Electrical Workers Registration Board
SAFETY | COMPETENCY | COMPLIANCE

Teaching Guidelines for Electrical Inspector

Programme Outline for Examination and Practical Skill Assessments

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

New Zealand Government
Te Kāwanatanga o Aotearoa

Electrical Workers Registration Board
SAFETY | COMPETENCY | COMPLIANCE

More information

Information, examples and answers to your questions about the topics covered here can be found on our website: **www.mbie.govt.nz**

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1. Introduction

Under the Electricity Act 1992 (the Act), the Electrical Workers Registration Board (the Board) has a responsibility to set the registration criteria and ensure that all persons applying for electrical registration are competent.

These teaching guidelines assist training providers in the development and delivery of courses for candidates who need to complete any or all of the following to be eligible for registration as an electrical inspector:

- Passing the Electrical Inspectors written examination; and
- The Electrical Inspectors practical assessment

Tuition provided for the Examination and Practical assessments must cover ALL subject matter as specified in the relevant sections of this document.

While the teaching guidelines are detailed, they do not cover every aspect that may be required for examination or practice. For example, it should not be inferred that a particular subject should be limited to specific examples listed to adequately cover all examination and assessment subject matter.

2. Scope

This teaching guideline is the foundation for the examination and practical application assessment subject matter that is applicable to entrance level knowledge and skill requirements for electrical inspectors.

Candidates undergoing tuition in accordance with this guideline should receive a comprehensive tuition course that incorporates electrical theory, relevant legislative requirements contained in the Act, the Electricity (Safety) Regulations 2010 (the ESR) and the Standards cited in Schedule 2 of the ESR by:

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

3. Registration Requirements and Limits of Work

Registration Requirements

Those seeking registration as an Electrical Inspector must have**:**

1. Passed a Board-approved Electrical Inspector written examination; and
2. Passed a Board-approved Electrical Inspector practical assessment; and

   either

3. Completed not less than 3 years practical work experience and on job training, in carrying out PEW that is satisfactory to the Board; or
4. Held registration as an Electrician or Electrical Engineer with a limit of work equivalent to an Electrician for not less than 3 years and completed 3 years of practical experience in the PEW of an Electrician or an Electrical Engineer.

Limits of Work

An Electrical Inspector may, subject to the limitations set out below**:**

1. Carry out PEW on installations, works and appliances;
2. Test any PEW of the type they are authorised to carry out;
3. Certify any PEW of the type they are authorised to carry out;
4. Supervise a person to carry out an inspection of PEW;
5. Carry out inspection of any PEW of the type they are authorised to carry out.

Limitations

An Electrical Inspector must **not** carry out PEW in a mining operation, hazardous area, medical cardiac protected area or mains parallel generation system.

4. Competence

A person is not deemed to be competent to carry out any inspection of high risk electrical work solely by virtue of the pre-requisite registration.

In addition to registration a person can only carry out an Inspection in any particular area of high risk PEW if they are competent to do so.

A person is competent when they can demonstrate at any time they have the necessary knowledge, skills, experience, training and qualification to carry out the work safely and in compliance with the legislation and work standards applied by the industry.

Competency should be regularly assessed and maintained through ongoing professional development.

5. Examination and Assessments

Examination questions may cover any aspects of this guideline. They may also include aspects of underpinning electrical theory knowledge necessary to understand and apply the relevant legislative requirements contained in the Act, ESR and Standards.

For example, a sound knowledge of electrical instrument testing procedures and ability to understand and evaluate the meaning of test results is required to carry out competent electrical testing and inspection. When considering special electrical installations candidates will therefore require knowledge from the ESR, AS/NZS 3000 and the additional requirements of cited Standards for those special installations

Electrical inspector training is based on subject matter knowledge level ratings allocated letters “A”, “B”, “C” 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.

Knowledge Level	Description
A	**Essential knowledge** Electrical worker must show a high level of knowledge or understanding of the competency
B	**General understanding** Electrical worker must show a working knowledge or understanding of the competency

C	**Awareness** Electrical worker must show a basic level of knowledge or understanding of the competency

Knowledge must be demonstrated for each learning requirement based on the level rating. Further guidance in the use of performance verbs for development of examination questions and assessments is contained in section 13.

6. Practical Skill Assessments

Candidates are required to satisfactorily pass the electrical inspector practical skill assessment. This will include practical application of electrical inspections skills on different types of installations.

In order to successfully complete a number of these electrical inspection skill assessments and to familiarise and inform candidates to actual installation environments, “site visits” will be required.

Applicants will also be required to demonstrate a comprehensive understanding of the safety principles in the application of electrical testing procedures and be able to explain and assess the safety implications of test results in a variety of contexts.

7. Safety General Requirements

Safety, competency and compliance to required standards, protocols and principles must be promoted and adhered to by the provider at all times.

This includes but is not limited to the:

- personal safety of the tutors, assessors and candidates while carrying out training practical exercises and skill assessment;
- safety of the installations and property being used or accessed;
- promotion and demonstration of best workplace and inspection practice.

Note: It is expected that repeated demonstrations of unsafe work or testing practices by a candidate will result in a “not competent” assessment.

8. Definitions

Unless the context otherwise requires, within these guidelines:

Term	Definition
AC	Alternating current
Act	Electricity Act 1992
AFDD	Arc fault detection device
COC	Certificate of Compliance
Code or ECP	New Zealand Electrical Code of Practice issued under Part 4 the Act
Competent	A person is competent when they can demonstrate at any time they have the necessary knowledge, skills, experience, training and qualification to carry out the work safely and in compliance to the standards applied by the industry
DC	Direct current
ESC	Electrical Safety Certificate
ESR	Electricity (Safety) Regulations 2010
ELV	Extra low voltage
HRDB	WorkSafe High Risk Database
PEW	Prescribed Electrical Work
MEN	Multiple earth neutral system of supply
RCDs	Residual current devices
RoI	Record of Inspection
Standard	International & NZ standards as cited. (Not limited to ESR). May include: • a New Zealand Standard (NZS) • an 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 (S)	A section of the Electricity Act 1992
WoEF	Warrant of Electrical Fitness

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

9. Reference Texts

- The Electricity Act 1992
- Electricity (Safety) Regulations 2010
- ECP's and official standards cited in Schedule 2 and of the Electricity (Safety) Regulations 2010
- AS/NZS 3000
- EWRB supervision policies and Supervision Companion Guide

10. Theory

10.1 Responsibilities of an Electrical Inspector

10.1.1 Limits of Work

1.	Explain the PEW an electrical inspector can carry out in Schedule 1 of the ESR.		**B**
2.	Explain that inspectors are not permitted to inspect electrical installation work if they have: personally carried out the work; or supervised someone else carrying out the work; or issued the certificate of compliance for the work.	ESR 71(2)	**A**
3.	Explain that inspectors must not carry out inspection work on any high-risk installation unless they are competent. (Refer to section 4 of this document for definition of competent).		**A**

10.1.2 Inspection Requirements

1.	Explain that inspection of PEW is for the purpose of ensuring that: • the thing on which the work has been done is, and will be when connected to a power supply, be electrically safe; and • the work has been done in accordance with the ESR.	ESR 72(2)(f) & (g)	**A**

2.	Explain S 82 requires testing, certification and inspection to be carried out in compliance with the ESR before that work is connected to a power supply.	ESR 60, 73A	**A**
3.	Explain S 82 does not prevent connection to a supply if the connection is solely for testing, inspection or certification.		**A**
4.	Explain all high-risk PEW must be inspected for the purposes of ESR 70. The inspection must not rely on the certification issued by the electrical worker and must independently verify and test the safety of the completed work.	ESR 70	**A**
5.	Explain, the inspector, as one of the actions required to ensure the work has been carried out in accordance with the ESR, should always verify the person who certified the work was authorised to do so by checking their status on the public register.	ESR 68, 70	**A**
6.	Explain the compliance and inspection requirements for low and extra-low voltage installations.	ESR 59	**A**
7.	Explain inspection work must be done in accordance with AS/NZS 3000 and also the applicable cited standards.	ESR 60 (1) & (2).	**A**
8.	Explain that a person who inspects an installation to the certified design must carry out this inspection in accordance with the design specifications.	ESR 72, 58, 63	**A**

10.1.3 Inspection Work – Safety and Offences

1.	Explain inspection work is on fundamental safety aspects as related to personnel, property and electrical fittings	ESR 20, 22, 23, 24	**A**
2.	State the level 2 offence provisions for non-compliant inspections carried out by an inspector	ESR 73	**C**
3.	State the offences in relation to serious harm or significant property damage	S 163C, 163D	**C**

10.1.4 Documentation (General)

1.	Evaluate the purpose, and format of all these documents, either for certification, in-service testing, safety verification, design or inspection and any other equivalent ones cited in the relevant standards. • RoI • CoC • ESC • WoEF stickers and forms for connectable installations • record of assessment / certificates of verification for periodic assessments	ESR 73A (3) (4)	**A**

	• certificates of periodic verification as per AS/NZS 3019 • certified design • current tag issued in accordance with AS/NZS 3760		

10.1.5 Ethics

1.	Identify that electrical workers have a statutory obligation whilst carrying out PEW to report situations which present an immediate danger to life or property and shall as soon as practicable advise the owner or occupier and WorkSafe.	ESR 19(2)	**B**
2.	Be able to describe that the HRDB is subject to auditing by WorkSafe and offence provisions relating to inspections.	ESR 73 74F	**B**
3.	Identify that an inspector can be subject to disciplinary action if, as result of a complaint, and investigation they are found guilty of a disciplinary offence by the Board.	S 143	**B**
4.	Identify that inspectors when called upon should be competent to provide the industry with correct, reliable information, promoting electrical safety with any mentoring or advisory roles.		**C**

10.1.6. Certification and Safety Verification

10.1.6.1 Record of Inspection			
1.	Determine that a person who carries out an inspection on high risk PEW must prepare a written RoI relating to the work and must retain a copy for seven years.	ESR 72, 72A (1)	**A**
2.	Explain that the person who issues the RoI must provide a copy of it within 20 working days after it was issued to the person who contracted to do the work or the owner or occupier.	ESR 72A	**A**
3.	Detail that an RoI (including details of CoC) must be lodged on the WorkSafe's HRDB in a particular format within 20 working days after the inspection.	ESR 74F, 112A	**A**
4.	Outline how to register to access the HRDB and lodge a RoI.		**B**
5.	State that the public can search the HRDB.	ESR 112B	**C**
10.1.6.2 Certificate of Compliance and Electrical Safety Certificates			
1.	Derive who is responsible for completing certification documents in various scenarios involving different parties (e.g. line mechanic, inspector electrician, and meter-installer) on an installation that may be enlivened as a whole or part installation.	ESR 65, 73A	**A**

2.	Determine the meaning of the term "connection" as defined in the ESR and evaluate the requirement to issue an ESC once an installation is connected or reconnected to a power supply.	ESR 73A(5) 74A (2)	**A**
3.	Evaluate a CoC that should not be accepted or used by the Inspector to complete an RoI if any one of these conditions applies. • It is inaccurate • It is incomplete • It does not provide supporting documents when it indicates it does.	ESR 65, 66, 67, 68,	**A**
4.	Categorise that no PEW is considered complete until a CoC has been issued for it.	ESR 65	**B**
5.	Determine when an ESC must be issued in different scenarios and what it verifies.	ESR 74A	**A**
6.	Explain what is required for the purposes of a COC to ensure the work has been completed lawfully and safety.	ESR 66(2)	**A**
7.	Explain what information is required on a CoC and how that information must be recorded and who can issue the CoC.	ESR 67, 68, 74I	**A**
8.	Detail the responsibilities including time frames and record keeping for persons issuing a CoC and ESC.	ESR 74C, 74E, 74G	**A**
9.	Specify it is an offence to issue a CoC that contains incorrect information.	ESR 69	**C**
10.1.6.3 Certificate of Periodic Verification			
1.	Identify that an installation that has been disconnected from the electricity supply for more than six months requires a certificate to be issued in accordance with section 3 of AS/NZS 3019 by a person authorised to certify mains work.	ESR 74(2)	**B**
10.1.6.4 Warrant of Electrical Fitness (WoEF)			
1.	Explain what a WoEF is and where it is required.	ESR 78	**A**
2.	Detail that a WoEF includes the sticker, the form and any test sheets included in the relevant standard that must be attached to the form.	ESR 78	**A**
3.	Identify that any person proposing to supply power to a connectable installation must verify that the connectable installation has a current WoEF.	ESR 76	**B**
4.	Explain with respect to ESR 78 (1) (a) and (b) a WoEF can only be issued by an inspector or specially authorised person.	ESR 78(1) (a)(b)	**A**
5.	Evaluate that in relation to a connectable installation that has been certified under ESR 66, the person who did the certification may issue a WoEF at the same time as the certification is done. This means the person has wired, tested and installed the complete	ESR 78(1)(c)	**A**

	installation not just issued a CoC for carrying out PEW on a part installation.		
6.	Derive a WoEF must be issued in accordance with the appropriate standards for the particular installation (refer to 10.3.2 connectable installations, for details).	ESR 78	**A**
7.	Determine that a person who issues a WoEF must: • give a copy to the person who requests the WoEF • keep a copy of the completed WoEF for three years • complete a WoEF that is in the form prescribed or approved by WorkSafe, and affix the sticker in a prominent place on the connectable installation.	ESR 78	**A**
8.	Specify that a WoEF 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.	ESR 78	**B**
9.	Specify that every WoEF must be on the form that is either: • the form prescribed by the relevant standard or a form approved by WorkSafe.	ESR 78(5) AS/NZS 3004.2 appendix C	**B**
10.	Outline it is a level 1 offence to issue a WoEF: • that is contrary to the regulations • for a connectable installation that is electrically unsafe if the person is not authorised to issue a WoEF.	ESR 78	**C**

10.1.7 Periodic Assessments of Certain Installations

1.	Distinguish that safety assessments are required for these installations and what type of verification documentation is required to be provided as opposed to the initial inspection commissioning requirements.	ESR 75	**B**

10.2 Inspection of Prescribed Electrical Work

10.2.1 Work Requiring Inspection

1.	Distinguish different risk categories of PEW, what type of work is, high, general, or low-risk and what work is subject to inspection.	ESR 6A, 70	**A**
2.	Explain the inspection requirements and the limits to the types of work that can be done by a homeowner under the exemption of Act as detailed in the ESR.	S 79, ESR 57 ECP 51	**B**

3.	Detail the definition of mains work and the exemptions in certain circumstances which expressly states what is and is not high risk PEW in regards to revenue metering and testing.	ESR 4 6A(2)	**A**
4.	Explain that an inspector can only inspect an installation if they have all the competencies to do so.		**A**

10.2.2 Low Voltage Electrical Installations

1.	Determine the different domestic electrical installations that must be installed and inspected or maintained in accordance with either Part 1 or 2 of AS/NZS 3000.	ESR 59	**A**
2.	Explain that low voltage installations on which PEW is done must be tested in accordance with AS/NZS 3000.	ESR 63	**A**
3.	Evaluate specific verification checks, and tests that should be carried out by the person inspecting mains work on a new low voltage installation that has had a CoC issued by the electrical worker for that installation.	AS/NZS 3000 S 8	**A**
4.	Evaluate which installations must comply with Part 2 of AS/NZS 3000 and also to which other cited standard.	ESR 60(1)	**A**
5.	Determine which electrical installations if installed in accordance with Part 2 of AS/NZS 3000 must also comply with the standards cited in the ESR.	ESR 60 (2)	**A**
6.	Select the requirements regarding the connection of standard low voltage installations to a MEN system of supply.	ESR 27(4)	**C**
7.	Explain an installation must have at least one MEN switchboard and that the switchboard located electrically closest to the point of supply must be an MEN switchboard.	ESR 27	**A**

10.2.3 High Voltage

1.	Distinguish that all installation, testing, inspection and connection done on a high voltage installation must be done in accordance with a certified design prepared for the installation.	ESR 62,58	**A**
2.	Determine that PEW on installations that operate at high voltage must be certified and inspected.	ESR 70(2)	**A**
3.	Outline requirements for a person who inspects a high voltage installation to verify that the installation complies with NZECP 34 and also with ESRs 34, 41(1), 42(1), 43(1), and 44(1) as referred to Works.	ESR 73A(2), 73B	**C**
4.	Describe the dangers and fundamental theory associated with testing and inspecting high voltage installations with respect to step and touch voltages, clearances and earthing requirements with reference to ESRs 13 to 17 and NZECP 34.		**B**

10.2.4 Medical Locations

1.	Describe the basic principle theory associated with micro and macro shock hazards, equipotential earth bonding in cardiac areas as opposed to body protected zones.	AS/NZS 2500	**B**
2.	Assess what is an electrical medical device, medical location, mobile medical facility, patient treatment area.	ESR 4 & schedule 4	**A**
3.	Outline that an installation intended for use with electrical medical devices must comply with Part 2 of AS/NZS 3000 and also AS/NZS 3003.	ESR 60(1)(a)	**B**
4.	Explain that a connectable installation in a mobile medical electrical facility must comply with Part 2 of AS/NZS 3000 and NZS 6115.	ESR 60(1)(c)	**A**
5.	List the requirements for inspecting medical electrical installations including the commissioning requirements detailed in Appendix B of AS/NZS 3003.		**C**
6.	State the requirements for periodic inspection of medical electrical devices including the safety and performance testing requirements are detailed in AS/NZS 3551.	ESR 91	**C**
7.	Determine patient areas zone requirements for body protected and cardiac protected electrical areas as defined in AS/NZS 3003.		**A**
8.	Identify that WoEF checks and issuing requirements for mobile medical facilities that must be issued in accordance with NZS 6115.	ESR 78(2)(b)	**B**
9.	Identify that a WoEF for a mobile electrical medical facility is valid for one year from its date of issue.	ESR 78(4)	**B**
10.	Identify the periodic assessment requirements for 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 location AS/NZS 3003.	ESR 75(1)(f)	**B**
11.	Explain installation and maintenance ELV work in a medical location is PEW.	ESR Schedule 1(2)(b)(ii)	**A**
12.	Outline the dangers and special precautions that must be taken associated with testing and inspecting medical electrical installations.		**B**

10.2.5 Hazardous Areas

1.	Define a hazardous area.	ESR 4	**B**
2.	Derive what installation and maintenance ELV work in a hazardous area is PEW.	ESR Schedule 1(2)(b)(ii)	**A**

3.	Identify that AS/NZS 60079.14 provides the specific requirements for the design, selection, erection and the required initial inspection of electrical equipment in hazardous areas. This standard is also based on manufacturer's instructions being followed.	ESR Schedule 2	**B**
4.	Explain that inspections must be carried out in accordance with AS/NZS 3000 part 2 and AS/NZS 60079.14.	ESR 60(1) (b)	**A**
5.	Identify that Standard AS/NZS 60079.17 sets out the requirements for ongoing inspections of electrical installations and maintenance of electrical equipment in explosive atmospheres.	ESR Schedule 2	**B**
6.	Explain 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/NZS 60079.17.	ESR 75(1)(e)	**A**
7.	Outline the danger associated with, and precautions required when, undertaking testing and inspection work in a hazardous area.		**B**

10.2.6 Animal Stunning and Meat Conditioning Appliances

1.	Determine that work done on animal stunning and meat conditioning appliances is high risk work and must be certified and inspected.	ESR 70, 6A	**A**
2.	Explain that work done in accordance with Part 2 of AS/NZS 3000 must also be tested and inspected in accordance with NZS 6116.	ESR 60(2)(b)	**A**
3.	Outline the dangers associated with testing and inspecting animal stunning and meat conditioning appliances and the precautions necessary to ensure safety.		**B**

10.2.7 Mains Parallel Generation Systems

1.	Determine that a mains parallel generation system that is connected to the national grid installed in accordance with Part 2 of AS/NZ 3000 must also be certified and inspected in accordance with the requirements of AS/NZS 3000, AS/NZS 3010 and AS 4771.1.	ESR 70, 60(2)(f)	**A**
2.	Explain that prior to 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 the ESR.	ESR 73A (e).	**A**
3.	Outline the dangers associated with testing and inspecting a mains parallel generation system.		**B**
4.	Identify there are specific requirements for an emergency power supply in a hospital as required by Part 2 of AS/NZS 3000 and AS/NZS 3009.	ESR 60(2)(e)	**C**

10.2.8 Photovoltaic

1.	Determine that a photovoltaic system in an installation is prescribed as high- risk PEW which will require certification and inspection.	ESR 6A,	**A**

		Schedule 1	
2.	Determine that the low voltage-direct current component of the photovoltaic system is high-risk PEW.	ESR Schedule 1	**A**
3.	Evaluate where there is a mains inverter within the photovoltaic system, which is a low voltage mains parallel generation system that is connected to the national grid, that the inverter must be installed to comply with the standards AS/NZS 3000 and AS 4777.1.	ESR 60(2)(f), AS/NZS 3000	**A**
4.	Explain that if a photovoltaic system is installed to comply with part 2 of AS/NZS 3000 then it must also comply with standard AS/NZS 5033.	ESR 60(2)(d)	**A**
5.	Outline the general requirements and knowledge of other standards applicable for photovoltaic generating systems and storage systems.		**B**

10.2.9 Installation that does not comply with Part 2 of AS/NZS 3000

1.	Derive that AS/NZS 3000 comprises of two parts bound in one document		**A**
2.	Explain that part 1 (section1) of AS/NZS 3000 provides a mechanism for acceptance of design and installation practices that may not be addressed by those given in part 2.	AS/NZS 3000	**A**
3.	Outline the above mechanism is only intended to apply where departures from methods in part 2 are significant and a degree of flexibility exists within part 2.	AS/NZS 3000	**B**
4.	State the specific safety principles and rules for installations under Part 1 of AS/NZS 3000.	ESR 61 AS/NZS 3000	**C**
5.	Explain that a low or ELV installations is able to be constructed and inspected to comply with part 2 of AS/NZS 3000 or a certified design prepared in accordance with part 1.	ESR 59 (2)	**A**
6.	Outline that an installation that has been constructed in accordance with a certified design must be tested, and inspected in accordance with that design.	ESR 58 (3) 63 (1) (d)	**B**
7.	Describe what establishes a certified design in accordance with the ESR.	ESR 58 (1) (2)	**B**

10.2.10 Switchboards

1.	Distinguish what is an MEN Switchboard, 'main switchboard', 'switchboard', distribution board and 'switchgear' and possible configured supply and switchboard systems in an installation.	ESR 4, AS/NZS 3000. S 1	**A**
2.	Outline types of fittings and accessories used as isolation devices for electrical circuits, located on switchboards.		**C**

3.	Specify the requirements for testing a low voltage main switchboard and main earthing systems for compliance with Part 2 of AS/NZS 3000.		**B**
4.	Evaluate AS/NZS 3000 general requirements for switchboards including: • the location (permitted/not permitted and associated requirements) • access to the wiring and switchgear • protection against the spread of fire • environment and mechanical conditions • revenue metering (energy distributor) requirements • prospective short circuit current levels.		**A**
5.	Assess the MEN system of earthing (general arrangement) for main and distribution switchboards.	(S5) of AS/NZS 3000	**A**

10.2.11 Employer Licences

1.	Describe what an employer licence is and how it can authorise an employee who is otherwise not registered and licenced to carry out PEW.	S 115, 117	**C**
2.	Identify that a person working under an employer licence can certify work and any certification document should contain the employer licence organisation number in place of a registration number.	ESR 67(2)(d)	**C**
3.	Identify that when inspecting high risk work carried out by a person authorised under an employer licence any certification must contain the employer licence number in lieu of the registration number which can be searched on the EWRB public register.		**C**
4.	State that the employer licence holder must maintain a system of operation to ensure the employees they have working under the employer licence are able to carry out the PEW safety and competently.	ESR 94	**C**

10.3 Safety Checks for Installations and Appliances

10.3.1 Periodic Safety Assessments

1.	Determine the requirements for periodic assessments to be carried out on certain installations.	ESR 75	**A**
2.	Determine the requirements of a “record of assessment” and what form and content it should record.	ESR 75	**A**
3.	Identify the standards and requirements for low voltage installations in: • caravan parks AS/NZS 3001	ESR 75	**B**

	• boat marinas AS/NZS 3004.1 • demolition and construction sites AS/NZS 3012.		
4.	Explain what persons are authorised to carry safety assessments on the above installations.	ESR 75(2)	**B**
5.	Explain what standards are required for periodic safety assessments for low installations in: • carnivals or fairgrounds 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 in mobile medical locations AS/NZS 6115 and AS/NZS 3003.	ESR 75	**A**
6.	Determine what persons are authorised to carry safety assessments on the above installations.	ESR 75(3)	**A**

10.3.2 Connectable Installations

1.	Explain that the definition of connectable installation as contained in the Act includes all the electrical appliances associated with the installation.	S 2	**A**
2.	Explain that a new connectable installation must be tested in accordance with the relevant standard and in accordance with section 8 of AS/NZS 3000.	ESR 78	**A**
3.	Outline the testing and safety verification requirements of these standards: • pleasure vessel AS/NZS 3004.2 • mobile medical facility NZS 6115 other connectable installations AS/NZS 3001.	ESR 78(2)	**B**
4.	Distinguish imported connectable installations (that require WoEF in accordance to AS/NZS 3001) must also be assessed to Part 1 of AS/NZS 3000.	ESR 78(2)(c)	**A**
5.	Match the requirement for a person supplying electricity to a connectable installation with the requirement to verify it has a current WoEF.	ESR 76(1)	**B**
6.	Identify 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 WoEF.	ESR 77(1)	**B**

10.3.3 Verifying safety before connecting installations

1.	Explain that before connecting a low voltage installation to a power supply, the person doing the connection must do all of the following:	ESR 73A(1)(e)	**A**

	• ensure the polarity and phase rotation of the supply are correct • ensure that the supply is correctly rated • ensure that the installation is compatible with the supply system if the supply is from an MEN system, verify that there is an earthing system.		
2.	Explain that the person connecting the power to an installation must sight signed documentation by the person who did the testing, including what tests were done and what the test results were.	ESR 73A(3)	**A**
3.	Evaluate the meaning of 'connection' as being the last piece of PEW that will allow electricity to flow to an installation, or part installation in a variety of possible scenarios.	ESR 73A(5)	**A**
4.	Outline the requirements that need to be complied with before a person connects a high voltage installation to a power supply.	ESR 73(2), 38(2)	**A**

10.3.4 Appliance and Equipment Safety

1.	State that all electrical products sold in New Zealand need to meet recognised standards and regulations.		**C**
2.	Identify the recognised standards for all commonly available electrical products in are listed in the ESR schedule 4.		**C**
3.	Outline what supplier declarations of conformity (SDoC) are used for and what they must contain to be valid.	ESR 83	**C**
4.	Categorise what declared medium risk and high risk articles are and how they are deemed to have approval for sale.	ESR 83A 84, 85, 86,	**C**
5.	Illustrate when an appliance is deemed to be "electrically unsafe".	ESR 23(1)	**C**
6.	Explain the different ways fittings and electrical appliances specified in ESR 26 are deemed to be electrically safe.	ESR 26	**A**
7.	Outline the requirement that a new electrical appliance that is offered for sale or supply must comply with AS/NZS 3820 or standard listed in schedule 4 of the ESR or if imported the Conformity Cooperation Agreement.	ESR 80 (2)	**C**
8.	Outline the requirement that a used electrical appliance that is offered for sale or supply must be tested and tagged in accordance with AS/NZS 5761.	ESR 80(3)	**C**
9.	Identify that following any work done on an extra low voltage or low voltage electrical appliance that may affect its electrical safety it then must be tested in accordance with AS/NZS 5762.	ESR 90(2)	**C**
10.	Outline knowledge that documentation and other requirements for specialised appliances and fittings such as those used in medical		**C**

	electrical devices or hazardous areas are stated in the associated standards for those areas.		

10.4 Legislation

10.4.1 Electrical Workers Registration Board Policies and Rules

1.	State that the Board has delegated authority under Part 10 of the Act to set the registration, licencing, competency requirements and limits of work for all classes of registration.		**C**
2.	Assess the limits of PEW as they relate to all the classes of registration as gazetted.		**A**
3.	Detail the responsibilities and obligations of the supervisor and the supervised person as specified in the Board supervision policies and companion guide.		**A**
4.	Explain that supervision is PEW as defined in Schedule 1 of ESR.		**A**
5.	List the exemptions for PEW carried out under supervision both as a trainee with a limited certificate and as a "supervised person" that is not a trainee.	S 76, 77, 78, ESR 92	**C**
6.	Identify 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 and that is within the scope of the work that the trainee's supervisor is authorised to do.	ESR 93	**C**

10.4.2 Practising Licences

1.	Determine that a registered person is not authorised to do or assist in doing PEW by virtue of their registration unless they have a current practising license that authorises the person to do the work or assist in doing the work	S 98	**A**

10.4.3 Power of Entry

1.	Outline the limits, powers and conditions covering any person authorised by the Board in respect to access entry into property for the purposes of inspection.	S 83	**C**

10.4.4 Disciplinary Offences

1.	State that sections 142 and 143 define the disciplinary provisions and disciplinary offences.		**C**
2.	Outline the disciplinary actions under Sections 147M that can be taken against a person found guilty of a disciplinary offence, including but not limited to:		**C**

	• cancelling or suspension of a person's registration or licence • limiting the work that person can do		

10.4.5 Safety Competency Requirements

1.	State the safety responsibilities for persons carrying out PEW.	ESR 100(1)	**C**
2.	Derive the ESR requirement for compliance with AS/NZS 4836.	ESR 100(1)(d)	**A**
3.	Identify the safety requirements of ESR are in addition to and do not limit a person's responsibilities under the Health and Safety at Work Act 2015.	ESR 100(2)	**C**
4.	State the employers' responsibilities for the safety of employees.	ESR 101	**C**
5.	State that a registered person, as a result of disciplinary action, may be required by the Board to complete a specified competency programme within a specified time period.	S 108	**C**
6.	State the Board sets competency training programmes for persons who do or assist in doing PEW in respect to persons who: • apply for practising licences • hold practising licences • apply for renewal of practising licences	S 108	**C**

10.4.6 Electricity Act 1992 and Electricity (Safety) Regulations 2010

1.	Outline the legislative functions and principles governing the safe regulation of electricity as contained in the Act and the ESR.		**B**
2.	Outline the structure and layout of the Act, locate specific parts sections, use numerical values and show what the interpretations of section 2 mean.		**B**
3.	Outline the ESR structure, including content, divisions into parts, sections and schedules in particular: • Regulation 3 applications • Regulation 4 Interpretations • Regulation 113 knowledge of the transitional requirements, regulations are not retrospective if the previous installation or fittings are electrically safe • Schedule 1 definition of PEW and what is not PEW • Schedule 2 cited Standards and codes of practice • Schedule 4 Standards applicable to fittings and appliances • Schedule 8 Rules for mining equipment and conductors.		**B**

10.4.7 Standards and Codes of Practice

1.	Specify appropriate standards for specific installations and applications and where to access these standards.		**B**

2.	Show knowledge to access free standards available for licenced electrical workers and trainees with Limited Certificates from the EWRB online standards library.		**B**
3.	Show knowledge that all updated versions of standards are not immediately cited in the regulations and the cited standard remains the official standard.		**B**
4.	List the fundamental electrical safety principles detailed in Part 1 and Part 2 of AS/NZS 3000 and how they are applied.		**C**
5.	Specify the procedures, safety requirements and recommendations for a safe working environment contained in standard AS/NZS 4836 on or near electrical installations or systems.		**B**
6.	Describe general applications 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, AS/NZS 5033 and ECP 51 are used for.		**C**
7.	Describe general applications AS/NZS 3016; AS/NZS 3010; AS/NZS 3832; AS/NZS60079.14, AS/NZS60079.17 IEC 60479-1; ECP 34 and ECP 35 are used for.		**C**
8.	Describe general applications AS/NZS 6116 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 50, and ECP60 are used for.		**C**

10.5 The Multiple Earth Neutral System

10.5.1 MEN System of Earthing and Arrangement

1.	Explain the distribution arrangements and be able to identify all the components that are associated with an MEN system of supply to an installation.	AS/NZS 3000	**A**
2.	Explain the reasons for multiple earthing of the neutral conductor and be able to determine the advantages and disadvantages of this and the principles involved.		**A**
3.	Describe the types of earthing systems used, including their various advantages and disadvantages.		**C**
4.	Detail 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**
5.	Determine the 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**

6.	Evaluate the purpose and function of an earth electrode in a low voltage installation.		**A**
7.	Outline the earthing requirements for low voltage installations as stated in Section 5 of AS/NZS 3000.		**B**

10.5.2 Prospective Short Circuit Currents

1.	Determine the hazards that high prospective short circuit current levels pose to persons, protective devices, fittings and property damage.		**A**
2.	Outline the physical electrical, magnetic and electro-mechanical dangers associated with prospective short circuit currents if the equipment is inadequate to interrupt the short circuit current.		**B**
3.	Match the requirements to establish the suitability of a particular piece of equipment for a given application in terms of current rating and category of duty.		**C**
4.	Calculate the resulting prospective short circuit levels under fault conditions for an installation and individual sub-circuits.		**B**

10.5.3 Dangers Associated with Reversed Polarity

1.	Assess the dangers associated with a transposition of mains polarity at the installation point of connection with the electricity supply.		**A**
2.	Detail the tests that must be used to positively identify the correct polarity of the neutral conductor of mains for an installation before the supply is connected.		**A**
3.	Explain that no installation can be connected to the supply or enlivened until the polarity has been tested and found to be correct. This means an installation cannot be enlivened and polarity tests carried out retrospectively.		**A**
4.	Detail the safety verification methods that can be used to identify correct polarity of the mains neutral conductor once an installation has been connected or enlivened.		**A**
5.	Evaluate the dangers of reversed polarity including reasons and by calculation why protective devices often do not operate when a phase to neutral transposition of the mains to an installation occurs.		**A**
6.	Explain the dangers that reversal of polarity presents in a multi-phase or three-phase installation.		**A**
7.	Explain the methods by which phase rotation can be confirmed in a three-phase installation.		**A**

10.6 Protective Devices

10.6.1 General Arrangement and Specifications

1.	Compare the selection and installation of switching and protective devices that enable control and automatic disconnection of supply in the event of overload, short circuit, excess earth leakage arcing faults or over/under voltage supplies	S 2 of AS/NZS 3000	**C**
2.	Apply tables contained in AS/NZS 3000 to select appropriate protection device ratings for given cable sizes installed under specified conditions both in single-phase and three- phase applications.	AS/NZS 3000 Tables C5 & C6	**B**
3.	Define what is meant by the terms rated current and excess current protection.		**C**
4.	Describe the following terms applicable to sub-circuit protection: • voltage rating • current rating • utilisation categories – that replace fusing factors Breaking capacity and kVA rating		**B**
5.	Explain the terms as related to the various types of protective devices such as but not limited to: • DC rated protection associated with photovoltaic circuits as opposed to AC • current rating • voltage rating fusing current.		**B**

10.6.2 Under Voltage Protection

1.	Assess 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.		**C**

10.6.3 Residual Current Devices (RCDs)

1.	List the operating principles of RCDs and how they provide supplementary protection to users of electrical appliances and equipment.	S 2 of AS/NZS 3000, ESR 89	**C**
2.	Assess the maximum tripping current and operating times for RCDs to be deemed electrically unsafe.	ESR 24	**A**

3.	Assess different types of RCD's where they are required and their operating characteristics including: • RCDs installed for protection against shock are type A for New Zealand • Supply to electric vehicle chargers requires type B RCD • Protection against initiation of fire with type S RCD's section 2.6.2.3 of AS/NZS3000 • Requirements for leakage protection in medical treatment areas Type 1 10 mA not Type A 10 mA understand the difference in accordance with AS/NZS 3003 • Requirements for installing Type A 10 mA RCD protecting areas of increased risk and children against electric shock as detailed in Section 2.6.1 of AS/NZS 3000.	S 2 of AS/NZS 3000	**A**
4.	Apply knowledge for installing single phase and three phase RCDs in residential, industrial and commercial situations, including requirements in AS/NZS 3000 for the installation of RCDs in domestic and residential premises for alterations and additions and new installations.		**B**

10.6.4 Arc Fault Detection Devices (AFDD)

1.	Describe the basic operating principle and benefits of using an AFDD		**B**
2.	Assess knowledge and understanding of arc faults and the associated risks.		**B**

10.6.5 Isolating Transformers

1.	Outline why an isolating transformer provides maximum safety when used with only one electrical appliance connected.	ESR 89	**C**
2.	State 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.		**C**
3.	Interpret that the isolating transformer may be used in conjunction with other approved safeguards for hand-held appliances to provide additional protection.		**C**

10.7 Cabling Systems

1.	Detail that a cable selection process involves assessing factors such as loading, voltage rating, environmental conditions, length of run, earthing requirements, mechanical factors and additional considerations including derating factors and prospective short circuit currents.		**A**

2.	Assess how a cable is chosen for a stated application considering all of the above factors.		**A**
3.	Select cable type and size required for a sub-circuit under specified load conditions, using the appropriate parts of AS/NZS 3000.		**C**
4.	Select cable type and size required for mains and submains under specified load conditions using the following tables of AS/NZS 3008.1.2: 10, 13, 22, 23, 24, 27(1), 27(2), 41, 42, 45		**C**

10.7.1 Maximum Demand

1.	Determine methods and fundamental principles for determining maximum demand.	AS/NZS 3000	**A**
2.	Understand how to calculate the maximum demand for domestic installations. using the appropriate appendix of AS/NZS 3000.		**B**
3.	Extract the maximum demand for non-domestic installations, using the appropriate appendix C AS/NZS 3000 • sub-main • mains • total installation loading.	AS/NZS 3000	**B**

10.7.2 Voltage Drop

1.	Identify and explain situations where excessive volt drop may occur and the consequences of the volt drop.		**A**
2.	Explain how loading affects the volt drop.		**B**
3.	Apply the requirements of AS/NZS 3008.1.2 to calculate voltage drop and determine the size of cable required.		**C**
4.	Select the most appropriate conductor for a given application.		**B**

10.8 Testing Competency

1.	Show the correct selection of appropriate testing instruments for different installation and applications including considerations for • category rating • resolution • accuracy.		**B**
2.	Determine test requirements, considerations, procedures, and correct testing sequence of installations as required in AS/NZS 3000 and AS/NZS 3017 (sections 1, 2 and 3).		**A**
3.	Explain and demonstrate the safe and competent use of test instruments including but not limited to: • Low ohms tester		**A**

	• Insulation resistance tester • voltmeter • current meter • earth fault loop impedance testers • RCD tester.		
4.	Evaluate the meaning of different test results for determining the safety or state of the installation or fitting being tested.		**A**
5.	Evaluate polarity testing requirements, considerations and procedures in AS/NZS 3017.		**A**
6.	Assess the earth fault loop testing requirements, considerations, and procedures in AS/NZS 3017.		**A**
7.	Explain the reasons on where and why earth fault loop impedance tests are required in an installation: • MEN switchboard and • termination of a sub-circuit.		**A**
8.	Detail how earth fault loop impedance tests can be used to verify the conductivity of mains connections.		**A**
9.	Evaluate AS/NZS 3017 section 3 objectives and requirements for operation of RCDs.		**A**
10.	Evaluate AS/NZS 3017 section 3 objectives requirements and procedures for measuring resistance of an earth electrode.		**A**
11.	Apply AS/NZS 3017 section 3 objectives, requirements and procedures for measurement of touch voltage.		**B**
12.	Apply AS/NZS 3017 section 3 objectives, requirements and procedures for continuity resistance of incoming neutral to an installation.		**B**
13.	Describe earth leakage testing.		**B**
14.	Apply the safety verification methods for polarity using an independent earth probe.		**B**
15.	Explain safety verification methods for verifying polarity using an independent earth probe can only be completed after the polarity tests in AS/NZS 3017 have been completed and the polarity was verified as correct.		**A**

10.9 Professional Development

1.	Outline that all inspectors are required to maintain and develop their individual skills, knowledge and competency by way of their own professional development, in order to perform inspections safely, with existing and new technologies		**C**

11. Practical Tasks and Skill Assessments

During the course of practical instruction and assessment; emphasis must be placed on the importance of understanding the safety principles and rationale behind why the various tests are carried out and how they are used to determine safety.

The candidate shall demonstrate an acceptable level of fundamental skill knowledge understanding and competency in the compulsory practical skill task options listed.

A number of assessments will require “site visits” to appropriate installations. During the installation ‘site visits” candidates will be expected to become familiar with and use the inspection or verification check lists or equivalents from the appropriate standards.it is expected these assessments would to a large extent involve a visual compliance application within the specific safety parameters of the installation.

Electrical testing competency can only be assessed after an independent practical demonstration.

Skills 8 to 17 are installation “site visits” as part of the assessment process outside the workshop / classroom environment. It is intended that “site visits “will increase the candidates’ awareness and appreciation of the associated risks and competency requirements in these areas.

Note: “site visits” from skills 8 to 10 must be completed, in addition to two “site visits” from skills 11 to 17.

11.1 Skill Assessment Grading

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

Skill Level	Description
C	Competent
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 verified by a Board approved skill assessor holding an Inspectors practicing licence.

12. Practical Assessment Skills

Skill No.	Skill Definitions and Task Requirements
1.	Electrical safety and safe working practices by assessing candidate's ability to competently select and use the appropriate equipment and apply safe work practices whilst carrying out practical skills, inspection and testing.
2.	Competent use of test instruments for carrying out continuity tests, protective earth, equipotential bonding conductor resistance, insulation resistance, circuit connections, polarity, earth fault loop impedance, RCD and phase rotation measurements. Evaluate what the testing measurements represent, how and why safety and compliance was achieved. Refer to testing and competency clause 10.8.
3.	Inspection and earth fault loop testing of earthing systems for compliance in accordance with AS/NZS3000. Refer to testing competency clause 10.8.
4.	Selection identification and testing of RCD's-Type A Type 1 Type 2 Type S, Type B, RCCBs and RCBOs. (10, 30, 300, milliamp range) Completion of test sheets recording current and tripping times.
5.	Safety verification of installation supply neutral conductor polarity using test instruments: • without an electricity supply available • when an electricity supply is available.
6.	Correct completion and issuance of valid certification documentation. Demonstrated knowledge on what parties are responsible for completing which document and why: • Records of inspection. • Certificate of Compliance and Electrical Safety Certificate for a new and existing whole installation and part installation • Certificate of Verification for an existing installation WoEF for connectable installations (including forms and any associated test records).
7.	Inspection assessment and testing of "Mains Work" on a low voltage installation in accordance with Section 8 of AS/NZS 3000.
8.	Inspection assessment and testing of an existing low voltage installation for completion of a Certificate of Verification in accordance with ESR 74(2) (c) and AS/NZS 3019.
9.	Inspection assessment and testing of a connectable installation for the issue of a WoEF in accordance with AS/NZS 3001 or AS/NZS 3004.2 or NZS 6115.
10.	Carry out a periodic assessment on at least one installation listed in ESR 75(1) (a) to (f) in compliance with the appropriate standard cited.

Skill No.	Skill Definitions and Task Requirements
11.	Inspection assessment of a high voltage installation.
12.	Inspection assessment on installations intended for use with electrical medical devices in accordance with AS/NZS 3000, AS/NZS 3003 and NZS 6115.
13.	Inspection assessment of hazardous areas in accordance with AS/NZS 3000 and AS/NZS 60079.14.
14.	Inspection assessment of animal stunning appliances and meat conditioning appliances in accordance with AS/NZS 3000 and NZS 6116.
15.	Inspection assessment of work on mains parallel generation systems in accordance with AS/NZS 3010 and AS 4777.1
16.	Inspection assessment of photovoltaic systems in accordance with AS/NZS 3000, AS/NZS 5033 and AS 4777.1.
17.	Inspection assessment of low or ELV installation that does not comply with part 2 of AS/NZS 3000.

13. Guidance to Use of Performance Verbs Applied to Knowledge Levels

To assist examiners and tutors with the development of suitable examination questions and assessments these performance verbs can be applied to the respective knowledge levels as indicated in the table below.

This does not restrict the selection of other suitable verbs from this list for any learning objective.

Verb	Description	Knowledge Level		
		A	B	C
Apply	To employ formulae, theorem, principle or rule		✓	
Assess	To fix the size quantity, amount, value or quantity	✓	✓	
Calculate	To determine or ascertain mathematical methods		✓	
Categorise	To place in a class or division.		✓	✓
Compare	To establish similarities or dissimilarities.		✓	✓
Construct	To build an entity by fitting parts together.		✓	
Convert	To change into others of a different kind.		✓	
Decode	To interpret in plain language.		✓	
Define	To state the exact meaning or give the limits.		✓	
Derive	To trace from a source or deduce.	✓		
Describe	To give a description or state the characteristics		✓	✓
Detail	To deal with things item by item.	✓		
Determine	To resolve or establish precisely.	✓		
Diagnose	To identify the cause or fault.	✓		
Differentiate	To identify the difference between items or requirements.		✓	✓
Distinguish	To make the difference recognisable.	✓	✓	
Estimate	To give an approximate judgement.		✓	
Evaluate	To critically interpret and appraise in various contexts.	✓		
Explain	To make known in detail.	✓	✓	
Extract	To derive from.	✓	✓	
Graph	To draw a graph as representing a given function.	✓	✓	
Identify	To establish individuality of an item.		✓	✓
Illustrate	To give specific examples of a general case.		✓	✓
Interpret	To put in plain words.			✓
List	To record a number of connected items.			✓
Match	To join two or more things so they correspond.			✓
Name	To use the word by which an item is known.			✓
Outline	To draw or describe the essential parts only		✓	✓

Verb	Description	Knowledge Level		
		A	B	C
Perform	To carry out a task.		✓	✓
Plot	To mark or connect points on a graph or schematic		✓	✓
Reproduce	To produce again, to produce copies or representations.		✓	
Round	To approximate to a specified degree of accuracy			✓
Select	To choose for suitability from a list.			✓
Show	To demonstrate.			
Simplify	To make easier to do or understand.	✓	✓	
Solve	To determine the answer to a problem.		✓	✓
Specify	To provide details of design, materials requirements or conditions.		✓	✓
State	To express in words or numbers.			✓
Trace	To follow the course, development, history of.			✓





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