NOTES:

1 Basic protection is not necessary for voltages not exceeding 25 V a.c. or 60 V ripple-free d.c., in dry indoor conditions.

2 Insulation is capable of withstanding the test voltage for the required period when the insulation resistance after the test voltage has been applied for the specified period remains above the required minimum value.

7.5.6 Arrangement of PELV circuits

The following applies for PELV circuits, where one conductor of the output circuit is earthed.

Basic protection shall be provided by—

(a) barriers or enclosures affording a degree of protection of at least IPXXB or IP2X; or

(b) insulation capable of withstanding a test voltage of 500 V a.c. for 1 min.

Exception: Basic protection shall be deemed unnecessary if electrical equipment is within the zone of influence of equipotential bonding and the nominal voltage does not exceed—

1 25 V a.c. or 60 V ripple-free d.c., when electrical equipment is normally used in a dry location only and large-area contact with the human body is not to be expected; or

2 6 V a.c. or 15 V ripple-free d.c., in all other cases.

NOTES:

1 The earthing of circuits may be achieved by an appropriate connection to earth within the source itself.

2 AS/NZS 60479 indicates that large-area contact is approximately 8000 mm^2.

3 Insulation is capable of withstanding the test voltage for the required period when the insulation resistance, after the test voltage has been applied for the specified period, remains above the required minimum value.

7.5.7 Voltage drop in conductors

The drop in voltage at any point in an extra-low voltage electrical installation shall not exceed 10% of the nominal value when all live conductors are carrying the circuit-operating current.

NOTE: Information on voltage drop is given in the AS/NZS 3008.1 series.

Exception: This requirement need not apply where electrical equipment is specially designed for operation with a voltage drop greater than 10%.

NOTE: Motor starting, solenoid closing and other similar applications where high transient currents may be experienced that can significantly increase voltage drop, are excluded from consideration.

7.5.8 Control of an electrical installation

7.5.8.1 *Main switches*

The supply to an extra-low voltage electrical installation shall be controlled by a main switch or switches operating in all unearthed conductors.

Exception: This requirement need not apply where the extra-low voltage electrical installation is supplied from part of an electrical installation operating at a voltage greater than extra-low voltage and the operation of the main switch for the high voltage part of the electrical installation results in the disconnection of the supply.

7.5.8.2 *Other switches*

Switches in an extra-low voltage electrical installation shall comply with the following:

(a) A switch shall operate in all unearthed conductors where the extra-low voltage supply is earthed at the point of supply, e.g. PELV.

(b) Switches may operate in one less conductor than the number of conductors in the circuit, e.g. SELV.

7.5.9 Overcurrent protection

7.5.9.1 *General*

Every extra-low voltage circuit shall be individually protected at its origin against overload and short-circuit currents by a protective device that—

(a) shall comply with the applicable requirements of Clauses 2.2 and 2.5; and

(b) may be provided in one conductor less than the number of conductors in the circuit.

Where the extra-low voltage supply is earthed at the point of supply, the protective devices shall be installed in all the unearthed conductors.

Exception: Circuits arranged in accordance with Clause 7.5.9.2 need not be provided with overcurrent protection.

7.5.9.2 *Omission of overcurrent protection*

Overcurrent protection need not be provided where one of the following applies:

(a) The expected interruption to supply could result in a greater danger than the overcurrent.

(b) The rated output of the source of supply does not exceed the current rating of the circuit and the circuit is supplied from either of the following sources:

  (i) A transformer marked to indicate that it is short-circuit proof in accordance with AS/NZS 61558 and—

    (A) the rated output of the transformer does not exceed 1 A; or

(B) the short-circuit current of the transformer does not exceed the current-carrying capacity of the circuit conductors and such short-circuit current is marked on the transformer.

(ii) A battery, comprising cells having a high internal resistance, e.g. Leclanché or dry-type primary cells.

7.5.10 Connecting devices

Plug and socket-outlet devices, including installation couplers, for SELV and PELV shall comply with the following:

(a) Plugs shall not be able to enter sockets of other voltage systems.

(b) Sockets shall not accept plugs of other voltage systems.

(c) Sockets shall not have a contact for a protective earthing conductor.

7.5.11 Wiring systems

7.5.11.1 *General*

Conductors and insulation of cables for extra-low voltage electrical installations shall be suitable for the intended purpose and need not be further protected unless installation conditions so demand.

NOTE: Attention is drawn to the requirements of Clause 3.9.8.3 for segregation of different wiring systems and the need for further protection in some situations.

7.5.11.2 *Aerial conductors*

Aerial conductors used in extra-low voltage electrical installations shall be installed in accordance with the applicable requirements of Clause 3.12.

Exceptions:

1 The clearances above ground or elevated areas need not apply provided that the requirements of Clause 3.3.1 are satisfied.

2 Bare conductors may be erected in accordance with the requirements for insulated conductors.

7.5.11.3 *Underground conductors*

There are no depth-of-burial requirements for the safety of extra-low voltage cables.

NOTE: Consideration should be given to the risk of mechanical damage.

7.5.12 Testing

7.5.12.1 *General*

The separation of ELV circuits shall be verified in accordance with Clause 7.5.12.2 in the case of protection by SELV, and Clause 7.5.12.3 in the case of protection by PELV.

The insulation resistance value obtained in accordance with Clauses 7.5.12.2 and 7.5.12.3 shall not be less than 0.5 MΩ when tested at a voltage of 250 V d.c.

7.5.12.2 *Protection by SELV*

The separation of live parts from those of other circuits and from earth shall be confirmed by a measurement of the insulation resistance.

7.5.12.3 *Protection by PELV*

The separation of live parts from other circuits shall be confirmed by a measurement of the insulation resistance.

7.6 HIGH VOLTAGE ELECTRICAL INSTALLATIONS

7.6.1 Scope

The particular requirements of this Clause (Clause 7.6) apply to electrical installations and those portions of electrical installations operating at high voltage.

For protection and earthing purposes, this Clause also applies to all the electrical equipment up to and including any low voltage cables and switchgear associated with high voltage transformers.

This Clause (Clause 7.6) does not apply to the following:

(a) Electric discharge illumination systems.

(b) X-ray equipment.

(c) High frequency equipment.

(d) High voltage wiring and electrical equipment enclosed within self-contained electrical equipment and supplied at low voltage where precautions have been taken to prevent contact with high voltage conductors.

7.6.2 Application

7.6.2.1 *In Australia* **A**

In Australia, electrical installations and those portions of electrical installations operating at high voltage shall be installed in accordance with AS 2067.

7.6.2.2 *In New Zealand* **NZ**

In New Zealand, requirements for high voltage electrical installations and those portions of electrical installations operating at high voltage are set in the Electricity (Safety) Regulations.

7.6.3 Issues relevant to high voltage installations

A1 For the design of electrical installations with voltage 1 kV or more, the issues that shall be taken into account include the following:

(a) Insulation levels to withstand highest voltage and/or impulse withstand voltages.

(b) Minimum clearances to live parts taking into account electrode configurations and impulse withstand voltages.

(c) Minimum clearances under special conditions.

(d) The application of various devices connected to the system.

(e) The methods of installation of equipment, cables and accessories.

(f) General requirements of installations regarding choice of circuit arrangement, documentation, transport routes, lighting, operational safety and labelling.

(g) Special requirements with respect to buildings.

(h) Protection measures with respect to access.

(i) Protection measures with respect to fire.

(j) Provision of earthing such that the system operates under all conditions and ensures safety of human life where there is legitimate access.

(k) Testing.

7.7 HAZARDOUS AREAS (EXPLOSIVE GAS OR COMBUSTIBLE DUSTS)

7.7.1 Scope

The particular requirements of this Clause (Clause 7.7) apply to the selection of electrical equipment and its installation to ensure safe use in areas where flammable or combustible materials are produced, prepared, processed, handled, stored or otherwise exist, and therefore may give rise to an explosive atmosphere.

7.7.2 Classification of hazardous areas

7.7.2.1 *Responsibility for classification*

The responsibility for classification of a hazardous area (see Clause 1.4.15) rests with the persons or parties in control of the installation. The requirements are contained in AS/NZS 60079.10.1 for gas or vapour and AS/NZS 60079.10.2 for combustible dust.

7.7.2.2 *Hazardous areas (AS/NZS 60079 series)*

For the purposes of classification, two types of hazardous area are as follows:

(a) Hazardous area (gas or vapour) in which an explosive gas atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of apparatus.

NOTES:

1 Hazardous areas are divided into zones based upon the frequency and duration of the occurrence of explosive gas atmospheres.

2 Explosive gas atmospheres include flammable vapours (from liquids).

(b) Hazardous area (dust) in which combustible dust in the form of a cloud is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment.

NOTES:

1 Hazardous areas are divided into zone based upon the frequency and duration of the occurrence of explosive dust atmospheres.

2 The potential of creating an explosive dust cloud from a dust layer.

3 Combustible dusts may include fibres and flyings.

7.7.2.3 *Reduction or elimination of the hazard*

Through design and operation, it is possible to reduce the degree of hazard. This is achieved by giving attention to items such as plant layout, product containment and ventilation.

7.7.2.4 *Electrical equipment*

7.7.2.4.1 *Selection*

Electrical equipment selected for use in hazardous areas shall comply with the applicable requirements of AS/NZS 60079.14.

7.7.2.4.2 *Installation*

Electrical equipment shall be installed in accordance with the installation requirements of AS/NZS 60079.14.

NOTES:

1 AS/NZS 60079.14 includes requirements for the competency of persons.

2 AS/NZS 60079.17 includes requirements for inspection and maintenance.

7.8 STANDARDS FOR SPECIFIC ELECTRICAL INSTALLATIONS

7.8.1 Scope

A1 **This Clause (Clause 7.8) specifies Standards for specific electrical installations.**

A1 **Where the listed Standards do not specify a requirement, the relevant requirements of this Standard apply.**

Clause 7.8.2 lists Standards that are additional to, replace, or modify the general requirements of this Standard.

Clause 7.8.3 lists Standards that provide additional guidance for specific electrical installations. The relevant regulatory authorities may have requirements additional to these standards with a varying method of application.

7.8.2 Standards containing requirements that are additional to, replace, or modify the general requirements of this Standard

7.8.2.1 *Construction and demolition sites*

Electrical installations for construction and demolition sites shall comply with AS/NZS 3012.

7.8.2.2 *Electromedical treatment areas*

Electrical installations in electromedical treatment areas (including home patient areas) shall comply with AS/NZS 3003.

7.8.2.3 *Transportable structures and vehicles including their site supplies*

Electrical installations in transportable structures and vehicles including their site supplies shall comply with AS/NZS 3001.

7.8.2.4 *Marinas and recreational boats*

Electrical installations in marinas and recreational boats shall comply with AS/NZS 3004.

NOTES:

1 AS/NZS 3004 is a two-part Standard as follows:

(a) AS/NZS 3004.1 provides requirements for electrical installations on marinas.

(b) AS/NZS 3004.2 provides requirements for electrical installations in recreational boats.

2 In Australia, for electrical installations on commercial vessels, refer to the Australian Maritime Safety Authority, National Marine Safety Committee's *National Standard for Commercial Vessels*, Part C: Design and construction—Section 5: Engineering—Subsection 5B: Electrical (NSCV C 5B). A

7.8.2.5 *Shows and carnivals*

Electrical installations in shows and carnivals shall comply with AS/NZS 3002.

7.8.2.6 *Telecommunication network power supplies*

Extra-low voltage (d.c.) power supply installations within public telecommunication networks shall comply with AS/NZS 3015.

7.8.2.7 *Cranes and hoists*

Electrical installations for cranes and hoists shall be in accordance with the applicable requirements of this Standard.

NOTE: Such electrical installations may be subject to the requirements of the AS 1418 series or other requirements of the relevant regulatory authorities.

7.8.2.8 *Lifts*

Electrical installations for lifts shall be in accordance with the applicable requirements of this Standard.

NOTES:

1 See Clause 7.2.3.4 for requirements affecting the control and arrangement of special lift installations.

2 Such electrical installations are within the scope of the AS 1735 series and compliance therewith may be required by the relevant regulatory authorities.

7.8.2.9 *High voltage installations*

* In Australia, high voltage electrical installations shall comply with AS 2067. **A**

In New Zealand, high voltage installation shall comply with the New Zealand Electricity (Safety) Regulations. **NZ**

7.8.2.10 *Generating sets*

* Electrical installations which include the use of generating sets for the supply of electricity at voltages normally exceeding 50 V a.c. or 120 V d.c. shall comply with AS/NZS 3010.

7.8.2.11 *Inverters*

* Electrical installations including grid connections of energy systems via inverters shall comply with AS/NZS 4777 series.

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7.8.2.12 '**Text deleted**'

7.8.2.13 *Stand-alone power systems*

* Electrical installations including stand-alone power systems shall comply with AS/NZS 4509 series.

7.8.2.14 *Photovoltaic (PV) arrays*

* Electrical installations including photovoltaic arrays shall comply with AS/NZS 5033.

7.8.2.15 *Secondary battery systems*

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Battery energy storage systems (BESS) and associated battery systems, as defined in AS/NZS 5139, shall comply with AS/NZS 5139. All other secondary battery systems, as defined in the scope of AS 3011 (series), installed in buildings, structures or premises such as those with critical power continuity requirements (e.g. for telecommunications, uninterruptible

A1 power supplies (UPS), hospitals, sub-stations and black start) that are outside the scope of AS/NZS 5139 shall comply with AS 3011 (series).

7.8.2.16 *Mobile medical facilities*

* In New Zealand, electrical installations for mobile medical facilities shall comply with NZS 6115. NZ

7.8.2.17 *Floor and ceiling heating systems*

* In New Zealand, electrical installations for floor and heating systems shall comply with NZS 6110. NZ

7.8.2.18 *Explosive atmospheres and hazardous areas*

* Electrical installations located in explosive atmospheres/hazardous areas that comply with AS/NZS 60079.14 are deemed to comply with this Standard.

7.8.3 Standards containing guidance

7.8.3.1 *Outdoor sites under heavy conditions*

Electrical installations in outdoor sites where heavy conditions exist may require compliance with additional requirements.

Such sites include open-cast mines, quarries, stockpiles and other industrial areas exposed to particularly onerous environmental and operational conditions.

NOTE: Such electrical installations are within the scope of AS/NZS 3007. Compliance with AS/NZS 3007, although not a requirement of this Standard, may be required by relevant regulatory authorities, who may also have other requirements.

7.8.3.2 *Electric fences*

Guidance on the installation requirements for electric fences is given in AS/NZS 3014 and AS/NZS 3016.

Where an electrically operated fence is connected directly or indirectly to electricity supply mains, such connections shall be made only through a mains-operated fence controller complying with AS/NZS 60335.2.76.

7.8.3.3 *Emergency power for supply in hospitals*

* Guidance on the installation requirements for emergency power supplies for hospitals is given in AS/NZS 3009.

7.8.3.4 *Lightning protection*

* Guidance on the installation requirements for lightning protection systems is given in AS/NZS 1768.

7.8.3.5 *Uninterruptible power systems (UPS)*

* Guidance on the installation requirements for uninterruptible power systems is given in AS 62040 series.

7.8.3.6 *Semiconductor power converters*

* Guidance on the installation requirements for semiconductor power converters is given in AS 60146 series.

7.8.3.7 *Rotating electrical machines*

* Guidance on the installation requirements for rotating electrical machines is given in AS 60034 series.

7.8.3.8 *Periodic verification*

* Guidance on period verification of electrical installations is given in AS/NZS 3019.

7.8.3.9 *Verification guidelines*

* Verification guidelines for common tests that may be used to check whether low voltage installations comply with this Standard are given in AS/NZS 3017.

7.8.3.10 *Film, video and television sites*

Guidance on the safe working procedures for the use of electrical equipment and electrical installations on film, video and television sites is given in AS/NZS 4249.

NOTE: Compliance with AS/NZS 4249 or other requirements, although not a requirement of this Standard, may be required by relevant regulatory authorities.

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7.9 SUPPLIES FOR ELECTRIC VEHICLES (NZ ONLY)

7.9.1 Scope

The particular requirements of this Clause (Clause 7.9) supplement or amend the requirements of Sections 2 to 7 of this Standard for parts of electrical installations intended for the charging of electric vehicles for New Zealand only.

NOTES:

1 Appendix P contains information on the modes of charging used for charging systems used for electric vehicles.

2 Attention is drawn to the contribution of EV charging to the maximum demand of an installation. Refer to Tables C1 and C2.

3 Electricity distributors may require notification of the installation of EV charging equipment.

7.9.2 Supply (NZ only)

7.9.2.1 *Source of supply*

The supply shall not be obtained from a switchboard in an outbuilding that has a separate MEN earthing system in accordance with Clause 5.5.3.1 option (c).