

Australian Standard[®]

**Emergency escape lighting and exit
signs for buildings**

**Part 1: System design, installation and
operation**



This Australian Standard® was prepared by Committee LG-007, Emergency Lighting in Buildings. It was approved on behalf of the Council of Standards Australia on 16 March 2005. This Standard was published on 12 May 2005.

The following are represented on Committee LG-007:

- Association of Consulting Engineers Australia
 - Australian Building Codes Board
 - Australian Chamber of Commerce and Industry
 - Australian Electrical and Electronic Manufacturers Association
 - Building Industry Authority, New Zealand
 - Business New Zealand
 - Department of Commerce, NSW
 - IES: The Lighting Society
 - National Electrical and Communications Association
 - New Zealand Electrical Regulatory Authorities
 - Property Council of Australia
-

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Australian Standard[®]

Emergency escape lighting and exit signs for buildings

Part 1: System design, installation and operation

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee LG-007, Emergency Lighting in Buildings, to supersede AS/NZS 2293.1:1998 *Emergency lighting for buildings, Part 1: System design, installation and operation*. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian rather than an Australian/New Zealand Standard.

This Standard incorporates Amendment No. 1 (September 2008). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The AS (/NZS) AS/NZS 2293 series comprises three Parts as follows:

AS(/NZS)

- 2293 Emergency escape lighting and exit signs for buildings
- 2293.1 Part 1: System design, installation and operation (this Standard)
- 2293.2 Part 2: Inspection and maintenance
- 2293.3 Part 3: Emergency escape luminaires and exit signs

The objective of the AS 2293 series of Standards is to provide all those associated with the design, construction, installation, certification and maintenance of all the individual components of an emergency escape lighting and exit signage scheme, and the scheme as a whole, with the requirements and guidelines to provide an installation that will ensure an acceptable level of illumination to the nominated areas for the safe evacuation of occupants from those areas in an emergency situation.

The objective of this Standard is to provide designers, installers and certifiers of emergency escape lighting and exit signage schemes with the relevant requirements and guidance for the provision of emergency escape lighting and exit signs to all designated spaces within a building in order to ensure an acceptable level of illumination for the safe evacuation of occupants from those spaces in an emergency situation.

The principal reason for this edition of the Standard is to specify installation requirements for exit signs employing internationally accepted pictographs instead of the previously used word 'Exit'. Also, the basic terminology used to describe the subject matter of the Standard has been modified to be compatible with that used in IEC 60598-2-22 *Luminaires, Part: 2-22: Particular requirements—Luminaires for emergency lighting*. The terminology now used, and reflected in the new series title, recognizes the term emergency lighting as including four categories of lighting, each provided with an alternative energy supply, as follows:

- (a) Emergency escape lighting.
- (b) Illuminated emergency exit signs.
- (c) High risk task area lighting.
- (d) Standby lighting.

Of these categories, items (a) and (b) are the newly adopted terms that refer to the two types of emergency lighting that are required by law in Australia and comprise the scope of the AS 2293 series of Standards. Items (c) and (d) are types of lighting that have a limited history in this country and which are not covered by this series of Standards.

This Standard also includes the following significant changes from the previous edition:

- (i) Replacement of word 'exit' with pictograph.

- (ii) Inclusion of detailed restrictions on the use of arrows.
- (iii) Revision of maximum viewing distances for exit signs.
- (iv) As this Standard is not a joint Australian/New Zealand document, there is no content specific to New Zealand only.
- (v) The adoption of terminology from IEC 60598-2-22.

Further to the content of this Standard, the committee will investigate new techniques, new or developing energy sources and illuminants (e.g. photoluminescent materials), new approaches such as wayfinding systems and also the effects of smoke on emergency lighting, for possible inclusion in future editions of the AS 2293 series.

The committee invites input from interested parties in relation to any of these matters.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

This Standard distinguishes between documents cited as normative references and those referenced for information only. Those belonging to the former category are cited in the clause titled ‘Normative references’ and listed in Appendix A while those of the latter type are listed in the bibliography.

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STANDARDS AUSTRALIA

Australian Standard

Emergency escape lighting and exit signs for buildings

Part 1: System design, installation and operation

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for the design and installation of emergency escape lighting and illuminated emergency exit signage systems for buildings. Both central battery and single point or self contained systems are included.

The scope of this Standard does not include the following:

- (a) Constructional (including appearance) requirements for emergency escape luminaires and exit signs.

NOTE: These requirements can be found in AS 2293.3.

- (b) Requirements for maintaining an emergency escape lighting installation once installed.

NOTE: These requirements can be found in AS/NZS 2293.2.

- (c) Specification of the types of buildings or particular spaces that are required to be provided with emergency escape lighting.

NOTE: This is typically set out in the Building Code of Australia (BCA).

- (d) Requirements for emergency evacuation lighting of the interior of lift cars.

NOTE: These requirements can be found in AS 1735.

- (e) Requirements for high-risk task area lighting.

- (f) Requirements for standby lighting.

NOTE: Due to the known detrimental effect of smoke on the visual conditions provided by emergency lighting, it is recommended that provision be made to keep escape paths as free from smoke as possible by means such as construction techniques and ventilation.

1.2 APPLICATION

It is anticipated that this Standard will be referenced in the May 2006 edition of the Building Code of Australia, thereby superseding the previous referenced edition from the AS/NZS 2293 series.

1.3 NORMATIVE REFERENCES

The referenced documents detailed in Appendix A are indispensable for the application of this document.

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given in the Building Code of Australia, as appropriate, and those below apply.

1.4.1 Ambient temperature

The dry-bulb temperature in still air, averaged over a period of 8 h.

1.4.2 Approved

Approved by the relevant regulatory authority.

1.4.3 Battery

A unit consisting of one or more cells connected in a series, parallel or series-parallel arrangement to supply the voltage and current requirements of a connected load.

1.4.4 BCA

Building Code of Australia.

1.4.5 Boost charge

A system of charging adopted to recover the battery in accordance with the duty requirements of the system, the voltage of the system under these circumstances being outside the normal operational limits of the system.

1.4.6 Cell

The basic single unit consisting of case, electrolyte, positive and negative plates, and connecting terminals, used for storing electric energy by electrolytic processes

1.4.7 Centrally supplied (emergency lighting) system

A system of emergency lighting in which a number of emergency luminaires, or exit signs, or both are supplied from a common power source.

Within a building there may be more than one power source, each of which supplies the emergency luminaires and exit signs in a particular section of the building.

1.4.8 Combined emergency luminaire

Luminaire containing two or more lamps, at least one of which is energized from the emergency lighting supply and the others from the normal lighting supply. The emergency lamp(s) in a combined emergency luminaire is(are) either maintained or non-maintained. (Refer to Figure 1.1)

1.4.9 Combined illuminated emergency exit sign

Definition as for combined emergency luminaire.

1.4.10 Designated area

A specific area within a building that is required to be provided with emergency escape lighting.

1.4.11 Direct lighting

A system of lighting in which most of the light emitted by the luminaires is directed towards the surfaces to be lit. The term usually refers to light emitted in a downward direction.

1.4.12 Electrolyte density

The density of the electrolyte measured in kilograms per cubic metre at a specific temperature.

1.4.13 Emergency escape lighting

That part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before vacating an area.

1.4.14 Emergency lighting

Lighting for use when the supply to the normal lighting fails; it includes emergency escape lighting, illuminated emergency exit signage, high-risk task-area lighting and standby lighting.

NOTE: Only emergency escape lighting and illuminated emergency exit signage are addressed in this Standard.

1.4.15 Emergency luminaire

A luminaire which is designed for use in an emergency lighting system.

NOTES:

- 1 Emergency luminaires are required to be classified in accordance with AS 2293.3. A bare lamp unit may serve as an emergency luminaire provided that it has been appropriately classified.
- 2 An emergency luminaire may be integral with a normal lighting luminaire or may be a completely separate unit.

1.4.16 Exit sign

Refer to Clause 1.4.22.

1.4.17 Externally illuminated exit sign

A sign consisting of white symbols on a green background, in accordance with Figure D2, illuminated by an incident source comprising an emergency luminaire located in front of the plane of the sign face.

1.4.18 Final subcircuit

In the context of this Standard, generally the wiring from the subcircuit protective device to the luminaires except that, in central systems, wiring originating from the distribution board to the fused terminal box and wiring between the fused terminal box and the emergency luminaire or exit sign is deemed to be part of the one final subcircuit.

NOTES:

- 1 See AS/NZS 3000 for a more detailed definition.
- 2 See Clause 7.4.2.2(b) and Appendix B for details of the fused terminal box and its installation.

1.4.19 Float charge

A system of charging adopted to maintain a battery in a fully charged state.

1.4.20 Illuminance

The luminous flux arriving at a surface divided by the area of the illuminated surface.

1.4.21 Illumination

A general expression for the quantity of light arriving at a surface. The physical measure of illumination is illuminance.

1.4.22 Illuminated emergency exit signage

Those parts of an emergency lighting scheme intended to communicate the path of travel to a required exit by displaying appropriate images from those detailed in Appendix D.

NOTE: Throughout this Standard, the term 'exit signs' is used to refer to 'illuminated emergency exit signage'.

1.4.23 Indirect lighting

A system in which most of the light is provided by reflection from ceilings, walls or other surfaces.

1.4.24 Light loss factor (LLF)

The ratio of the illuminance produced by a lighting system at a specified time to the illuminance produced by the same system when new.

NOTE: The LLF combines the losses caused by lamp lumen depreciation, luminaire depreciation and room surface depreciation. Further information is available in AS 1680.1.

1.4.25 Low illuminance area internally illuminated exit sign

A sign consisting of light emitting or light transmitting green symbols on an opaque background. Referred to herein as a 'low illuminance area exit sign'.

1.4.26 Luminaire

Equipment which houses the lamp(s) and directs the light in desired directions. It includes items necessary for fixing, protecting and operating the lamp(s).

1.4.27 Luminance

The physical quantity corresponding to the brightness of a surface (e.g. a lamp, luminaire, sky or reflecting material) in a specified direction. It is the luminous intensity of an area of the surface divided by that area.

Unit: candela per square metre (cd/m^2). Symbol: L.

1.4.28 Luminous flux

The measure of the quantity of light. For a lamp or luminaire it normally refers to the total light emitted irrespective of the directions in which it is distributed.

Unit: lumen (lm). Symbol: N.

1.4.29 Luminous intensity

The concentration of luminous flux emitted in a specified direction.

Unit: candela (cd). Symbol: I.

1.4.30 Maintained emergency luminaire

Luminaire in which all emergency lighting lamps are energized at all times when normal or emergency lighting is required. (Refer to Figure 1.1)

NOTES:

- 1 See Figure C1 of Appendix C for a typical schematic arrangement for a maintained, self-contained emergency luminaire.
- 2 The term 'maintained' can be applied to individual lamps in a combined emergency luminaire.

1.4.31 Maintained illuminated emergency exit signs

Definition as for maintained emergency luminaire.

1.4.32 Monitored supply

The electrical supply to normal lighting luminaires, failure of which is sensed by the emergency lighting system.

1.4.33 Mounting height

The vertical distance between the underside of a luminaire and the floor.

1.4.34 Nominal system voltage

A reference voltage which is used as a basis for the design of a central emergency lighting system.

NOTE: Preferred values of nominal system voltage are 12 V, 24 V, 32 V, 48 V, 110 V and 240 V.

1.4.35 Non-maintained emergency luminaire

Luminaire in which all emergency lighting lamps are in operation only when the supply to the normal lighting fails. (Refer to Figure 1.1).

NOTE: See Figure C1 of Appendix C for a typical schematic arrangement for a non-maintained, self-contained emergency luminaire.

1.4.36 Non-maintained illuminated emergency exit sign

Definition as for non-maintained emergency luminaire.

1.4.37 Normal lighting

All installed electric lighting supplied from the designated normal power supply.

1.4.38 Pictorial element

A combined symbol (i.e. arrow or figure in doorway) and contrasting background, forming a visual 'building block', one or more such building blocks being used with or without other elements to create an exit sign display. Refer to Figure D1 in Appendix D.

1.4.39 Reflectance (reflection factor)

The ratio of the total luminous flux reflected from a surface to the total luminous flux which arrives at the surface. Usually expressed as a decimal in the range 0 to 1, but may also be expressed as a percentage.

Symbol: ρ .

1.4.40 Regulatory authority

The body having statutory powers to administer an Act of Parliament, or the regulations of such an Act, pertaining to any matter covered by this Standard.

1.4.41 Required in-service duration

The duration of operation of the emergency lighting system which the regulatory authority requires the system to be capable of providing at any time.

1.4.42 Reversible inverter

A device which functions as a battery charger while the normal electricity supply is available and which, on failure of the normal supply, assumes the function of an inverter supplying the emergency lighting from the emergency power source.

1.4.43 Room index (K)

An index related to the dimensions of a room used for calculation of the utilization factor and other characteristics of a lighting installation. Room index is derived from the following equation:

$$K = \frac{a \times b}{h(a + b)}$$

where

a, b = the dimensions of the sides of the room

h = the height of the luminaires above the reference plane, e.g. floor.

1.4.44 Self-contained emergency luminaire

An emergency luminaire containing or having mounted within 2 m of it, a battery, battery charger, inverter (where used), and the controls necessary for sensing failure of the normal supply and for changing over to the emergency supply, and vice versa.

1.4.45 Single-point (emergency lighting) system

A system of emergency lighting employing only self-contained type emergency luminaires.

1.4.46 Standard internally illuminated exit sign

A sign consisting of white symbols on a green background, both being light emitting or light transmitting.

1.4.47 Static inverter

A device capable of converting direct current to alternating current without utilizing moving parts.

1.4.48 Sustained emergency luminaire

Alternative name for a combined, non-maintained emergency luminaire. Refer to Clause 1.4.8 and Figure 1.1.

1.4.49 Sustained illuminated emergency exit sign

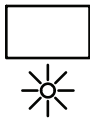
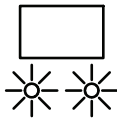
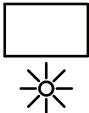
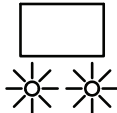
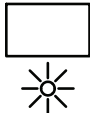
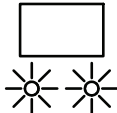
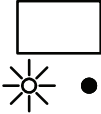
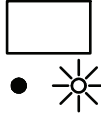
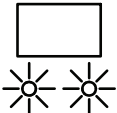
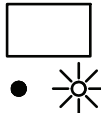
Definition as for sustained emergency luminaire.

1.4.50 Utilization factor (UF)

The proportion of the luminous flux emitted by the lamp(s) which reaches the reference plane.

NOTES:

- 1 In this Standard the reference plane for illuminance calculations is normally taken as a horizontal plane at floor level.
- 2 Requirements for the calculation and presentation of utilization factors are given in AS 1680.3.

EMERGENCY LUMINAIRE TYPE	NORMAL OPERATION (i.e. MAINS OPERATING)	EMERGENCY OPERATION (i.e. MAINS FAILED)
NON-MAINTAINED (CLAUSES 1.4.35 AND 1.4.36)	 or 	 or 
MAINTAINED (CLAUSES 1.4.30 AND 1.4.31)	 or 	 or 
COMBINED NON-MAINTAINED (i.e. 'SUSTAINED') (CLAUSES 1.4.8 AND 1.4.9)		
COMBINED MAINTAINED (CLAUSES 1.4.8 AND 1.4.9)		

LEGEND:

-  = Non-energized lamp
 = Energized lamp

FIGURE 1.1 EXAMPLES OF EMERGENCY LUMINAIRE CONNECTION TYPES

1.5 COMPLIANCE WITH OTHER STANDARDS

1.5.1 Electromagnetic compatibility

Electromagnetic compatibility (EMC) requirements are specified by the Australian Communications Authority.

1.6 NEW DESIGNS AND INNOVATIONS

Any alternative materials, designs, methods of assembly and procedures that do not comply with specific requirements of this Standard, or are not mentioned in it but give equivalent results to those specified, are considered to be alternative solutions and are not covered by this Standard. The Building Code of Australia is a performance-based document and must be used in assessing and approving any performance based alternatives.

1.7 ALTERATIONS AND ADDITIONS

Any alterations or additions to an existing emergency lighting installation shall be carried out in accordance with this Standard.

Where an addition or alteration to an existing installation will impair the operation of the existing installation, the relevant portion of that installation shall be brought into compliance with this Standard.

NOTE: Building alterations such as changes in partitioning, provision of additional rooms and, for indirect lighting systems, changes to the surface finishes of ceilings and upper walls may necessitate modifications to the emergency lighting system for continued compliance with this Standard.

SECTION 2 SYSTEM PERFORMANCE, ARRANGEMENT AND CONTROL

2.1 SCOPE OF SECTION

This Section sets out requirements for the operational performance, arrangement and control of emergency escape lighting and exit signage systems. These requirements include a specified minimum duration of operation to be provided at any time during the life of an installation.

NOTE: As it cannot be known when the normal lighting will fail, it is essential for their correct performance that emergency escape lighting and exit signage systems are regularly maintained. Refer to AS/NZS 2293.2.

2.2 DURATION OF OPERATION

2.2.1 Initial

At the time of commissioning of any emergency power supply or significant part thereof (e.g. battery cell) all emergency escape luminaires and exit signs powered from that supply shall operate satisfactorily on emergency power for 1.33 times the applicable duration required in Clause 2.2.2.

NOTE: The greater initial duration is required to allow for the depreciation in battery capacity that will occur with time.

2.2.2 In-service

At any time during the life of an installation, the duration of satisfactory operation on emergency power of every emergency escape luminaire or exit sign shall be not less than 90 min except where applicable building regulations specify a shorter minimum period.

2.3 OPERATION, ARRANGEMENT AND CONTROL

2.3.1 General

Upon failure of the electrical supply to the normal lighting in an area, irrespective of whether or not it is illuminated, each relevant emergency escape luminaire and exit sign shall be energized from its emergency supply in accordance with Clause 2.3.2.

2.3.2 Normal lighting requiring cool-down

Where the combination of lamps and control gear utilized in the normal lighting luminaires is such that the lamps might not restrike immediately after restoration of the normal supply, one of the following measures shall be taken:

- (a) Provision of a time delay or other suitable means to maintain the operation of the emergency lighting for the period necessary to allow the normal lighting lamps to restrike.
- (b) Installation of a proportion of normal lighting luminaires of a type which will provide immediate lighting to a level not less than that provided by complying emergency escape lighting.

NOTES:

- 1 The typical normal luminaire to which this clause applies is a high intensity discharge luminaire with ordinary control gear. In the case of a loss of normal power for, say, 1 min it might be up to 10 min after restoration of power before such a luminaire restrikes and produces significant luminance.
- 2 Approach (b) will also address the situation of normal HID lights switching off due to a momentary drop in supply voltage that is not sufficiently large to be sensed by the emergency lighting system as a loss of power.

- 3 Where automatic lighting control systems are used, care should be taken to ensure that there are sufficient luminaires, not controlled by that system, to facilitate safe egress in the event of the malfunction or failure of the lighting control system. In addition, it is recommended that exit signs be of the maintained or combined type.

2.3.3 Sensing of supply failure

2.3.3.1 Centrally supplied systems

In centrally supplied systems, the failure of the normal supply to any final subcircuit supplying lighting to a designated area shall automatically energize emergency escape luminaires and exit signs in the area served by that subcircuit.

NOTE: This requirement does not preclude the additional automatic energizing of emergency escape luminaires and exit signs in areas not served by the subcircuit to which supply has failed.

Alternatively, where the designated area is served by two or more normal lighting subcircuits, not all final subcircuits need be sensed for loss of supply provided that one of the following requirements applies:

- (a) At least 50% of the normal lighting subcircuits are sensed for loss of supply and the normal lighting luminaires on the subcircuits which are sensed are distributed throughout the designated area in such a manner that the illumination provided by these subcircuits alone is not inferior to that afforded by the required emergency escape lighting.
- (b) In a three-phase installation, at least one normal lighting subcircuit per phase is sensed for loss of supply and the normal lighting luminaires supplied by those subcircuits are distributed throughout the paths of travel of the designated area.

In all cases, loss of supply shall be sensed at the load side of the device protecting the final subcircuit.

NOTE: See Figure C2 of Appendix C for an example circuit arrangement.

2.3.3.2 Single-point systems

In single-point systems, the failure of the normal supply to any final subcircuit supplying lighting to a designated area shall cause each self-contained emergency escape luminaire and exit sign in the area served by the subcircuit to be automatically connected to its emergency power source.

NOTE: This requirement does not preclude other emergency escape luminaires and exit signs, connected to subcircuits that might not have lost supply, from also being automatically connected to their emergency power sources in response.

Where any part of a designated area is served by more than one normal lighting subcircuit, the arrangement and connection of the emergency luminaires and exit signs shall be such that the illuminance provided by the normal lighting luminaires on the circuits that are sensed for loss of supply is not inferior to that provided by the required emergency lighting.

NOTES:

- 1 See Figure C1 of Appendix C for an example circuit arrangement.
- 2 See Clause 4.3 for additional requirements which may impact upon the connection of self-contained emergency luminaires and exit signs for testing purposes.

2.4 LABELLING OF DEVICES CONTROLLING THE OPERATION OF EMERGENCY LIGHTING

Every device (e.g. circuit-breaker, switch, fuse) which, if turned off or removed, will cause emergency escape lighting or exit signs to operate shall have the following notice clearly and durably affixed on or immediately adjacent to it:

WARNING: INTERRUPTING SUPPLY WILL DISCHARGE EMERGENCY LIGHTING BATTERIES.

SECTION 3 EMERGENCY POWER SUPPLIES FOR CENTRALLY SUPPLIED SYSTEMS

3.1 SCOPE OF SECTION

This Section specifies requirements for components and facilities associated with emergency power supplies for centrally supplied systems.

3.2 EMERGENCY POWER SOURCE

3.2.1 Location

Except where otherwise permitted in this Clause, the emergency power source and associated equipment shall be located in a room or enclosure specifically provided for the purpose. The room or enclosure shall not be used for any other purposes except that spare parts and equipment required for maintenance of the emergency lighting system may be stored therein.

The emergency power source may be located in a room with battery systems associated with building monitoring, fire safety or evacuation systems provided that the room complies with the requirements of Clauses 3.2.2 to 3.2.4 and the emergency power source is physically separated from the other equipment by a non-combustible barrier.

The emergency power source may be located external to the building that it serves, provided that the wiring from the power source to the building that it serves complies with Clause 7.4 and is protected from physical damage.

For temporary structures such as those used in carnivals and shows, the power source need not be located in a special room or enclosure, provided that—

- (a) the power source is located in an area accessible only to authorized persons, as required by Clause 3.2.3, and is protected from physical damage and the weather; and
- (b) the area is free from obstructions and, if not naturally ventilated, is ventilated in accordance with Clause 3.2.4.

NOTES:

- 1 It is recommended that the normal electricity distribution centre and the emergency power source be located in different fire compartments of the building.
- 2 Attention is drawn to the fact that where a theatre or group of theatres is incorporated as part of a building complex, the regulatory authority may require the provision of separate emergency power sources for the theatre(s) and for the remainder of the building.

3.2.2 Fire resistance

Except where the emergency power source is located external to the building in its own separate enclosure, the materials and methods utilized in the construction of the room or enclosure provided in accordance with this Clause 3.2 shall have a fire resistance from the building to the room or enclosure housing the emergency power source of not less than the fire-resistance level required for the building structure in accordance with the Building Code of Australia.

3.2.3 Identification and access

The purpose of the room or enclosure shall be clearly identified by a label affixed on or adjacent to the access door. The label shall read 'Emergency Lighting Power Source' and shall contain an instruction permitting entry to authorized persons only.

3.2.4 Ventilation

3.2.4.1 Limitation of temperatures

The room or enclosure shall be of such dimensions or so ventilated that the temperature of electrical materials and equipment will not exceed the maximum values permitted by the manufacturer at any time, including during discharge testing.

NOTE: Particular consideration should be given to ensuring that adequate ventilation is provided during periods that the emergency lighting is called upon to operate, i.e. to limit temperatures attained in the absence of the normal supply.

3.2.4.2 Maintenance of fire resistance

Any ventilation provided shall be arranged so that the fire resistance required by Clause 3.2.2 is maintained.

3.2.5 Use of uninterruptible power supply (UPS) systems

Uninterruptible power supply (UPS) systems used as the emergency power source for central systems shall—

- (a) be used solely for that purpose; and
- (b) comply with—
 - (i) AS 62040.1.1:2003; or
 - (ii) AS 62040.3:2002

and otherwise as required in this section.

NOTE: Care should be taken in the selection of the UPS system to ensure that it is capable of starting up the connected emergency lighting load solely on the supply from the inverter, i.e. to accommodate peak inrush currents associated with the switching of certain types of lamps from cold. The selection of the UPS system and of the fuses protecting the emergency supply conductors should also be coordinated so that a fault in the emergency power distribution system will result in the operation of one or more of these fuses, not in the shutting down of the UPS.

3.2.6 Protection of emergency power wiring

All outgoing circuits from the battery to the load shall be protected in each conductor by a fuse or circuit-breaker positioned as close as practicable to, and in any case not more than 5 m from, the battery.

Circuit breakers directly controlling the reticulation of emergency power (including those internal to any applicable UPS) shall not incorporate residual current protection devices (RCDs).

3.3 BATTERIES AND THEIR INSTALLATION

3.3.1 Acceptable types of batteries

Batteries shall be of a type specifically designed for continuous float charging conditions.

NOTE: The following are examples of the types of batteries which comply with this requirement:

- (a) Stationary batteries of the lead-acid Plante positive plate type complying with AS 2191.
- (b) Lead-acid stationary batteries of the vented type complying with AS 4029.1.
- (c) Lead-acid stationary batteries of the sealed, valve-regulated type complying with AS 4029.2.
- (d) Lead-acid stationary batteries of the pure-lead, positive pasted-plate type complying with AS 4029.3.
- (e) Nickel-cadmium stationary batteries of the vented or sealed type complying with AS 3731.1 or AS 3731.2, as applicable.
- (f) Heavy duty lead-acid batteries with tubular positive plates.

(Lead-acid batteries of the type designed for motor vehicle starting and home lighting applications do not comply with this requirement.)

Where the cells used are of a type which require maintenance of the electrolyte above a specified level, facilities shall be provided to permit visual inspection of the electrolyte level against reference marks.

NOTE: Cells which incorporate dip sticks for checking the electrolyte level are acceptable.

3.3.2 Battery capacity

The capacity of the battery shall be such that it is capable of supplying an output final voltage of not less than the following:

- (a) For d.c. reticulation systems—85% of the nominal system voltage.
- (b) For a.c. reticulation systems—the minimum voltage recommended by the battery manufacturer, provided that the a.c. voltage is maintained in accordance with Clause 3.5.3.

The minimum voltage specified in Items (a) or (b), as applicable, shall be measured at the battery terminals and shall apply—

- (i) when the total emergency lighting load is connected for the duration specified in Clause 2.2.1; and
- (ii) at any temperature within the range of ambient temperatures which can be expected at the battery location.

The number of cells employed in the battery shall be such that the individual cell voltages will not fall below those recommended by the battery manufacturer, account being taken of the rate of discharge.

3.3.3 Installation requirements

3.3.3.1 General

The battery system shall be installed in accordance with AS 3011.1 or AS 3011.2, as applicable, and with the additional requirements of Clauses 3.3.3.2 to 3.3.3.5.

NOTE: Guidance on the installation, maintenance, testing and replacement of secondary batteries in buildings is provided in AS 2676.1 (for vented cells) and AS 2676.2 (for sealed cells).

3.3.3.2 Battery enclosure/stand

The materials used in the construction of the battery enclosure or stand shall be inherently resistant to the corrosive effects of the battery electrolyte or shall be treated to prevent corrosion.

3.3.3.3 Unearthed supply system

For d.c. reticulation systems, the battery system shall be unearthed. An earth-fault detection system shall be installed to warn of the breakdown of either conductor to earth. The sensitivity of the earth-fault detection system shall not exceed 10 mA.

3.3.3.4 Battery connections

All connections to the battery shall be made with bolted lugs. The battery shall not be tapped for intermediate voltage and shall not be used for any function other than the supply of power to emergency lighting in accordance with this Standard.

Each conductor between the battery charger and the battery shall be fitted with an overcurrent protection device to protect the battery from discharging into the battery charger in the event of a fault condition. This device shall be located such that the battery is not prevented from supplying the emergency lighting after operation of the overcurrent device due to a fault in the charger.

3.3.3.5 Rating plate

A rating plate bearing the following information shall be securely fixed on or adjacent to the battery enclosure/stand in such a position as to be readily seen upon gaining access to the enclosure or on approaching the battery stand, as appropriate:

- (a) Manufacturer's brand name.
- (b) Manufacturer's catalogue number.
- (c) Number of cells and rated capacity, in ampere hours, of each cell at a specified rate of discharge.
- (d) Duty ratings, as follows:
 - (i) Amperes.
 - (ii) Period.
 - (iii) End volts.
 - (iv) Temperature.

3.4 BATTERY CHARGER ASSEMBLY

3.4.1 General

Battery chargers for d.c. reticulation systems, shall comply with the requirements for a Type 1 battery charger in AS 4044 and with the requirements of Clauses 3.4.2 to 3.4.8 of this Standard. The requirements for alarms in Clause 3.4.7 shall apply in place of those given in AS 4044.

Where provision is made for automatic or manual selection of boost charging, the battery charger shall automatically reset to the float charge mode at the termination of boost charging.

3.4.2 Control of output voltage

The charging equipment arrangements shall be such that, during charging with any load connected, the voltage appearing at the origin of the emergency lighting distribution system will not exceed 116% of the nominal system voltage.

NOTE: The purpose of this requirement is to ensure that emergency luminaires and exit signs will not be subjected to voltages in excess of those for which they are designed.

3.4.3 Rating of battery charger

The rating of the battery charger shall be such that—

- (a) after the battery has been discharged from the fully charged state by supplying the total connected emergency lighting load for the duration specified in Clause 2.2.1; and
- (b) after recharging for a period of not more than 16 h;

the battery shall have recovered to the extent that it is capable of sustaining an additional discharge as specified in Item (a). The output voltage at the end of each discharge period shall be in accordance with Clause 3.3.2.

NOTE: For certain premises (e.g. theatres) a shorter recovery period than 16 h may be necessary to enable re-occupation of the premises after operation of the emergency lighting.

Where a maintained system is employed and the output of the battery charger is used to supply the standing load, the rating of the battery charger shall be such that, in addition to supplying the normal power requirements, it will be capable of maintaining the battery and recharging it as specified above.

Where a separate inverter is employed, the rating of the battery charger shall take account of the need to operate the inverter on no-load, in accordance with Clause 3.5.2.

3.4.4 Enclosure of battery charger

The battery charger shall be housed in an enclosure of adequate strength and rigidity. The battery charger may be incorporated in the battery enclosure provided that it is housed in a separate compartment.

3.4.5 Battery low-voltage alarms

Visible and audible alarms shall be provided which shall be actuated when the battery voltage falls below the relevant value specified in Clause 3.3.2. The alarms shall be energized from the battery and the visual alarm shall be of a type which requires manual resetting.

3.4.6 Means for disconnecting the emergency escape lighting or exit signage load

Where provision is made for manual disconnection of the battery from the emergency escape lighting or exit signage load, the isolating switch or device shall be either—

- (a) arranged so that, when in the isolated position, it also isolates the normal lighting or a part of the normal lighting which is essential for the normal occupation of the building; or
- (b) installed in a manner which will ensure that the switch or device is not left in the isolated position when the building is in use.

NOTE: The manual isolating switch or device may be used to permit disconnection of the emergency lighting load—

- (a) during periods when the building is unoccupied; or
- (b) when the battery has been discharged to the low voltage alarm limit by operation of the emergency lighting; to protect the battery from damage which may result from being excessively discharged.

The requirements of Items (a) and (b) shall not apply to the battery isolator provided in accordance with AS 3011.1 or AS 3011.2.

Provision may be made for automatic disconnection of the battery from the load to protect the battery from damage due to excessively low voltage.

NOTE: The battery supplier should be consulted in the selection of the appropriate voltage setting for the protective device.

3.4.7 Instrumentation and controls

The battery charger assembly shall incorporate the following instrumentation and control equipment:

- (a) Isolating switch for the a.c. supply.
- (b) Indicating light for the a.c. supply.
- (c) Voltmeter (d.c.) marked to indicate both the float and boost charge voltages.
- (d) Charging ammeter (d.c.).
- (e) Load ammeter (d.c.).
- (f) A float/manual boost charge selector switch of the momentary operation type, where provision is made for manual selection of boost charging (see Clause 3.4.1).
- (g) A device to prevent backfeed to the charger from the battery in the event of a fault occurring in the battery charger (see Clause 3.3.3.4).
- (h) Fuses or circuit-breakers for outgoing emergency lighting circuits.
- (i) Battery earth-fault alarm (see Clause 3.3.3.3).