

	
<h1>Snowy Technical Standards</h1>	
SHL-ELE-156 (M)	Annexure M - Lighting and Power General Low Voltage Electrical Requirements
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This annexure forms part of the General Low Voltage Electrical Requirements Standard ([SHL-ELE-156](#)).

1. Scope

This Annexure sets out the requirements for Lighting and small power.

Lighting and small power must be designed and constructed conforming to the [General Electrical Requirements Specifications](#) and this Annexure..

Lighting and power distribution boards must be designed and constructed such that they can be operated and maintained live by personnel without the need for arc-rated PPE. If this cannot be achieved, then the enclosure must be treated as a switchboard and must comply with the requirements detailed in [Annexure B](#) – Low Voltage Switchboards.

1.1. Applicable Standards

The design, manufacture and testing of equipment and components detailed in this annexure must comply with the requirements of all relevant Australian Standards or in the absence of appropriate Australian Standards, with relevant IEC, ISO or International Standard, together with the requirements of competent authorities having jurisdiction over all or part of the manufacture, installation or operation of the equipment, except where modified by this specification.

All works must comply with the requirements of the most recent releases of the regulations and standards noted in Snowy Standard [SHL-ELE-156](#). In the event of a conflict between different Codes, Standards or Regulations, the highest requirement must apply.

2. Technical Requirements

2.1. Lighting

2.1.1. General

Lighting must be supplied in accordance with the relevant Australian Standards, Workplace Health and Safety Legislation applying in the State in which the project site is located and the Building Code of Australia. Installations in hazardous areas, must comply with the relevant standards.

The illumination of plant areas must provide for the safety of personnel and for the safe and convenient operation and maintenance of the plant.

Energy efficiency and maintenance requirements should also be considered during the design process.

2.1.2. Specific requirements

The loop-in system of wiring must be followed wherever practicable throughout the installation. Wiring must be supplied and installed in accordance with the General Electrical Requirements and Annexure D - Low Voltage Cables and Cable Management Systems.

Each cable must be uniquely numbered thereby identifying the circuit to which it is connected.

Numbered discs or other approved identification must be fitted to each light fitting and outlet indicating the distribution board circuit to which it is connected.

The luminaires must be able to be individually disconnected from the lighting circuit by means of a three pin plug / socket arrangement.

Luminaire support brackets and support columns must be hot dipped galvanised after fabrication and must be designed to give adequate support for the luminaires. All brackets and supports and details of mounting must be subject to approval before manufacture.

All lighting circuits shall be protected by residual current circuit breakers (RCD) with a maximum rated residual current of 30mA as per AS3190, AS61008.1 or AS61009.1.

For specific application the minimum average illumination levels must be as listed below with a degree of uniformity of illuminance of not less than 0.7 as per AS1680.1:

AREA	LUX
Control room, relay room, Offices, rooms with panels or consoles, test room, Laboratories	400
Plant areas	400
Workshops	200
Control room emergency lighting	160
Switchyards at points of interaction for switching	160
Stairways and Ladder ways	80
Storage Areas	80
Parking area & access ways	40
Gravelled switchyard areas	20
General Yard Areas	10
Emergency lighting	10

For areas not categorised in the above list, the lighting levels must follow the recommendations of AS 1680. In calculating illumination levels a maintenance factor of 0.8 and lamp lumens after 1000 hours operation must be used.

Plant lighting in areas such as walkways, platforms, general access ways, localised equipment lighting must use high pressure sodium or mercury vapour luminaires. LED lighting can be used on approval by SHL. Colour rendition requirements and sensitivity to insect attraction must be assessed in the selection of luminaire types for each plant area.

Lighting in operating rooms and switchrooms must be fluorescent. LED lighting can be used on approval by

SHL.

Emergency lighting must be installed to provide safe egress in the event of a power failure. Emergency lighting must be by self-contained battery backed luminaires. Emergency lighting must comply with AS 2293.

All luminaires must be able to be maintained from the installed platforms and/or walkways or from the ground without the use of ladders.

2.1.3. Luminaries

The following types of luminaires are preferred by SHL:

- High pressure sodium or mercury vapour luminaries must comply with the following requirements:
 - Luminaries have an enclosure with a rating of IP65 to AS 60529,
 - Luminaries must have a glass refractor fitted with a safety cable or guard to prevent the refractor from falling and an external label with lamp wattage and circuit number.
 - Fittings must be fused internally with HRC fuses and power factor corrected to 0.9.
- Fluorescent luminaires must comply with the following requirements:
 - Fittings must be power factor corrected 0.9.
 - Fittings must be fused with HRC fuses and fitted with low loss ballasts.
 - Distance between tube centres must be a minimum of 80 mm.
 - Lamps must be standard white pre-heat rapid start.
 - The fittings must be fitted with moulded prismatic diffuser and neoprene gaskets.
 - Fittings must have no upward component of light.
 - Lamp holders must be spring loaded anti-vibration type.
 - Fittings must have a polyester powder coat paint finish.
 - Fittings must have an enclosure rating of IP65 to AS 60529.

All luminaires are subject to approval by SHL. A sample fitting may be required to be submitted to the SHL prior to approval.

All high intensity discharge luminaires must be provided with Edison-type Screw lamp holders in accordance with AS 3140 and must be supplied complete with lamps having matching bases.

LED lighting must be allowable subject to approval by SHL.

2.1.4. Illuminated exit signs and emergency lights

A system of illuminated exit signs and emergency lights must be installed in areas throughout office areas power stations and other industrial sites.

The illuminated exit signs and emergency lighting system must be a single point system comprising maintained self-contained units and must be supplied and installed in accordance with AS/NZS 2293 Parts 1 and 3.

Illuminated exit signs and emergency lights must be spaced to meet the requirements of AS/NZS 2293 Parts 1 and 3 and the Building Code of Australia for Class 5 buildings for office locations and Class 8 buildings for power stations and other industrial sites.

All stairways accessing multiple levels of a particular building must be classed as required exits and must be fitted with exit signs.

Emergency luminaires must include 2 x 36 W fluorescent tubes with one tube connected in the maintained mode and one tube connected to the normal supply. Use of an equivalent LED light fitting is permissible.

Where LED lights are used, one supply will be from the normal supply and the other from internal backup.

The normal supply for the emergency luminaires must be taken from a separate section of the light and power distribution board.

Automatic testing

Centralised automatic testing facilities must be supplied and installed, in accordance with AS/NZS 2293.1 to test all illuminated exit signs and emergency lights supplied under this Contract.

Provision must be made for varying the test programme in terms of sequence and timing of the tests.

All cabling from the automatic testing equipment to the individual illuminated exit signs and emergency lights must be supplied and installed in accordance with the manufactures specifications and recommendations.

Maintenance manual and records

Maintenance manuals and records must be provided with the illuminated exit signs and emergency lighting system to facilitate the correct operation and maintenance. The manuals and records must comply with this specification and AS/NZS 2293.1 part 7.

The maintenance manuals must include as installed plans showing the location of all illuminated exit signs and emergency lights and their supply circuits. Each illuminated exit sign and emergency light must be given a separate and unique number for identification purposes. A legend must be included to identify each type of illuminated exit sign and emergency light.

2.2. Distribution boards

2.2.1. General

The distribution board construction must be of 1.6mm steel, polyester powder coated orange (X15 to AS 2700) and finished to an industrial standard. Each board must have stainless steel 'Cam' door latches and dustproof seal to achieve IP54.

Distribution boards must have a minimum form of Form 2 segregation according to AS/NZS 61439.1

The distribution board must be fully rated to accommodate the maximum prospective fault current expected.

Each board must be fitted with a typed schedule of circuits firmly attached to the door and protected from dirt and grease by a plastic cover. The type schedule must also indicate cable size(s) for associated main and/or sub-mains to and from the panel. All equipment mounted on the distribution boards must be labelled in accordance with this Annexure. Where space prevents the full circuit description being placed on an identification label, circuit numbering must be used and a legend provided on the door of the distribution board.

The incoming supply module must be segregated from the outgoing units and distribution busbars must be insulated or shrouded to prevent accidental contact with live bars. Separate outgoing units must be provided for lighting, power and emergency lighting. Separate grouping of circuit breakers must be provided for lighting, general purpose outlets and emergency luminaires.

It is preferable that a distribution board only has one source of supply. The source of supply must have a main isolator fitted and accessible at from the top half of the escutcheon plate. Where an enclosure contains more than one source of supply, a warning label must be affixed to that effect.

Removal of the escutcheon to access live cables and/or busbar must not be possible without the use of tools.

Spare poles must have pole-fillers fitted.

Each distribution board must contain as a minimum, fully rated busbar, neutral bar and earth bar and the busbars must be a type test assembly.

Main isolators must be centrally placed above their group of sub-circuits.

The load throughout the installation must be balanced between phases.

All active, neutral and earth wires terminating at the distribution boards must be ferruled to indicate the sub-circuit number.

2.2.2. Fuse Distribution Boards

Only HRC fuse fittings that comply with IEC 60269 Parts 1 and 2 must be utilised within these distribution boards.

Spare fuse carriers must be provided.

2.2.3. Arc flash requirements

Distribution boards must be designed and constructed to achieve an arc incident energy of less than 1.2 cal/cm² (i.e. PPE category 0) with doors open.

2.3. Cables and cable installation

Cables and cable installation must be supplied and installed in accordance with Annexure D – Low Voltage Cable and Cable Management Systems.

2.4. Lighting switches and contactors

Lighting switches must be the protected type and must be mounted approximately 1400 mm above the floor.

Lighting contactors must be used for high load areas such as the exciter floor.

2.5. Power outlets

All outlets must be protected by core balance earth leakage circuit breakers.

All outlets must be effectively earthed and their location and mounting arrangement must be to the approval of SHL.

2.5.1. Switched socket outlets (SSO)

The SSOs must be mounted 900 mm above floor level. The actual locations must be at convenient points close to all equipment requiring maintenance and must be selected in conjunction with SHL.

SSOs must be 10 A, 240 V combination switch and plug sockets. SSOs located in the Control room, Switch rooms, Offices and other air-conditioned environments must be suitable for general indoor use. SSOs suitable for outdoor use must be supplied for but not limited to the within the operational areas of hydro stations and all outdoor locations.

All SSOs installed must have an adjacent label stating the source of supply.

All SSOs that are supplied by a UPS must have an adjacent label stating the source of supply and the UPS name.

2.5.2. Three phase outlets

Three phase outlets must be either rated at 32 amps or 63 amps, 500 V combination switch and plug sockets. The outlets must be mounted 900 mm above floor level.

All outlets must be 5 wire, with a full size neutral.

Three phase outlets must be connected to provide identical phase rotation and polarity at all plug sockets. Identical keying positions must be provided for all three phase outlets.

All three phase outlets must be suitable for outdoor use.

2.6. Earthing

Earthing for all equipment provided must be in accordance with AS 3000 and Annexure K – Low Voltage Earthing.

2.7. Labelling

Labels must be provided adjacent to circuit isolation and protection devices bases. These labels must contain the following information as a minimum:

- device number
- circuit description
- phase identification (for 2 or 3 phase circuits), active/neutral identification (for single phase circuits) or positive/negative identification (for DC circuits)
- fuse rating (fuse only)
- any other information which may assist in the unambiguous identification, isolation or replacement of the fuses.

For the distribution board, the following requirements must apply:

- each phase must be clearly marked
- each isolation/protective device must be uniquely numbered
- a circuit identification schedule must be provided in a protective pocket located on the inside of the fuse-board enclosure door, with circuit descriptions typed. The circuit identification schedule must be a registered drawing.

In circuit diagrams and wiring diagrams, all circuit isolation and protection devices must be designated by an appropriate letter together with a serial number. Each circuit isolation and protection devices must have a unique designation number for that cubicle. In addition it is preferable that each circuit isolation and protection device has a unique designation number for a system (circuit diagram).

The circuit Isolation and protection devices in cubicles must be located to aid the visibility of isolation status. They must be grouped and arranged logical to provide clarity on the circuits isolated. In general main Isolation devices must be at the top with minor isolations lower in the panel.

2.8. Testing

The electrical installation and all electrical equipment must be tested after the work has been completed to ensure that the equipment is functioning correctly and that the installation complies with AS 3000.

A photometric survey may be required to confirm that the lighting conditions have been achieved.

A Certificate of Compliance or of Electrical Safety is required for any new installation or modified installations in accordance with the relevant statutory regulations.