Define a medical location. A
[ER4]
2. Define a electrical medical device. A
[ER4]
3. Understand that an installation intended for use with medical electrical devices must comply with Part 2 of AS/NZS3000 and also AS/NZS3003. A
[ER60(2)(a)]
4. Understand that installation intended for use with medical electrical facility in a connectable installation must comply with Part 2 of AS/NZS3000 and NZS6115. A
[ER60(2)(c)]
5. Understand that work on installations intended for use with medical electrical devices must be inspected in accordance with the verification process described in the **declaration of conformity** for the installation. A
6. Demonstrate knowledge of the requirements for inspecting medical electrical installations including the commissioning requirements detailed in Appendix D of AS/NZS 3003. A
7. Understand the requirements for periodic inspection of medical electrical appliances including the safety and performance testing requirements are detailed in AS/NZS 3551. A
[ER91]
8. Demonstrate an understanding of the patient areas zone requirements for body protected and cardiac protected electrical areas as defined in AS/NZS3003. C
9. Demonstrate knowledge of the warrant of electrical fitness checks and issuing requirements for a mobile medical facilities that must be issued in accordance with NZS6115. B
[ER78(2)(b)]
10. Understand that a warrant of electrical fitness for a mobile electrical medical facility is valid for one year from its date of issue. A

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|----------------------------------|---|----------|
| 11. | Demonstrate knowledge of the periodic assessment requirements for low voltage and extra low voltage installations intended for use with electrical medical devices situated:
(i) in mobile medical facilities: in accordance with NZS6115
(ii) in any other medical location: NZS3003.1

[ER71(1)(f)] | B |
| 12. | Be aware that extra low voltage work in a medical location is prescribed electrical work.

(See ER Schedule 1(2)(b)(ii)) | A |
| 13 | Understand the dangers and special precautions that must be taken associated with testing and inspecting medical electrical installations. | A |
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9.2.9 Hazardous areas | | |
| 1. | Define a hazardous area.

[ER4] | A |
| 2. | Be aware that extra low voltage work in a hazardous area is deemed prescribed electrical work.

(See ER Schedule 1(2)(c)(ii)) | A |
| 3. | Understand that explosive atmospheres electrical installation design, selection and erection is referenced in AS/NZS60079.14 | A |
| 4. | Understand that explosive atmospheres electrical installation inspections and maintenance requirements in hazardous areas is reference in AS/NZS 60079.17. | A |
| 5. | Understand that to carry out electrical work or inspection work in a hazardous area the person must be competent to undertake that work. | A |
| 6. | Be aware that electrical work carried out in a hazardous area must be inspected.

[ER70(1)(e)] | A |
| 7. | Understand that work done in a hazardous area that complies with Part 1 of AS/NZS3000 is to be inspected in accordance with the verification process in the declaration of conformity for the installation.

[ER72(2)(b)] | A |
| 8. | Understand that inspections must be carried out in accordance with AS/NZS3000 and AS/NZS60079.17.

[ER72] | A |
| 9. | Be aware that periodic assessments for low voltage and extra low voltage installations in a hazardous area are to be undertaken in accordance with the requirements of AS/NZS60079.17. | C |
| 10. | Understand the danger associated with, and precautions required when undertaking testing and inspection work in a hazardous area. | A |

9.2.10 Animal stunning and meat conditioning appliances

1. Understand that work done on animal stunning and meat conditioning appliances must be certified and inspected. **A**
[ER66(4) ER70(i)(g)]
2. Be aware that work done on the installation in accordance with Part 1 of AS/NZS3000 must be inspected in accordance with the verification process described in the declaration of conformity and NZS6116. **A**
[ER72(2)(e)]
3. Understand that work done in accordance with Part 2 of AS/NZS3000 must also be tested and inspected in accordance with NZS6116. **A**
[ER72(2)]
4. Be aware of the dangers associated with testing and inspecting animal stunning and meat conditioning appliances and the precautions necessary to ensure safety. **A**

9.2.11 Mains parallel generation systems

1. Understand that a mains parallel generation system that is connected to the national grid installed in accordance with Part 2 of AS/NZS3000 must also be certified and inspected in accordance with the requirements of AS/NZS3000, AS/NZS3010 and AS4771.1. **A**
[ER70 and 72]
2. Be aware that the person carrying out the inspection in accordance with 1 above must obtain a copy of the declaration of conformity for the installation and the certification prior to undertaking that inspection. **A**
3. Be aware that before connecting the installation to a power supply it must be tested and verified as electrically safe by carrying out checks and tests as prescribed in regulation 73(2). **A**
4. Understand the dangers associated with testing and inspecting a mains parallel generation system. **B**
5. Be aware that there are specific requirements for an emergency power supply in a hospital as required by Part 2 of AS/NZS3000 and AS/NZS3009. **A**
[ER60(3)]

9.2.12 Main switchboards, etc

1. Define the terms 'main switchboard', 'switchboard', and 'switchgear' refer to the regulations interpretations and AS/NZS 3000. **A**
2. List the requirements for testing a low voltage main switchboard and main earthing systems for compliance with Part 2 of AS/NZS3000. **B**
3. Discuss the special requirements for main switchboards, MEN switchboards as per regulation 27 and AS/NZS 3000. **A**

- | | | |
|-----|--|----------|
| 4. | Explain with reference to AS/NZS 3000 requirements for switchboards considering: | B |
| | <ol style="list-style-type: none"> 1. the location 2. access to the wiring and switchgear 3. protection against the spread of fire 4. environment and mechanical conditions 5. revenue metering (energy distributor) requirements 6. prospective short circuit current levels. | |
| 5. | Explain the application of AS/NZS 3000 and the earthing requirements for MEN switchboards. | A |
| 6. | Describe the different types of fittings and accessories used as isolation devices for electrical circuits, located on switchboards. | C |
| 7. | List the specific checks and tests that must be carried out by the person inspecting a new low voltage installation who has received a declaration of conformity for the installation and a CoC completed by the installer for that installation. | A |
| 8. | Understand that a domestic low voltage installation that has a maximum demand at or below 80 amperes single-phase or 80 amperes per phase in a multi-phase must comply with Part 2 of AS/NZS3000. | A |
| | [ER60(1)] | |
| 9. | Be aware that certain installations must be installed in accordance with Part 2 of AS/NZS3000 and also the standards as indicated. | A |
| | [ER 60(2) and (3)] | |
| 10. | Understand that the certain installations listed in 9 above must also be inspected in accordance with Part 2 of AS/NZS3000 and the standards as indicated in ER 60(2) and (3). | A |

9.3 Safety checks for installations and appliances

9.3.1 Safety assessments (periodic inspections)

- | | | |
|----|--|----------|
| 1. | Be fully conversant with installation owner responsibilities regarding safety assessments (periodic inspections) for certain types of electrical installations. | A |
| | [ER75] | |
| 2. | Understand that safety assessments on certain installation can only be carried out by a person authorised to inspect "prescribed electrical work" (electrical inspector) on the relevant kind of installation in the relevant location specifically: | A |
| | <ul style="list-style-type: none"> • low voltage installations in caravan parks • low voltage installations in boat marinas • low voltage installations at demolition and construction sites. | |
| | [ER 75(2)] | |

3. Be aware of the requirements of regulation 75 covering safety inspection checks for other specific types of electrical installations including: **A**
- low voltage installations at carnivals or fair grounds (AS/NZS 3002)
 - low voltage installations in hazardous areas (AS/NZS 60079.17)
 - low voltage and extra low voltage installations intended for use with electrical medical devices situated in mobile medical facilities in accordance with NZS 6115
 - in any other medical-electrical location (AS/NZS 3003.1)
- Understand that the above inspections can only be carried out by a person with the competencies referred to in the relevant standard specified. **A**
4. Understand that the person carrying out the periodic inspection check must record the results on a form prescribed by the Secretary or, if the Standard contains a form, on that form. **A**
5. Understand that a copy of the form must be: **A**
- given to the person requesting the periodic inspection; and
 - retained for three years or send a copy to the Secretary by the person doing the inspection.

9.3.2 Connectable installations

1. Be fully conversant with regulations 77 and 78 regarding the issuing of warrants of electrical fitness for connectable installations. **A**
2. Understand that warrants of electrical fitness for connectable installations are valid for a period of four years from the date of issue. **A**
- [ER 78]
- Be aware that a warrant of electrical fitness for a mobile medical facility is valid for one year from the date of issue. **A**
3. Warrants of electrical fitness must be issued on forms and stickers prescribed by the Secretary for that purpose. **A**
4. Understand that a warrant of electrical fitness for a connectable installation must be issued in accordance with the relevant standard AS/NZS3001 except that for a: **A**
- (a) pleasure vessel issued in accordance with AS/NZS3004.2
 - (b) mobile medical facility issued in accordance with NZS6115
5. Understand that a warrant of electrical fitness can be issued at the same time as the CoC issued under ER66 by the person who did that certification. **B**

9.3.3 Verifying safety before connecting installations

Understand that before connecting a low voltage installation to a power supply the person doing the connection must do all of the following: **A**

- (i) ensure the polarity and phase rotation of the supply are correct
- (ii) ensure that the supply is correctly rated
- (iii) ensure that the installation is compatible with the supply system
- (iv) if the supply is from an MEN system, verify that there is an earthing system
- (v) if there is a revenue meter:
 - (A) confirm there is a declaration of conformity for it signed by the installer or
 - (B) verify it for electrical safety by checking and testing it.

[ER 73(1) and (2)]

1. Be fully conversant with regulation 74 regarding the requirements for the issue a certificate of verification (COV) for an electrical installation by a person authorised to certify mains work that has been disconnected for six months or more. **A**
2. Understand the requirements of AS/NZS 3019 regarding inspection and testing for re-verification of disconnected and existing electrical installations to ensure that they are electrically safe. **A**
3. Understand that a certification of verification issued for the purpose of regulation ER 74(3) can only be issued by a person authorised to inspect mains work. **A**
4. Understand that if prescribed electrical work has been carried out on an existing installation that has been disconnected from the electricity supply for six months or more a CoC for that work and COV must be cited prior to the installation being connected to the electricity supply. **A**

9.4 Notification and installation record procedures

9.4.1 Documentation

1. The candidate must be fully conversant with all documents and forms associated with: declarations of conformity, inspections, certification, verification, periodic safety assessments and issuing warrants of electrical fitness. **A**
2. Understand the importance of accurately completing all documentation associated with testing, certification, inspection and verification processes. **A**
3. Demonstrate a clear understanding of the terminology used throughout documents and forms cited in the Electricity (Safety) Regulations 2010 and relevant standards. **A**
4. The candidate must understand the procedure and requirements of the audit trail following an inspection. **A**
5. Candidates must be aware of offence provisions in the Electricity (Safety) Regulations 2010 pertaining to certifying and issuing documents for non-compliant electrical work or for work that has not been inspected. **A**

9.4.2 Standards and certification requirements for appliances and equipment

1. Understand that all low voltage electrical appliances and fittings must comply with AS/NZS 3820. **C**
2. Understand that a low voltage electrical appliance or fitting complies with AS/NZS 3820 if it has been tested and verified to a Standard listed in AS/NZS 4417 by a testing laboratory listed in AS/NZS 4417. **C**
3. Understand that declared articles are specified high risk electrical appliances and fittings that must have the express approval of the Secretary, prior to being offered for sale in New Zealand. **C**
[ERs 84, 85, 86 and 114]
4. Understand the provision of regulation 23 covering when an appliance is deemed to be “electrically unsafe”. **B**
5. Understand that specific installations, fittings and electrical appliances are deemed to be electrically safe when tested, inspected and tagged and used in accordance with relevant standards listed in regulation 26. **A**
6. Understand that an electrical appliance being hired out or leased complies with regulation 26 if it has been tested and tagged in accordance with AS/NZS 3760 and has passed those tests before being hired or leased. **C**
7. Understand that a used electrical appliance being sold complies with regulation 80 if, before sale, it has been tested in accordance with AS/NZS 5761 and has been tagged accordingly. **C**
[ER80]
8. Understand that after any work done on a extra low voltage or low voltage electrical appliance that may effect its electrical safety must be tested in accordance with AS/NZS5762 before being released from that persons control or returned to service, and in the case of a low of extra low voltage electrical medical device it is tested in accordance with AS/NZS3551. **A**
[ER90]
9. Understand that documentation and requirements for specialised appliances and fittings (medical electrical devices, hazardous areas, etc) are listed in other Standards (eg, AS/NZS 3551; AS/NZS 60079.14). **C**

9.4.3 Certificates and certification

1. Understand the documentation completion processes for prescribed electrical work requiring inspection and that a declaration of conformity and certificate of compliance must first be obtained confirming the tests carried out prior to inspection being undertaken by the inspector. **A**
[ERs 67, 68 and 70, 71, 72]
2. Understand that it is the responsibility of the person who certifies the work to complete the appropriate section of the certificate of compliance. **A**
3. Understand the issuing and time requirements for giving a certificate of compliance to the person who commissioned the work and that a copy must be retained for three years by the person inspecting that work.

4. Understand that the person inspecting the work must within 20 working days after a written request from the Board supply a copy of the certificate to the Board. **A**

9.4.4 Exemption for domestic electrical wiring work (home owners)

Understand that a person who carries out domestic electrical wiring work, done under the exemption in section 79 of the Act must carry it out and test the work in accordance with ECP51. **A**

The work must be certified and tested in accordance with Part 2 of AS/NZS3000 before being connected to a power supply, by a person authorised to inspect mains work.

Be aware that it is an offence for any person authorised to inspect mains work to certify and connect any non-compliant work that has been done under the exemption of Section 79 of the Act. **A**

9.4.5 Warrant of electrical fitness (ewof)

1. Be aware of the requirements of AS/NZS 3001 for caravans and other types of connectable installations and, AS/NZS 3004.2 for pleasure vessels. Testing is to done in accordance with section 8 of AS/NZS 3000 and the issuing of a warrant of electrical fitness in accordance with relevant standard. **A**
2. Be aware that a warrant of electrical fitness for mobile medical facility must be issued in accordance with NZS6115. **A**
3. Understand that the person who issues a ewof must: **B**
 - give to the person who requests the warrant
 - keep a copy of the completed warrant for three years
 - complete a warrant of electrical fitness that is in the form prescribed by the Secretary, and
 - affix the sticker in a prominent place on the connectable installation.
4. Be aware that a warrant of electrical fitness for a connectable installation expires four years from its date of issue or in the case of a mobile medical facility one year from its date of issue. **A**

[ER78(4)]

9.4.6 Caravan park and marina operator responsibilities

1. Understand the responsibilities of marina and caravan park operators to ensure that connectable installations have a current warrant of electrical fitness prior to supplying electricity to that installation. **A**
- [ER76]
2. Be aware that a person must not hire or lease out, or offer to hire or lease out a connectable installation unless the connectable installation has a current warrant of electrical fitness. **C**

9.4.7 Employer licences

1. Be aware of the requirements of Section 115 of the Electricity Act 1992. Understand that the Board may impose restrictions or limits or any conditions as the Board thinks fit pertaining to the issue of an employer licence. **A**
[S 115]
2. The recording procedures for employer licence holders are prescribed in regulation 94 of the Electricity (Safety) Regulations and must comply with the system operation requirements (abridged): **B**
 - identifies the PEW
 - skills and training
 - procedures for carrying out, supervising and monitoring
 - investigating injuries caused to persons and damage to property

[ER 94]

9.5 Legislation

9.5.1 Electrical workers – under the “Rules of the Board”

1. Understand registration classes for electrical workers and work limits imposed are under the jurisdiction of the Board. **A**
2. Understand the testing, certification and inspection of work requirements as they relate to the registration classes: **A**
 - electricians
 - electrical inspectors
 - electrical engineers
 - electrical installers
 - electrical service technicians
 - appliance servicepersons (250V single-phase disconnect and reconnect)
 - appliance servicepersons
 - associated tradespersons (plumbers and gas fitters)
 - line mechanics
 - cable jointers.
3. Be aware that the Board issued supervision procedures for trainees dated 31 March 2010. **A**
4. Understand that regulation 92 limits the work that a supervised person may do. **C**
5. Be aware that a “trainee” may do or assist in doing any work that is within the particular class of work for which the “trainee” is seeking registration that is within the scope of the work that the trainee’s supervisor is authorised to do. **B**
[ER 93]

9.5.2 Practising licences

Understand that a registered person is not authorised to do or assist in doing prescribed electrical work unless they have a current practising license that authorises the person to do the work or assist in doing the work. **A**

[S 98]

9.5.3 Auditing

Understand that the Board can audit electrical workers to ensure the ongoing competency of registered persons actively engaged in electrical work and to ensure compliance with the regulations. **A**

[Section 149(d)]

9.5.4 Power of entry

Understand the limits, powers and conditions covering any person authorised by the Board in respect to access entry into property for the purposes of inspection. **A**

[S 115 Electricity Act 1992]

9.5.5 Disciplinary offences

1. Understand that Sections 142 and 143 of the Electricity Amendment Act 2006 define the disciplinary provisions and disciplinary offences. **A**
2. Fully understand the disciplinary actions that can be taken against a person found guilty of a disciplinary offence, including but not limited to: **B**
 - summarising the penalties applicable for A grade and B grade offences.
 - cancelling or suspension of a person's registration class, provisional licence or practising licence as the Board sees fit.

9.5.6 Competency requirements

1. Be aware that any person who carries out any prescribed electrical work must take all practicable steps as detailed in regulation 100. **A**
2. Be aware that the requirements of regulation 100 are in addition to and do not limit that persons responsibilities under the Health Safety and Employment Act 1992. **A**
3. Be aware that employers must take practicable steps to ensure the safety of any employee of that employer who is carrying out or assisting to carry out any work is competent to do that work. **A**
4. Understand that a registered person may as a result of disciplinary action be required by the Board to complete a specified competency programme within a specified time period. **B**

[S 108 Electricity Amendment Act 2006]

5. Understand that the Board can set competency training programmes for persons who do or assist in doing prescribed electrical work in respect to persons who: **A**
- apply for practising licences or provisional licences, or
 - hold practising licences or provisional licences, or
 - apply for renewal of practising licences or provisional licences.

[S 108 Electricity Amendment Act 2006]

9.5.7 Health and Safety in Employment Act 1992

1. Be aware of the Health and Safety in Employment Act and how this Act impacts on working conditions, safety issues and the requirement that electrical accidents involving serious harm to persons be reported to the Department of Labour. **A**

[S16 Electricity Act 1992 as amended by the Electricity Amendment Act 2006]

2. Understand that all practicable steps must be taken to identify significant hazards and potential hazards in the workplace. **A**
3. Be aware of and understand the hazard management process eliminate, isolate, minimise and controls for any hazard identified. **A**
4. Be aware of the responsibilities of the employer to provide employees with personal protective equipment that complies with safety standards and that PPE is regularly checked to ensure it is maintained in a safe condition. **A**
5. Understand that the HSE Act jointly charges both employers and employees with a responsibility to take all practicable steps to ensure that the workplace is a safe environment. **A**
6. Recognise the dangers associated with using inferior or makeshift equipment. Have a sound knowledge of the reporting procedures for the consumer and contractors involving electrical accidents. **A**
7. Understand the dangers/hazards involved and additional precautions when working on or near high voltage equipment. **A**
8. Be aware of the danger of using metal ladders around electrical equipment and electricity supplies. **A**
9. Be aware that to comply with the HSE Act and Electricity Act that a person must work within their competency level or be under the supervision of person who is competent to do that work. **A**

9.5.8 Electricity Act 1992 incorporating amendments of the Electricity Amendment Act 2006 and Electricity (Safety) Regulations 2010

1. Understand and demonstrate a thorough knowledge of the requirements detailed in the Electricity Act 1992 and the Electricity (Safety) Regulations 2010. **A**
2. Candidates should be able to locate in the Act statements and numerical values. **A**
3. **Electricity (Safety) Regulations 2010**
- (a) List the objectives and reasons for the regulations. **A**
- (b) Understand definitions and interpretations in regulation 4. **A**

- | | | |
|-----|---|----------|
| (c) | General layout and contents: | A |
| | <ul style="list-style-type: none"> • recognise the relevance of the regulations and the responsibilities of persons carrying out electrical work, including Standards and Codes cited by regulation demonstrate a thorough knowledge of each part of the regulations that impact on a person authorised to inspect mains work • have a clear understanding of the responsibilities for testing for electrical safety, the minimum/maximum acceptable test values for installation testing as prescribed in AS/NZS3000 and the relevant standards cited. | |
| (d) | Safety of works, electrical installations, fittings and electrical appliances: | A |
| | <ul style="list-style-type: none"> • have a thorough understanding of the requirements of the regulations. | |
| (e) | Systems of supply: | A |
| | <ul style="list-style-type: none"> • have a thorough understanding regulations 27 to 33 • recognise and demonstrate a clear understanding of the conditions and requirements identified in Codes which govern the supply to consumer installations/premises. | |
| (f) | Earthing: | A |
| | <ul style="list-style-type: none"> • earthing requirements and details are covered in AS/NZS3000 • that equipotential bonding tests are carried out to ensure that the connection between any point required to be equipotentially bonded and the switchboard earth bar is continuous and does not exceed 0.5 ohms • the minimum size of conductor used for equipotential bonding is detailed in Section 5 of AS/NZS 3000 • refer to AS/NZS 3003 regarding equipotential bonding requirements in medical locations. | |

9.5.9 Standards and codes

- | | | |
|----|---|----------|
| 1. | Demonstrate a good understanding of the requirements of the Standards and Codes and show proficiency in their use for specific applications. | A |
| 2. | Be aware of the availability of Codes for specific specifications. | A |
| 3. | Have a thorough knowledge of the fundamental electrical safety principles detailed in Part 1 and Part 2 of AS/NZS 3000 and how they are applied. | A |
| 4. | Have a thorough knowledge of the requirements for the installation of RCDs in installations as detailed Part 2 of AS/NZS 3000. | A |
| 5. | Have a good working knowledge of AS/NZS 3000; AS/NZS 3001; AS/NZS3002; AS/NZS 3003; AS/NZS 3004; AS/NZS 3008.1.2; AS/NZS 3012; AS/NZS 3760; AS/NZS 3820; AS/NZS 3019; AS/NZS 4701; ECP 51 and 54. | B |
| 6. | Have a general knowledge of AS/NZS 3016; AS/NZS 3012; AS/NZS 3832; AS/NZS60079.14, AS/NZS60079.17 IEC 60479-1; ECP 34 and ECP 35. | C |
| 7. | Have general knowledge of the AS/NZS 2500; AS/NZS 3350.2.98; AS/NZS 3551; AS/NZS 4249; AS/NZS 4417; AS/NZS 60950; NZS6115; IEC 60050; IEC 60309; ECP 36; ECP 41; ECP 50, ECP 52 and ECP60. | C |

9.6 Electrical safety of personnel

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|----|--|----------|
| 1. | Have a good understanding on the physiological effects of electricity on the human body including macro and micro electric shock levels. | A |
| 2. | Understand the zone designations and corresponding zone shock current limits detailed in Figure 13 and Table 4 of IEC 60479-1. | A |
| 3. | Have a good knowledge of cardio-pulmonary resuscitation and understanding that lives can be preserved and restored by the quick actions of rescuers in the event of an accident. | A |
| 4. | Hold a current competency certificate in resuscitation techniques in the methods approved by the New Zealand Resuscitation Council. | A |

9.6.1 Safe working practices

- | | | |
|----|---|----------|
| 1. | Understand the benefits of test before touch and working on equipment that has been isolated. | A |
| 2. | State the importance of using the “DANGER TAG” system to promote safety in the workplace. | A |
| 3. | (a) Explain how to test to prove isolation and the use of “DANGER TAGS” to promote safety in the workplace. | A |
| | (b) List the various methods employed for the isolation of equipment. | A |
| | (c) How to test to prove isolation. | A |

9.6.2 Selection of and use of RCDs and isolation transformers

- | | | |
|----|---|----------|
| 1. | Be fully conversant with the requirements for RCDs and isolating transformers used for supplying handheld appliances in various environments and locations. | A |
| 2. | Be fully conversant with RCD maximum operating times and maximum operating current values for personal protection. | A |
| 3. | Understand the differences between the installation and use of RCDs and isolation transformers for general personal protection and that required in medical situations (AS/NZS 3003). | A |

9.6.3 The dangers of high prospective short circuit currents

- | | | |
|----|---|----------|
| 1. | Have a thorough knowledge of the dangers that high prospective short circuit current levels pose to persons, protective devices, fittings and property damage. | A |
| 2. | Recognise and establish the suitability of a particular piece/item of equipment for a given application in terms of current rating and category of duty. | A |
| 3. | Determine the prospective short current and fault levels for a three-phase 400V distribution transformer when the kVA rating, Z% or % regulation and full load current values are stated. | B |

9.6.4 The multiple earth neutral (MEN) system

1. Understand the reasons for earthing, the principles involved, and the reasons for installing an earthing system. **A**
2. Have a thorough knowledge and understanding of the types of earthing systems used, their advantages and disadvantages. Selection of the correct equipment, apparatus and conductor size for a particular application associated with an earthing system. **A**
3. Understand that installations designed and constructed to operate at standard low voltage must be connected to a MEN system of supply. **A**
[ER27(2)]
4. Be aware that if an installation is supplied with electricity from a MEN system of supply: **A**
 - the installation must have at least one MEN switchboard, and
 - the switchboard located electrically closest to the point of supply must be a MEN switchboard.

[ER27(4)]
5. Explain the implications of a missing MEN link in an installation during fault conditions in respect to; line voltage to earth, fault current path, earth loop impedance and operation of protective devices. **A**
6. Understand and have a full appreciation of dangers or hazards that can arise when the main neutral conductor for an installation is faulty and is a greater impedance value than that of the main earth conductor. **A**
7. Understand that the earthing requirements for low voltage installations are stated in Section 5 of AS/NZS3000. **A**

9.6.5 Dangers associated with reversed polarity to an electrical installation

1. Understand and explain the dangers associated with a transposition of mains polarity at the installation point of connection with the electricity supply. **A**

Identify the test methods that can be employed to positively identify the polarity of the neutral conductor of mains for an installation when the supply is available, eg, independent earth stake, trailing lead and voltage testing instrument. **A**

Identify the test methods that can be employed to positively identify the polarity of the neutral conductor of mains when the electricity supply is not available, eg, independent earth stake, trailing lead and an ohm meter or the use of a specialised voltage injection test instrument. **A**
2. Understand and explain the dangers of reversal of polarity and reasons why (generally) protective devices may not operate when a phase to neutral transposition of the mains to an installation occurs. **A**
3. Understand and explain the dangers that reversal of polarity presents in a multi-phase or three-phase installation. **A**
4. Explain the methods by which phase rotation can be confirmed in a three-phase installation. **A**

9.6.6 Insulation classes

Understand the terms and meanings as detailed in Section 1.4.60 of AS/NZS3000 for:

A

- basic insulation
- supplementary insulation
- double insulation

9.6.7 Effects of prospective short circuit current

1. Be fully conversant with the physical electrical, magnetic and electro-mechanical dangers associated with PSCC if the equipment is inadequate to interrupt the short circuit current. **A**
2. Demonstrate the ability to calculate the resulting prospective short circuit levels under fault conditions for an installation and individual sub-circuits. **A**

9.6.8 Electrical safety of property

Evaluate the various methods of protection available and understand their methods of operation, their advantages and disadvantages for a particular application

A

9.7 Protective devices

1. **Protection**
 - (a) State what is meant by the terms rated current and excess current protection. **A**
 - (b) Describe the danger of excess current to cables and equipment. **A**
 - (c) Explain the forms of excess current protection: **A**
 - close excess current protection
 - coarse excess current protection.
 - (d) Explain the following terms applicable to sub-circuit protection: **A**
 - voltage rating
 - current rating
 - utilisation categories – that replace fusing factors
 - breaking capacity and kVA rating.

-
- (e) Describe, with the aid of labelled diagrams the construction, operation principles and applications of the following protective devices: **A**
- semi-enclosed rewirable fuses (installed in existing installations)
 - HRC fuses labelled in accordance with BS88:1998, IEC and AS/NZS 60269
 - miniature circuit breakers
 - cartridge fuses
 - fusible links
 - magnetic overload relays
 - thermal overload relays.
- (f) Understand and explain the following terms as related to protective devices: **A**
- current rating
 - voltage rating
 - fusing current
 - utilisation category
 - tripping factor
 - cut-off characteristic
 - time verses current characteristic
 - category of duty
 - discrimination
 - back-up protection
 - rupturing capacity
 - prospective short-circuit current
 - sensitivity
 - earth-fault loop impedance.
- (g) Understand and have a good working knowledge of the above protection equipment, applications to select the most appropriate protective device for use in a low voltage installation. **A**
2. **Residual current devices (RCDs)**
- (a) Understand that RCDs provide supplementary protection the users of electrical appliances and equipment. **A**
- (b) Demonstrate knowledge of the maximum tripping current and operating times for RCDs to be deemed electrically unsafe (see regulation 24). **A**
- (c) Explain the checking and testing requirements to ensure that RCDs installed for protection against shock are type A for New Zealand. **A**
- (d) Understand the operating principles of an RCD. **A**

- (e) Be aware of how RCDs are classified including: **A**
- method of operation
 - type of operation
 - number of poles and current paths
 - possibility of adjusting the residual operating current
 - resistance to unwanted tripping due to voltage surges
 - behaviour of the presence of d.c. components
 - protection against external influence
 - method of mounting
 - method of connection.
- (f) Understand the operational characteristics of RCDs and how different types of the available RCDs operate including: **A**
- residual current-operated circuit breakers (RCCB)
 - residual current-operated circuit breakers with overcurrent protection (RCBO)
 - socket-residual current protection devices (SRCD)
 - portable residual current protection devices (PRCD)
 - RCDs functionally independent of line voltage (used in residential type switchboards and SRCDs)
 - RCDs functionally dependent on line or auxiliary voltage (used in PRCDs)
 - typical residual current ratings
 - classification of RCDs according to the presence of d.c. components
 - load leakage currents.
- (g) Methodologies for installing RCDs in residential situations, industrial and commercial situations, single phase and three phase. **A**
- (h) Understand and apply the principles relating to protection for safety in AS/NZS 3000 and the role RCDs can play in protection for additional safety in damp situations. **A**
- (i) Understand and apply the requirements of: **A**
- AS/NZS 3000 regarding the installation of RCDs in domestic and residential premises
 - RCDs for use with hand-held electrical appliances.
- (j) Understand considerations for installing 10 mA RCD protecting areas of increased risk and children against electric shock as detailed in Section 2.6.1 of AS/NZS3000. **A**
- (k) Testing RCDs to ensure that they are not electrically unsafe in accordance with ER 24. **A**
- 3. Isolating transformers**
- (a) Describe the basic operating principle of an isolating transformer. **B**
- (b) Explain why an isolating transformer provides maximum safety when used with only one electrical appliance connected. **A**

- (c) Explain why it is necessary, when two or more electrical appliances are connected simultaneously to one isolating transformer, their earth continuity conductors are bonded together at the transformer but must not be earthed. **B**
- (d) Understand that the isolating transformer may be used in conjunction with other approved safeguards for hand held appliances to provide additional protection. **C**
- [ER89]
- (e) Explain why transformers are rated in kVA and not Watts or kW. **C**

9.7.1 Typical applications of protective devices

1. Be able to calculate the prospective short circuit/fault current levels within the installation. **A**
2. Understand and apply selection criteria (including the ratings) associated with protection of: **A**
 - mains
 - sub-mains
 - sub-circuits
 - final sub-circuits
 - fitting and equipment.
3. Prospective short circuit ratings/fault current levels and their effect on the equipment supplied and installed. **A**

9.7.2 Under voltage protection

1. Understand the associated problems caused by excessive volt-drop within an electrical installation, and in minor sub circuits. **A**
2. Select the most appropriate device/s for a particular application for use in low voltage installations considering the criteria. **A**

9.7.3 Cable selection

1. Understand that the cable selection process involves factors such as the current and voltage rating, environmental conditions, length of run, earthing requirements, mechanical factors and additional considerations including derating factors and perspective short circuit currents. **A**
2. Provide examples and explain how a cable is chosen for a stated application considering all of the above factors. **A**
3. Determine cable type and size required for a sub-circuit under specified load conditions, using the appropriate parts of AS/NZS 3000 and AS/NZS 3008.1.2 for a stated application. **A**
4. Determine the maximum demand for domestic and non domestic mains and sub-mains in accordance with AS/NZS3000:2007. **B**

5. Determine the cable type and size of mains and sub-mains for given applications, including: **A**
- cable types:
 - flexible (PVC, TPS, rubber-sheathed)
 - fixed wiring (TPS, conduit wire, neutral screened cable, XLPE, SWA)
 - underground
 - aerial
 - consideration of:
 - conductor material
 - maximum conductor temperature
 - air and soil ambient temperatures (de-rating and re-rating factors)
 - mechanical protection
 - installation method
 - maximum demand
 - length of run
 - grouping
 - current carrying capacity
 - short circuit capability
 - voltage drop
 - earth loop impedance.
6. Demonstrate sound understanding of installation techniques for a wide range of “low voltage” cable types in accordance with AS/NZS3000 and AS/NZS3008.1.2 including: **B**
- enclosed in conduit
 - installed on a cable tray
 - clipped to the surface
 - underground wiring
 - aerial wiring
- Considering such factors as:
- conductor material
 - maximum conductor temperature
 - air and soil ambient temperatures (de-rating and re-rating factors)
 - mechanical protection
 - grouping
 - current carrying capacity
 - length of run
 - voltage drop limitations
 - earth loop impedance.
7. Candidates are to demonstrate a good appreciation for selecting the correct and appropriate protective device associated with the cable chosen for a stated application. **B**

9.7.4 Maximum demand

1. Apply clause 2.2.2 of AS/NZS 3000: **A**
 - identify methods for determination of maximum demand
 - calculation of the total connected load and provisions for future increases
 - minimum permissible sizing for low voltage installation mains.
2. Calculate using Appendix C of AS/NZS 3000 the maximum demand for domestic installations: **A**
 - final sub-circuits
 - a sub-main
 - mains
 - total installation loading.
3. Calculate using Appendix C of AS/NZS 3000 the maximum demand for non-domestic installations: **A**
 - final sub-circuits
 - a sub-main
 - mains
 - total installation loading.
4. Apply Tables C5 and C6 by selection of appropriate protection device ratings for given cable sizes installed under specified conditions in single-phase and three-phase applications. **B**

9.7.5 Voltage drop

1. Identify situations where excessive volt drop may occur and the consequences of the volt drop. **A**
2. Understand how loading effects the volt drop. **A**
3. Apply the requirements of AS/NZS 3008.1.2 to calculate voltage drop and determine the size of cable required. **A**
4. Have the ability to select the most appropriate conductor for a given application. **A**

9.7.6 Special situations

1. Swimming pools, spa pools, public buildings, damp situations, lifts, hoists, electromedical treatment areas, caravan parks, shows/carnivals, temporary installations, marinas, extra low voltage installations, fire protection systems and equipment, emergency lighting equipment. **A**
2. Demonstrate a good working understanding of the regulations, Standards and Codes and installation procedures for installing electrical cables and equipment in special situations. **A**
3. Know how to contact the specialist agencies for advice and assistance when confronted with an unfamiliar situation. **A**
4. Special consideration is to be given to the candidates familiarity and level of competence in these areas and applications – by stressing that they are only permitted to work and inspect in areas in which they are competent. **A**

9.7.7 Electrical work auditing

1. Understand that only the prescribed certificate of compliance forms issued by the EWRB can be used to certify compliance. **B**
2. Be aware that certificates are identified by a unique numbering system and can be used for auditing registered persons' work by the EWRB. **B**
3. Be aware that completed certificates must be retained for a minimum of three years and a copy must be supplied within 20 working from receipt of a written request from the Board. **B**

9.7.8 Defective work

Understand:

- (i) that only compliant work can be issued with a certificate of compliance
- (ii) only work issued with a certificate of compliance can be connected to the supply source
- (iii) any defective work must not under any circumstance be issued with a certificate of compliance or be connected to the supply source
- (iv) it is an offence to issue a certificate of compliance for non-compliant electrical work.

A**9.7.9 Notify Secretary of danger**

Understand that if whilst carrying out prescribed electrical work, carrying out a periodic assessment under regulation 75 or examining a connectable installation for the issue of a warrant of electrical fitness under regulation 78, a person believes that the works, installation, fitting or appliance presents an immediate danger to life or property shall as soon as practicable report that danger to the owner or occupier where the danger exists and the Secretary.

A

[ER19]

9.8 Prescribed electrical work requiring inspection – overview

1. Be aware that prescribed electrical work that must be certified and also inspected is listed in regulation 70. **A**
2. Understand that regulation 71 states the purpose of inspections, documentation requirements, when a person may not inspect work to which they have been involved. **A**
3. Understand that regulation 72 cites companion Standards that cover the inspection requirements for installation work in addition to AS/NZS3000. **A**

9.9 Electrical inspector practical tasks and skills assessment

During the course of practical instruction and assessment; stress the importance of understanding how practical skill tasks relate to “on the job” situations.

The candidate shall demonstrate an acceptable level of skill and competency in the practical skill tasks listed for inspector.

Skill assessment grading

A consistent grading system has been introduced for all registration classes:

C = competent, and

NC = not competent.

Any skill that has not been assessed is to be awarded a NC result and the reason entered into the comments section on the practical assessment record form.

To pass the practical assessment programme all skills must be successfully completed with "C" entered into corresponding result column and initialled by a Board approved skill assessor.

Skill no.	Skill definition and task requirements
1	Cardiac pulmonary resuscitation (CPR) training in New Zealand Resuscitation Council approved methods.
2	Electrical safety and safe working practices by observing candidate's ability to competently use the appropriate tools for the job, apply safety principles whilst carrying out practical skills.
3	Care and competent use of test instruments for carrying out: continuity tests, protective earth and equipotential bonding conductor resistance, insulation resistance, earth fault loop impedance, RCD and phase rotation measurements.
4	Inspection and testing of "Mains Work" on a low voltage installation in accordance with Section 8 of AS/NZS3000:2007.
5	Selection, installation and testing of Type 1 and Type 2 RCCBs and RCBOs. Completion of test sheets recording tripping current and tripping times.
6	Positive identification of installation supply Neutral conductor polarity using test instruments: (a) without a electricity supply available (b) when a electricity supply is available.
7	Inspection and testing of an existing low voltage installation for completion of a Certificate of Verification in accordance with ER74(3)(c) and AS/NZS3019.
8	Inspection and testing of a connectable installation for the issue of an Electrical Warrant of Fitness in accordance with AS/NZS3001.
9	Install and terminate supply and load conductors to DIN and BS configuration energy revenue meters. Test for safety and check for correct operation.
10	Completion and issuance of compliance documentation: <ul style="list-style-type: none"> • Certificate of Compliance for a new installation • Certificate of Verification for an existing installation • Electrical Warrant of Fitness for a connectable installation.
11	Inspection and earth fault loop testing of earthing systems for compliance in accordance with AS/NZS3000.
12	Inspection of work on installations intended for use with electrical medical devices in accordance with AS/NZS3000, AS/NZS3003 and AS/NZS6115.

Skill no.	Skill definition and task requirements
13	Inspection of work on mains parallel generation systems in accordance with AS/NZS3000 and AS/NZS6115.
14	Inspection of work in hazardous areas in accordance with AS/NZS3000 and AS/NZS60079.17.
15	Inspection of work on animal stunning appliances and meat conditioning appliances in accordance with AS/NZS3000 and AS/NZS3000 and AS/NZS6116.
16	Inspect and test a three-phase low voltage installation for compliance with ER 72(2)(a) as the person proposing to do a new connection to a power supply.
17	Inspect work on an installation that complies with Part 1 of AS/NZS3000 and in accordance with the verification process described in the declaration of conformity.
18	Basic first aid training – complete a course with St John or Red Cross.