

Australian/New Zealand Standard™

Emergency lighting and exit signs for buildings

Part 3: Emergency luminaires and exit signs



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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee LG-007, Emergency Lighting in Buildings, to supersede AS 2293.3—2005, *Emergency escape lighting and exit signs for buildings, Part 3: Emergency escape luminaires and exit signs*.

This Standard incorporates Amendment No. 1 (May 2021). 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 2293 series comprises three Parts as follows:

AS/NZS

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

The objective of the AS/NZS 2293 series of Standards is to provide those associated with the design, construction, installation, certification and maintenance of all the individual components of an emergency 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, manufacturers and certifiers of emergency luminaires and exit signs with the relevant requirements for such products in order to facilitate the production of luminaires that will provide an acceptable level of emergency lighting to a space when installed to conform with AS/NZS 2293.1.

Changes in this edition of the Standard include the following:

- (a) Introduction of requirements for alternative light sources (i.e. LED) and allowance for the use of emerging battery technologies.
- (b) Inclusion of New Zealand requirements (for publication as AS/NZS Standard).
- (c) Updated references to new pictogram standards.
- (d) Added definition and requirements for dual function exit signs.
- (e) Replacement of AS 3137 with AS 60598.2.22.

Electronic files of all basic pictorial elements are grouped under the heading 'Image files for exit signs specified in AS/NZS 2293.3' and attached to this document as a CD Rom in the case of a paper copy of the Standard and as a zip file in the case of an electronic copy. These files reproduce the contents of Figure 3.1 in a form suitable for directly creating complying pictorial elements over a range of sizes. These files are provided as an assistance to the user only and do not form part of this Standard.

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.

Statements expressed in mandatory terms in footnotes to tables are deemed to be requirements of this Standard.

CONTENTS

	<i>Page</i>
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE.....	5
1.2 APPLICATION	5
1.3 NORMATIVE REFERENCES	5
1.4 DEFINITIONS.....	6
 SECTION 2 GENERAL REQUIREMENTS FOR EMERGENCY LUMINAIRES AND EXIT SIGNS	
2.1 APPLICATION AND CONFORMANCE	8
2.2 LUMINAIRE CLASSIFICATION	8
2.3 SUITABILITY FOR OPERATING CONDITONS.....	8
2.4 ILLUMINATION AT SWITCH ON.....	8
2.5 LIGHT SOURCES.....	9
2.6 CONVERSION PACKS	10
2.7 MARKING	10
 SECTION 3 PARTICULAR REQUIREMENTS FOR EXIT SIGNS	
3.1 APPLICATION	12
3.2 TYPES OF EXIT SIGN	12
3.3 APPEARANCE OF EXIT SIGN FACE.....	12
3.4 ILLUMINATION	18
3.5 MAXIMUM VIEWING DISTANCES	20
3.6 MARKING	20
 SECTION 4 PARTICULAR REQUIREMENTS FOR SELF-CONTAINED EMERGENCY LUMINAIRES AND EXIT SIGNS	
4.1 APPLICATION	21
4.2 ARRANGEMENT AND CONTROL	21
4.3 BATTERIES.....	22
4.4 BATTERY CHARGERS	23
4.5 SELF-CONTAINED AUTOMATIC DISCHARGE TESTING FACILITIES	24
4.6 MARKING	25
 SECTION 5 PARTICULAR REQUIREMENTS FOR CENTRALLY SUPPLIED EMERGENCY LUMINAIRES AND EXIT SIGNS	
5.1 APPLICATION	26
5.2 ARRANGEMENT AND CONTROL	26
5.3 MARKING	26

APPENDICES

A ESSENTIAL DATA AND PREFERRED FORMAT FOR TEST REPORTS FOR EMERGENCY LUMINAIRES AND EXIT SIGNS 27

B SAMPLE DECLARATION OF CONFORMANCE FOR EMERGENCY LUMINAIRES AND EXIT SIGNS 33

C CLASSIFICATION OF EMERGENCY LUMINAIRES AND DUAL FUNCTION EXIT SIGNS 35

D TYPE TESTING OF SELF CONTAINED EMERGENCY LUMINAIRES AND EXIT SIGNS 41

E PROJECTION OF LIGHT SOURCE LIFE (LSL) IN LED EXIT SIGNS 49

BIBLIOGRAPHY 51

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Emergency lighting and exit signs for buildings

Part 3: Emergency luminaires and exit signs

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for the design, construction, performance and testing of emergency luminaires and exit signs. It applies both to emergency luminaires and exit signs that are centrally supplied, and to emergency luminaires and exit signs of the self-contained type.

NOTES:

- 1 Appendix A lists the essential data and preferred format of test reports for emergency luminaires and exit signs.
- 2 A sample declaration of the conformance of emergency luminaires and exit signs with this Standard is given in Appendix B.

1.2 APPLICATION

It is anticipated that this Standard will be indirectly referenced, via a direct reference to AS/NZS 2293.1, in the National Construction Code, and in New Zealand to the New Zealand Building Code, Clauses F6 and F8, thereby superseding the previous edition of the AS 2293 series.

Dual function exit signs shall firstly comply with all the requirements of the subsequent clauses 3.3 and 3.4 of this Standard in order to then be classified as an emergency luminaire.

Specific requirements relating to Clauses F6 and F8 of the New Zealand Building Code have been added where it is necessary to alter clauses of this Standard to comply with New Zealand requirements.

1.3 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard.

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

A1	AS 60598 Luminaires 60598.2.22 Part 2.22: Particular requirements—Luminaires for emergency lighting (IEC 60598-2-22, Ed. 4.1 2017 MOD)
	AS/NZS 1680 Interior and workplace lighting 1680.3 Part 3: Measurement, calculation and presentation of photometric data 2293 Emergency lighting and exit signs for buildings 2293.1 Part 1: System design, installation and operation 2293.2 Part 2: Routine service and maintenance
A1	[Text deleted]

IEC	
61951	Secondary cells and batteries containing alkaline or other non-acid electrolytes—Secondary sealed cells and batteries for portable applications
61951-1	Part 1: Nickel-cadmium
61951-2	Part 2: Nickel-metal hydride
60896	Stationary lead-acid batteries
60896-21	Part 21: Valve regulated types—Methods of test
62133	Secondary cells and batteries containing alkaline or other non-acid electrolytes—Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications
62133-2	Part 2: Lithium systems
62620	Secondary cells and batteries containing alkaline or other non-acid electrolytes—Secondary lithium cells and batteries for use in industrial applications
CIE	
S025	Test Method for LED Lamps, LED Luminaires and LED Modules
IES	
LM-80-08	Approved Method for Measuring Lumen Maintenance of LED Light Sources
LM-79	Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products
TM-21-11	Projecting Long Term Lumen Maintenance of LED Light Sources
IES/ANSI	
LM-80-15	Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
NZBC	New Zealand Building Code

NOTE: It is anticipated that IEC 63013, when published, will be referenced in this Standard.

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 2293.1 and those below apply.

NOTE: Some of the definitions below appear in AS/NZS 2293.1 but, being specific to exit signs, are repeated here for convenience.

1.4.1 Exit signs

1.4.1.1 Internally illuminated exit sign

A sign consisting of white symbols on a green background, in accordance with Figure 3.1, both being light emitting or light transmitting.

1.4.1.2 Dual function internally illuminated exit sign

This type of exit sign is also referred to as a ‘dual function exit sign’ for the purposes of this series. A sign consisting of white symbols on a green background, in accordance with Figure 3.1, both being light emitting or light transmitting, or a sign consisting of light emitting or light transmitting green symbols on an opaque background in accordance with Figure 3.3 either having an emergency classification assigned in accordance with Appendix C.

1.4.1.3 Low illuminance area internally illuminated exit sign

Referred to as a ‘low illuminance area exit sign’ in accordance with Figure 3.3. A sign consisting of light emitting or light transmitting green symbols on an opaque background.

1.4.1.4 Externally illuminated exit sign

A sign consisting of white symbols on a green background, in accordance with Figure 3.1, illuminated by an incident source comprising an emergency luminaire located in front of the plane of the sign face.

1.4.2 Definitions specific to exit sign appearance

1.4.2.1 Additional background and optional additional background

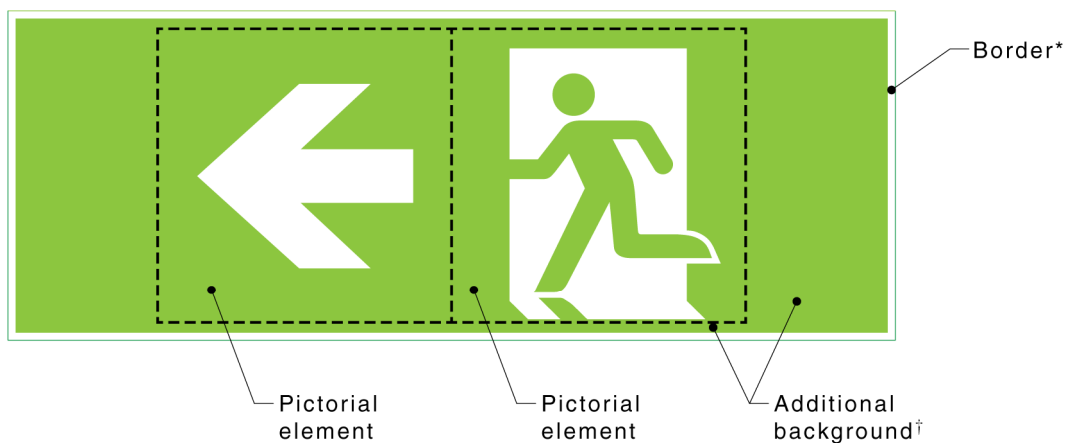
Additional background areas are those areas on the face of an exit sign that are not part of any pictorial element but are of the same colour as the background portion(s) of the pictorial element(s). Additional background forms part of a single element sign to ensure that the minimum size of a single element sign is consistent in proportion with dual element signs. Any areas of the face of a sign apart from the pictorial elements, additional background as defined above and allowable borders is designated as optional additional background. Refer to Figures 1.1 and 3.4(b).

1.4.2.2 Border

Any transilluminated white area of the face of the sign outside both the elements and any additional green background. Refer to Figure 1.1 and Clause 3.3.5.

1.4.2.3 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 1.1.



LEGEND:

- * = Optional. Only allowed on internally illuminated exit signs
- † = Optional on two element sign
- = Boundary of pictorial element. (Notional only. Does not appear on sign)

FIGURE 1.1 CONSTITUENT ELEMENTS OF EXIT SIGN FACE

SECTION 2 GENERAL REQUIREMENTS FOR EMERGENCY LUMINAIRES AND EXIT SIGNS

2.1 APPLICATION AND CONFORMANCE

2.1.1 General

Emergency luminaires and exit signs covered by this Standard may be either specifically designed for the application or a composite of an emergency power supply unit and a normal lighting luminaire provided that the complete assembly satisfies the relevant requirements of this Standard.

2.1.2 Application

Luminaires for emergency lighting of the self-contained or centrally supplied type shall comply with this Section and any additional requirements of Sections 3, 4 or 5 as applicable.

2.1.3 Conformance for electrical safety

A1 | All emergency luminaires and exit signs shall comply with AS 60598.2.22 unless otherwise varied in this Standard.

2.2 LUMINAIRE CLASSIFICATION

Emergency luminaires and dual function exit signs shall be classified in accordance with Appendix C and shall be marked in accordance with Clause 2.7.

2.3 SUITABILITY FOR OPERATING CONDITIONS

A1 | Emergency luminaires and exit signs shall start and operate as nominated in Appendix D (e.g. voltages between 94% and 106% of rated supply voltage, ambient air temperature of between 10°C and 40°C).

Where a product states suitability for operation at different conditions (for instance, at higher or lower voltage, temperature or humidity) then it shall be tested under these conditions in order to confirm that it will—

- (a) start and operate satisfactorily under these different conditions; and
- (b) meet the performance requirements of this Standard as applicable.

2.4 ILLUMINATION AT SWITCH ON

2.4.1 Maximum delay—Australia only

This Clause (2.4.1) applies in Australia only.

A1 | Emergency luminaires and exit signs shall provide a light output of at least —

- (a) 10% of the reference value within 1 s of the loss of normal lighting supply; and
- (b) 80% of the reference value within 15 s of the loss of normal lighting supply.

For an emergency luminaire, the reference value shall be the luminous intensity assigned in accordance with the classification procedure of Paragraph C3.2 of Appendix C.

For an internally illuminated exit sign the reference value shall be the minimum allowable luminance values as specified in Clause 3.4.2 for standard internally illuminated exit signs and Clause 3.4.3 for low illuminance area exit signs. A single measurement site as defined in Figure 3.4 may be used for this measurement.

- A1 | For this Clause 2.4.1, a dual function exit sign with a single light source shall be treated as an emergency luminaire. If a dual function exit sign has independent light sources for the luminaire and exit functions then it shall conform to the requirements for both an emergency luminaire and an internally illuminated exit sign.

The reference value shall be taken as the luminous intensity assigned in accordance with the classification procedure of Paragraph C3.2 of Appendix C.

The requirements of Items (a) and (b) shall apply both when the emergency luminaires and exit signs are initially switched on (i.e. cold start) and when the emergency luminaires and exit signs are switched on immediately after operation for a period of 15 min (i.e. hot start).

NOTES:

- A1 |
- 1 The provision of a light output of at least 10% of the reference value within 1 s of the loss of normal lighting supply is specified to minimize the possibility of panic occurring among the occupants of the building.
 - 2 In New Zealand, the maximum delay times are detailed in the New Zealand Building Code, Clause F6/AS1 Section 1.5.1.

2.4.2 Conditions for assessing conformance with Clause 2.4.1

For the purpose of assessing conformance with the requirements of Clause 2.4.1, the following conditions shall apply:

- (a) Before the emergency luminaires or exit signs are operated they shall be conditioned by connection to the normal supply in an ambient atmosphere at $25 \pm 2^\circ\text{C}$ for a period of at least 1 h.
- (b) Centrally-supplied emergency luminaires or exit signs shall be operated at their rated voltage or, where marked for operation within a range of voltages, the lowest marked voltage.
- (c) Self-contained emergency luminaires or exit signs shall utilize their in-built battery supply but the battery shall be in the fully charged state at the commencement of each assessment.

For the assessment of light output required following a 15 min period of operation, the battery shall be in the fully charged state at the commencement of that period of operation. Loss of supply shall be simulated immediately afterwards for assessment of conformance with the light output criteria.

2.5 LIGHT SOURCES

Where LED light sources are used as the emergency light source in emergency luminaires and exit signs, they shall comply with all of the following requirements:

- (a) The LED(s) used shall have an LM80 test report.
- (b) For maintained emergency luminaires or exit signs, the LED(s) shall fall within the parameters of the LM80 test report whilst operating within the luminaire or exit sign at an ambient temperature of 40°C .
- (c) For non-maintained emergency luminaires (and for New Zealand exit signs), the LED(s) shall fall within the maximum operating parameters of the LED data sheet (or as advised by the LED manufacturer) whilst operating within the luminaire or exit sign at an ambient temperature of 40°C .

- A1 | Conformance shall be demonstrated by testing in accordance with the provisions detailed in Appendix D.

2.6 CONVERSION PACKS

When embodying an emergency module (also known as a conversion pack) within a luminaire in order to convert it to an emergency luminaire, the converted luminaire shall be subjected to all the requirements of this Standard.

2.7 MARKING

A1

In addition to the information required by AS 60598.2.22 each emergency luminaire and exit sign shall be legibly and durably marked with the following information, as applicable. This marking shall conform with the legibility and durability requirements of AS/NZS 60598.1. Instructions and other texts required by this Standard shall at least be written in English.

The following information shall be marked on a non-detachable part of the luminaire and not on the diffuser or other optical control media (where this may affect the optical performance of the luminaire):

- (a) Luminaire classification(s) determined in accordance with Appendix C in respect of the following factors, as applicable:
 - (i) Differences in the luminous intensities emitted in the transverse (C_0) and longitudinal (C_{90}) vertical planes (see Paragraph C3.1).
 - (ii) Light sources of differing lumen output with which it may be used (see Paragraph C3.1).
 - (iii) Alternative forms in which the luminaire may be used (see Paragraph C2.2).
 - (iv) Designed mounting positions and orientation (see Paragraph C2.3).

A1

- (b) Where the luminaire has a different classification in different planes and the C_0 plane is not obvious, luminaires shall be marked to identify the orientation of the C_0 plane through the luminaire (see Appendix C). This marking shall be clearly visible during installation and subsequent inspection of the completed lighting system.

NOTE: The C_0 plane may be designated by the location of the identification symbol of Figure 2.1 at the appropriate position on the surroundings of the luminaire body, i.e. by placing the symbol on the C_0 axis relative to the light source.

- (c) The identification symbol specified in Figure 2.1. The symbol shall be black and white in colour and not less than 10 mm in diameter. It shall be located in a position where it will be visible from below when the luminaire is installed, except in cases where no appropriate surface exists on the luminaire, e.g. where only diffusing media or similar are visible below the ceiling.



FIGURE 2.1 IDENTIFICATION SYMBOL FOR EMERGENCY LUMINAIRES

- (d) Information necessary to ensure correct light source replacement where the light source is removable. This shall include the following as applicable:
 - (i) A statement of acceptable light source technologies that will not detrimentally affect such aspects as lumen output or the life of control gear. Statements of unacceptable technologies may also be included. Examples of technologies to be considered include tri-phosphor and 'amalgam' fluorescent light sources.
 - (ii) For incandescent light sources, a statement of the minimum acceptable nominal lumen output.

(iii) The colour temperature of acceptable light sources.

NOTE: This will typically be designated by the colour temperature, e.g. '4000 K'.

- (e) Warning notice regarding isolation of the electrical supply or supplies, if necessary, to ensure the safety of persons working on the emergency luminaire or the integrity of operation of the emergency luminaire.

A1 | NOTE: For further details see Clauses 3.6 and 4.6 and the applicable clauses of AS 60598.2.22.

- (f) For combined or sustained emergency luminaires with replaceable light sources, the location of the emergency light source shall be clearly marked, together with any information necessary to ensure correct light source replacement.

- (g) Designed mounting positions and orientation (related to luminaire position/safety IP rating, etc.). This information shall be marked on the luminaire to enable identification of the classification for each mounting position.

A1 | NOTE: Marking on the luminaire to relate the classification to the mounting position is not required where the luminaire is designed for mounting in one orientation only.

SECTION 3 PARTICULAR REQUIREMENTS FOR EXIT SIGNS

3.1 APPLICATION

Exit signs, in addition to complying with the requirements of Sections 2, 4 or 5 as applicable, shall comply with the requirements of this Section.

NOTE: Photometric classification in accordance with Appendix C in itself does not indicate conformance with this Section.

3.2 TYPES OF EXIT SIGN

Exit signs shall be classified as one of four types, as follows:

- (a) Internally illuminated exit sign.
- (b) Dual function internally illuminated exit sign.
- (c) Low illuminance area exit sign.
- (d) Externally illuminated exit sign.

NOTE: In New Zealand:

- (a) Non-maintained exit signs are allowed in New Zealand, provided they comply with the requirements of New Zealand Building Code, Clause F8/AS1, for such signs.
- (b) Photoluminescent sign complying with the requirements of New Zealand Building Code, Clause F8/AS1.

3.3 APPEARANCE OF EXIT SIGN FACE

3.3.1 Basic pictorial elements and shape

The basic pictorial elements from which the face of any exit sign is constructed shall be in direct proportion to the applicable elements displayed in and specified by Figure 3.1.

NOTE: These elements are as per ISO 7010.

An exit sign shall consist of one or more of these elements, combined only in accordance with one of the combinations specified in Figure 3.2 or Figure 3.3.

The green section of an exit sign shall be in the shape of a rectangle or square. The use of variations to these basic shapes (e.g. large-radius corners proposed due to manufacturing considerations) shall be acceptable only where specifically agreed by the relevant regulatory authority. The green section of an exit sign shall not be in the shape of a circle, nor of a triangle.

NOTES:

- 1 This requirement is in keeping with the principles of the meaning of various sign shapes set out in ISO 3864-1.
- 2 Consideration should be given to the specular reflectance of the face of an exit sign in order to prevent or minimize obscuration of the sign face at certain viewing angles due to reflections from adjacent light sources. It is anticipated that future editions of this Standard will provide requirements for maximum allowable specular reflectance.

3.3.2 Optional additional elements

As well as the basic pictorial elements, an exit sign face may also contain additional background and optional additional background in accordance with Clause 3.3.4, and in the case of a standard self-illuminated exit sign only, a white border in accordance with Clause 3.3.5.

3.3.3 Location of elements

Where a sign consists of one pictorial element [i.e. Figure 3.1(a) or (b)] this element shall be located in the centre of the additional background. (See also Clause 3.3.4.)

Where a sign consists of two pictorial elements, these shall be immediately adjacent to each other and located in the centre of any optional additional background.

3.3.4 Additional background

Where a standard or dual function internally illuminated or externally illuminated exit sign has only a single pictorial element, the face of the sign shall include additional background of an area at least equal to the total area of the pictorial element and this additional background shall comply with the requirements of Clause 3.4.2(d).

Both additional background and optional additional background shall comply with the requirements of Clause 3.3.6.

3.3.5 Borders

For a standard or dual function self-illuminated sign and for an externally illuminated sign, white transilluminated areas lying outside the areas of green background shall be acceptable on condition that any such areas—

- (a) form a continuous border around the green background; or
- (b) form lines of even thickness either at the sides or above and below the green background areas; or
- (c) comprise a total projected area not more than 20% of the combined area of the pictorial elements plus additional background.

Borders shall not be used on low illuminance area exit signs.



(a) Left facing



(b) Right facing



(c) Arrow

FIGURE 3.1 PICTORIAL ELEMENTS



(a) Straight on from here
(Refer to Clause 3.3.4)



(b) Left from here



(c) Right from here



(d) Left from here



(e) Right from here

FIGURE 3.2 FORMATS AND MEANINGS OF PICTORIAL ELEMENTS

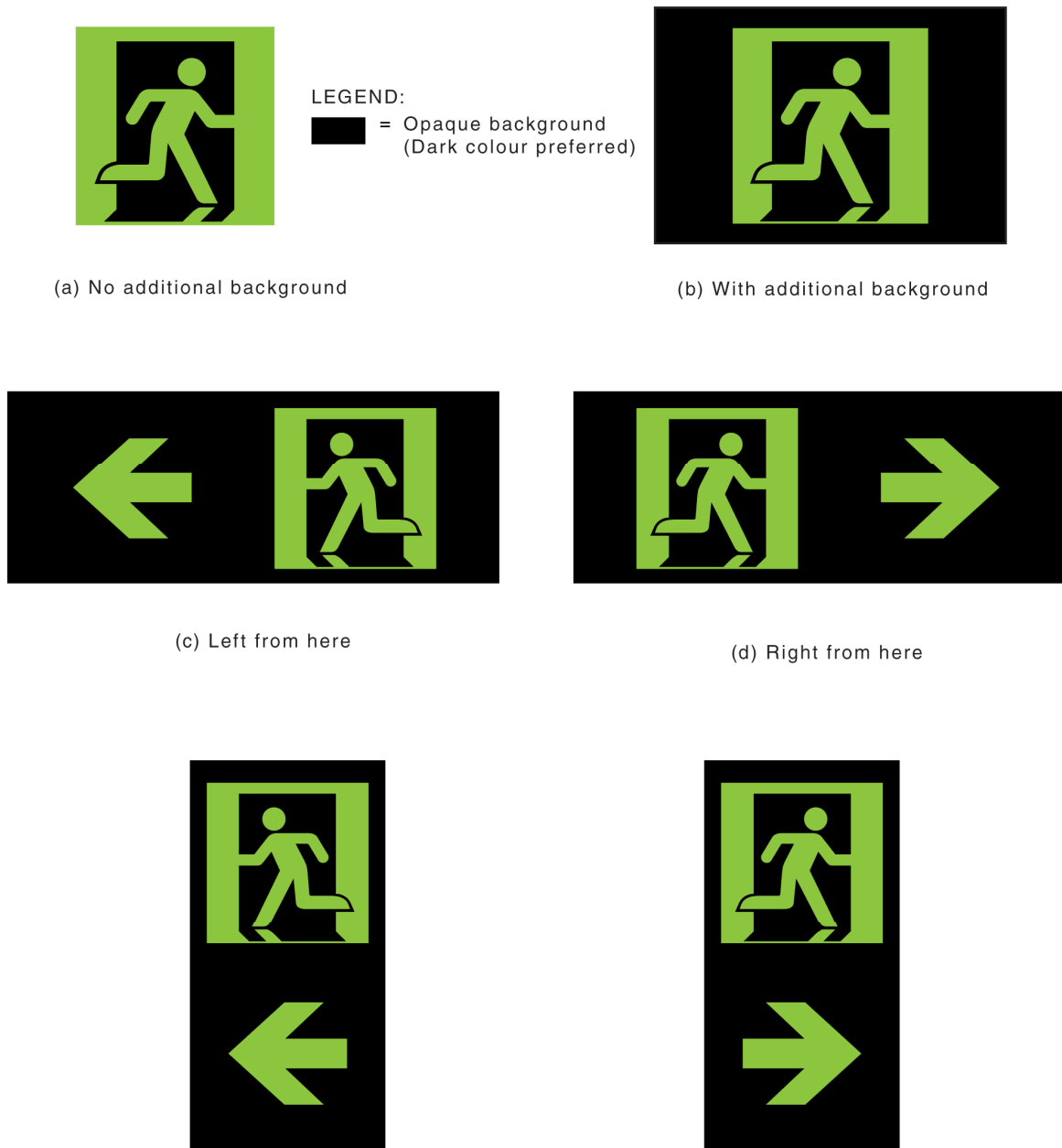


FIGURE 3.3 LOW ILLUMINANCE AREA EXIT SIGNS

3.3.6 Colours

3.3.6.1 General

For all types of exit sign, the colour of any additional background shall be identical to that of the background within the pictorial element(s), and there shall be no other color or marking present in either of these backgrounds except where allowed for under Clause 3.6.2.

3.3.6.2 Standard and dual function internally illuminated exit signs

The white and green colour portions of the face of a self-illuminated exit sign shall lie within the areas defined by the chromaticity coordinates specified in Table 3.1.

TABLE 3.1
CHROMATICITY COORDINATES

Colour		Corner points of colour region above the points			
		1	2	3	4
White	x	0.290	0.265	0.370	0.460
	y	0.260	0.310	0.405	0.425
Green	x	0.285	0.285	0.170	0.026
	y	0.707	0.441	0.364	0.399

NOTES:

- 1 These chromaticity coordinates are based on ISO 3864-4:2011, Table 2—Colour regions: Chromaticity coordinates and luminance for maintained internally illuminated safety sign colours.
- 2 The boundary for the green colour is extended towards the yellow boundary such that $x = 0.285$. This results in the y co-ordinates shifting to 0.707.
- 3 Chromaticity should be measured when exit sign is illuminated.

3.3.6.3 Low illuminance area exit signs

The symbols on the face of a low illuminance self-illuminated sign shall be green and comply with the requirements specified in Table 3.1. The background shall be opaque and a colour other than green.

NOTE: A dark colour should be used.

3.3.6.4 Externally illuminated exit sign

The green and white portions of an externally illuminated exit sign shall comply with the relevant colour specification requirements specified in Clause 3.3.6.2.

In New Zealand, the externally illuminated exit sign colour shall comply with New Zealand Building Code, Clause F8/AS1 3.1, Tables 2 and 3.

3.3.7 Size of pictorial elements

3.3.7.1 Minimum size

The minimum pictorial element height for any exit sign shall be 100 mm.

NOTE: Refer also to Clause 3.5 for maximum viewing distances.

3.3.7.2 Maximum size

There shall be no limit on the maximum pictorial element height.

3.3.7.3 [Text deleted]

A1

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3.4 ILLUMINATION

3.4.1 General

Exit signs, when illuminated, shall comply with the requirements of Clauses 3.4.2 to 3.4.4 as applicable. Where there is a difference in the luminous output of an exit sign face(s) between normal mains operation and emergency operation, the operating condition that results in the lower luminous output shall be used when assessing conformance with these clauses.

Luminance measurements of C_0 values shall be made within 5° from the normal to the face of the exit sign, using a meter with a circular measurement field of diameter not less than 75% and not more than 85% of the arm width as specified in Figure 3.4. Luminance measurements of C_{60} (horizontal) values shall be made at an angle between 55° and 75° in the horizontal plane to the normal to the face of the sign.

A1 | They shall also comply with the requirements of Clause 2.4 except that the reference value shall be the luminance value after stable photometric conditions have been attained.

3.4.2 Standard and dual function internally illuminated exit signs

The following requirements apply:

- (a) On the green areas of the pictorial elements, at each applicable measurement site specified in Figure 3.4, the C_0 luminance measured shall be not less than 8 cd/m^2 and the C_{60} luminance shall be not less than 10% of the C_0 value.
- (b) The ratio of the C_0 luminance measured at each applicable white measurement site specified in Figure 3.4 to the C_0 value at the nearest green measurement site shall be not less than 4:1.
- (c) The variation in C_0 luminance between any two white measurement sites specified in Figure 3.4, or between any two green measurement sites in the same figure, shall not be greater than 5:1.
- (d) For a single element sign, at no point shall the luminance be less than the minimum C_0 and C_{60} values stated in Item (a) for an additional background, which shall be adjacent to the pictorial element and have a minimum area that is at least equal to the area of the pictorial element.

NOTE: Refer to Clause 3.3.4 for further requirements.

3.4.3 Low illuminance area exit signs

The requirements are as follows:

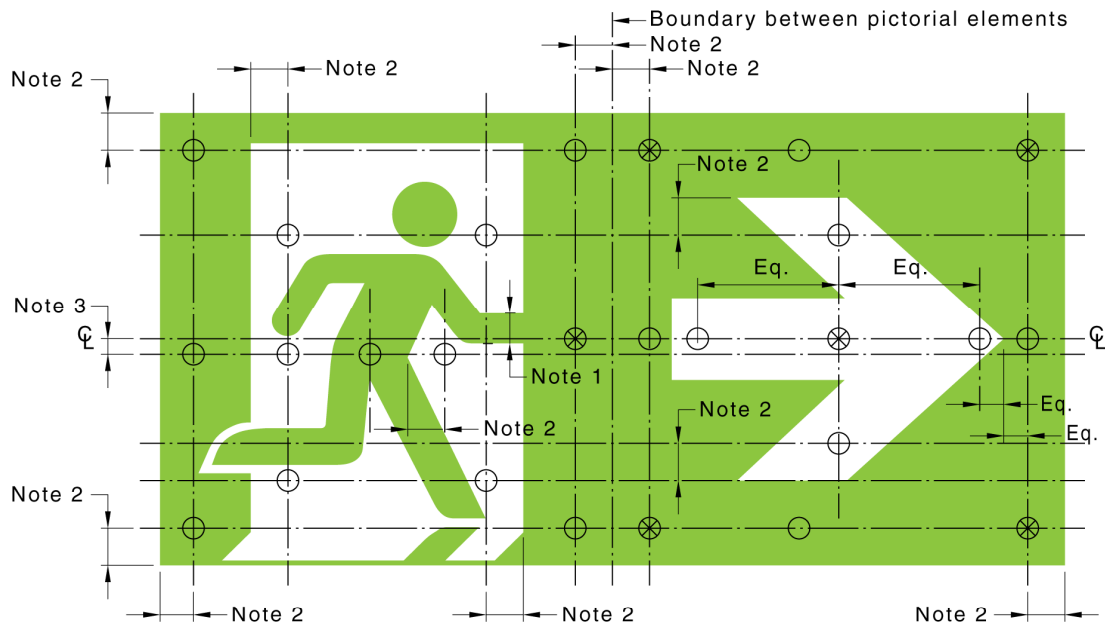
- (a) At each applicable green measurement site specified in Figure 3.4, the C_0 luminance measured shall be not less than 2 cd/m^2 and not greater than 25 cd/m^2 ; the C_{60} luminance shall be not less than 10% of the C_0 value.
- (b) The variation in C_0 luminance between any two applicable measurement sites specified in Figure 3.4 shall be not greater than 5:1.

3.4.4 Externally illuminated exit signs

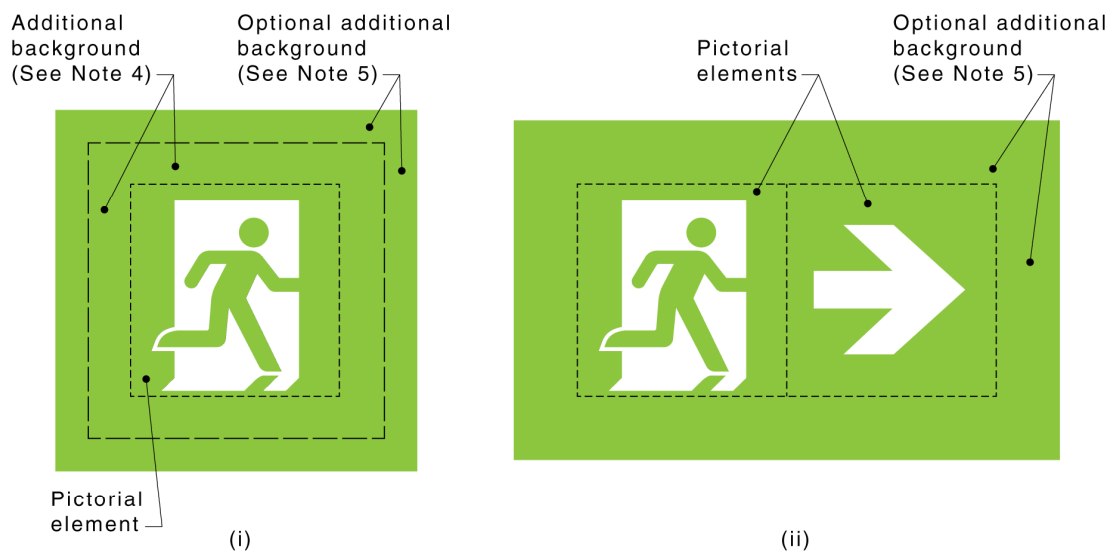
Externally illuminated exit signs shall be in accordance with AS/NZS 2293.1:201X, Clause 5.7.2.

3.4.5 Projected light source life in LED exit signs

For exit signs utilizing LEDs as their light source, a projection of the light source life shall be undertaken in accordance with Appendix E.



(a) Measurement points within pictorial elements



(b) Typical measurement area for additional background

LEGEND:

- = These measurement sites to be used when determining all luminance ratios plus when determining luminance maxima and minima
- ⊗ = These measurement sites to be used only when determining luminance maxima and minima
- = Boundary of pictorial element. (Notional only. Does not appear on sign.)
- = Boundary of additional background for a single element sign. (Notional only. Does not appear on sign.)

NOTES:

- 1 Measure width of arm at this point to determine required luminance meter measurement field.
- 2 This distance shall be $1.2 \times$ arm width.
- 3 This distance shall be $0.5 \times$ arm width.
- 4 Refer to Clause 3.4.2(d).
- 5 Within the optional additional background area luminance measurements are not required.

FIGURE 3.4 LUMINANCE MEASUREMENT POINTS

3.5 MAXIMUM VIEWING DISTANCES

For exit signs of pictorial element height greater than 200 mm, the maximum viewing distance shall be calculated by the following equation:

$$\text{Maximum viewing distance} = 160 \times \text{element height}$$

For any exit sign of pictorial element height less than or equal to 200 mm the maximum viewing distance shall be as specified in Table 3.2.

TABLE 3.2
MAXIMUM VIEWING
DISTANCE CATEGORIES

Element height mm	Maximum viewing distance m
≥100 <150	16
≥150 <200	24
200	32

3.6 MARKING

3.6.1 On body of exit sign

A1 | The requirements of Clause 2.7 shall apply. (See also Clause 4.6).

For LED exit signs the body shall also be marked with the Projected Light Source Life in accordance with Appendix E.

3.6.2 On face of exit sign

3.6.2.1 *Maximum viewing distance*

The maximum viewing distance in accordance with Table 3.2 shall be marked on the face of the exit sign, located on the background either within one of the elements or on additional background. The distance shall be displayed as a one or two digit number (as applicable) followed by the letter 'm'.

The digits and lettering shall be not less than 5 mm high and not more than 10 mm high.

Transilluminated white writing shall be acceptable on white and green signs but not on signs for low illuminance areas.

3.6.2.2 *Other information*

The manufacturer may display an identifying name or company logo on the face of an exit sign. This shall not be more than 10 mm high and shall be displayed close to and in the same colour as the maximum viewing distance.

NOTE: The maximum 10 mm text height is irrespective of the size of the sign.

SECTION 4 PARTICULAR REQUIREMENTS FOR SELF-CONTAINED EMERGENCY LUMINAIRES AND EXIT SIGNS

4.1 APPLICATION

Self-contained emergency luminaires and exit signs, in addition to complying with the general requirements of Sections 2, 3 or 5, as applicable, shall comply with the additional requirements of this Section.

4.2 ARRANGEMENT AND CONTROL

4.2.1 Automatic battery cut-off

Means shall be provided to automatically disconnect the battery from the load before the cell voltage falls below the minimum value recommended by the cell manufacturer. For this requirement, the minimum voltage recommended by the cell manufacturer shall be—

- (a) relevant to the number of cells used in the battery at the discharge rate applicable for the emergency luminaire or exit sign; and
- (b) selected to avoid the possibility of individual cells in the battery pack going into reverse polarity within 10 charge/discharge cycles.

The means of disconnection shall—

- (i) automatically reset upon restoration of the normal supply; and
- (ii) be arranged so that, after disconnection, the drain imposed on the battery is not greater than that recommended by the cell manufacturer for the operating conditions, so that the battery will not be discharged to the extent that it is incapable of recovery.

4.2.2 Test switch

A switch shall be provided to permit the operation of each emergency luminaire or exit sign to be checked by simulating a supply circuit failure. The switch shall be—

- (a) accessible from the exterior of the emergency luminaire or exit sign and in a convenient position for operation; and
- (b) of a type which cannot be maintained in the test position without the attendance of the person conducting the test.

Notwithstanding the above requirements, the following exemptions shall apply:

- (i) An internal test switch may be provided for emergency luminaires or exit signs of a type for which it is impractical to incorporate an external test switch, e.g. vandal-resistant luminaires or recessed luminaires. The internal test switch shall be located in a position which is normally accessible during light source and/or battery replacement (where applicable).
- (ii) No test switch need be provided for emergency luminaires or exit signs that are designed for use in hazardous locations, where the possibility of sparking resulting from operation of the switch would compromise safety features of the luminaire design.

- (iii) For remote self-contained luminaires or exit signs, the test switch may be located on either the luminaire or remote mounted control gear enclosure where the emergency luminaire or exit signs are located greater than 2 m apart from its control gear. Where the test switch is located on the luminaire, the maximum separation distance and cable type shall be specified by the manufacturer and Appendix D tests shall be performed at the worst case (i.e. at the claimed maximum distance as advised by the manufacturer).

4.2.3 Battery isolation facility

Any facility which is provided for the purpose of preventing operation of the emergency luminaire or exit sign from the emergency power source when disconnected from the normal supply shall—

- (a) only be capable of operation by the use of a key or special tool; and
- (b) be clearly marked as to its function and operating position.

NOTE: The battery isolation facility will be of advantage where the normal supply to the building (or the supply to the normal lighting within the building) is disconnected for extended periods, e.g. during construction or when the building is unoccupied or in hazardous area equipment, temporary huts, etc.

4.3 BATTERIES

4.3.1 Required type

A1

Batteries shall be tested in accordance with Appendix D to determine their suitability for use in emergency luminaires and exit signs. Batteries shall be of the sealed rechargeable type specifically designed for emergency or standby use. The batteries shall be fitted with self resealing gas vents or similar, as required by battery/cell chemistry and/or relevant safety standards. The marking on batteries shall conform with the test of marking requirements of AS/NZS 60598.1.

Batteries which are designed for operation only in specified positions, e.g. vertical, may be used provided that any restriction which this may place on the mounting of the luminaire is clearly marked.

Batteries other than nickel cadmium, lead acid, nickel metal hydride, or lithium shall comply with a relevant AS, NZS, IEC or ANSI battery product Standard for extended charge at elevated temperatures (elevated temperature is the maximum operating temperature as specified by the cell manufacturer in accordance with the relevant performance standard for the particular battery/cell chemistry). Where such Standards do not exist, conformance shall be tested against the cell manufacturer's specifications. Batteries which utilize sealed nickel-cadmium cells shall comply with the requirements of IEC 61951-1 for cells intended for permanent charge at elevated temperatures. Batteries which utilize sealed nickel metal hydride cells shall comply with the requirements of IEC 61951-2 for cells intended for permanent charge at elevated temperatures. Valve regulated lead-acid batteries shall comply with the relevant requirements of IEC 60896-21. Lithium cells shall comply with the requirements of IEC 62133 and IEC 62620.

NOTE: The ambient temperature in which the cells operate will largely determine the service life obtained from the battery. The temperature conditions experienced will be influenced by the following:

- (a) The design of the emergency luminaire or exit sign, e.g. location of the battery relative to internal sources of heat.
- (b) The particular type of emergency luminaire or exit sign, i.e. whether maintained or non-maintained. Batteries located within maintained emergency luminaires or exit signs will experience more onerous thermal conditions because of the heat generated by operation of the normal lighting light source(s).
- (c) The particular environment in which the emergency luminaire or exit sign is installed, e.g. coolroom or industrial area with significant process heat generation.

4.3.2 Battery capacity

A1 | Each battery shall be legibly and durably marked with the ampere-hour capacity assigned by the battery manufacturer at a specified rate of discharge. This marking shall conform with the test of marking requirements of AS/NZS 60598.1.

4.3.3 Intercell connections

Connections between the cells of a battery shall be made by a reliable means such as soldering, welding, bolting or the use of quick-connect tab and receptacle connectors. Such connections shall either be inherently corrosion-resistant or shall be treated to prevent corrosion.

Conformance is assessed by inspection.

4.3.4 Battery circuit protection

A1 | Battery circuit protection shall comply with the relevant section of AS 60598.2.22.

4.3.5 Provision for battery replacement

Where batteries are intended to be replaceable they shall be located and secured within emergency luminaires and exit signs in a manner that will enable their replacement to be readily effected without dismantling or replacing other internal components.

Connections between batteries and other equipment in the emergency luminaire or exit sign shall be made by easily replaceable means, such as quick-connect tab and receptacle connectors, which provide reliable electrical connections. Such connections shall either be inherently corrosion-resistant or shall be treated to prevent corrosion.

4.4 BATTERY CHARGERS

4.4.1 General

A1 | The design of the battery charger shall be such that, when subjected to the short circuit test in AS 60598.2.22, it will either—

- (a) continue to function; or
- (b) fail in a safe manner.

The rating of the battery charger shall be tested in accordance with Appendix D—

- (i) after the battery has been discharged from the fully-charged state by operating the emergency luminaire or exit sign for the initial duration of operation specified in AS/NZS 2293.1:2018 Section 2; and
- (ii) 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 (i). The output voltage at the end of each discharge period shall be not less than that recommended by the cell manufacturer.

The battery charger shall recharge and maintain the battery automatically while the normal supply to the emergency luminaire or exit sign is available. The system shall be arranged so that the battery will not receive a charge in excess of the limits recommended by the battery manufacturer under any condition of operation.

A1 | Conformance with the above shall be assessed by the relevant tests of Appendix D and AS 60598.2.22.

4.4.2 Visual indicator

Visual indication of battery charger operation shall be provided. The indicator shall be—

- (a) either red or green in colour under normal operating conditions;

- (b) arranged such that failure of the indicator device will not render the emergency luminaire or exit sign inoperative; and
- (c) located in a position which will be visible when mounted in any designed attitude or adjacent to the test switch where the control gear is remote mounted.

It is permissible to use this indicator to display additional information—for example, by flashing.

Conformance is assessed by inspection.

4.5 SELF-CONTAINED AUTOMATIC DISCHARGE TESTING FACILITIES

4.5.1 Application

This Clause applies to emergency luminaires and exit signs that are provided with self-contained, automatic facilities for discharge testing, i.e. fully stand-alone systems.

4.5.2 General requirements

The testing system used shall comply with the general requirements for automatically operated testing facilities in Section 3 of AS/NZS 2293.1, and with the following:

- (a) The test facility shall not interfere with the capability of the emergency luminaire or exit sign to operate correctly in response to loss of the normal supply.
- (b) The test facility shall automatically subject the emergency luminaire or exit sign to a discharge test at intervals of not more than specified in AS/NZS 2293.2. The system used to time the interval between successive discharge tests shall not be affected during periods when the normal supply is interrupted.
- (c) The test facility shall provide for the discharge test to continue for at least the required duration and, for the period of the test, the battery shall receive no charge.
- (d) Sensing means shall be provided to confirm that the emergency light source(s) remained illuminated for the required duration.
- (e) If loss of the normal supply occurs while the test is in progress, the emergency luminaire or exit sign shall remain connected in the emergency mode until the test has been completed or, if the normal supply has not been restored, until the emergency luminaire or exit sign is disconnected by the automatic battery cut off device.

NOTE: The operation of the emergency luminaire or exit sign can continue to be monitored after loss of supply, the indication of the outcome of the test being provided when the normal supply is restored.

4.5.3 Required indications

Distinctive indications shall be provided at each emergency luminaire or exit sign to identify the following operational states:

- (a) *Normal state*—an indication that the emergency luminaire or exit sign is in the normal mode, awaiting the next discharge test.
- (b) *Recently tested and complies*—a temporary indication that the emergency luminaire or exit sign was recently tested and remained illuminated for the required duration. The indication shall be maintained for at least 5 days following completion of the test after which the indication shall revert to that described in Item (i) below.

NOTE: The purpose of this temporary indication is to facilitate logging of the test results by maintenance personnel.

- (c) *Tested and failed*—an indication that the emergency light source(s) failed to remain illuminated for the required duration when subjected to a discharge test. This indication shall be maintained until the fault has been rectified and the emergency luminaire or exit sign successfully passes a subsequent discharge test.

Where a single visual indicator is used to provide all of the indications required by Items (a) to (c), it shall be yellow in colour and the following illuminated states shall have the meanings given:

- (i) *Continuously illuminated*—to indicate the normal state. See Item (a).
- (ii) *Slow flash*—to indicate recently tested and complies. See Item (b).
The cycle shall comprise 4 s ‘on’ and 1 s ‘off’.
- (iii) *Fast flash*—to indicate tested and failed. See Item (c).
The cycle shall comprise 0.5 s ‘on’ and 0.5 s ‘off’.

4.6 MARKING

A1

Self-contained emergency luminaires and exit signs shall be marked in accordance with the relevant requirements of Clause 2.7 and, where applicable Clause 3.6 and shall also be marked with the following information:

- (a) The information necessary to ensure correct replacement of the batteries, or to indicate that the battery is not replaceable.
- (b) Any restriction on luminaire orientation and the battery mounting position (see Clause 4.4.1).

Where the emergency power supply unit is located separately from the emergency luminaire or exit sign, each assembly shall be marked with the information required above.

SECTION 5 PARTICULAR REQUIREMENTS FOR CENTRALLY SUPPLIED EMERGENCY LUMINAIRES AND EXIT SIGNS

5.1 APPLICATION

Centrally supplied emergency lighting systems include the battery and charger system and associated emergency luminaires and exit signs. The requirements for the charger and battery used for centrally supplied systems are included in AS/NZS 2293.1.

Emergency luminaires and exit signs for these systems shall, in addition to complying with the general requirements of Sections 2 and 3 as applicable, comply with the additional requirements of this Section.

NOTE: In New Zealand, generators are permitted to be used to provide emergency lighting in buildings provided they comply with the requirements of New Zealand Building Code, Clause F6/AS1 Section 1.5.1(c) and the requirements of NZS 6104:1981.

5.2 ARRANGEMENT AND CONTROL

5.2.1 Test switch

A centrally supplied emergency luminaire or exit sign does not require a test switch.

5.2.2 Visual indicator

A centrally supplied emergency luminaire or exit sign does not require a visual indicator.

5.3 MARKING

Centrally supplied emergency luminaires and exit signs shall be marked in accordance with the requirements of Clauses 2.7 or 3.6 as applicable, and shall also be legibly and durably marked with the following information:

- (a) Where the luminaire or exit sign has provision for connection to a single supply only:
‘WARNING: Centrally supplied luminaire’.
- (b) Where the exit sign or luminaire has provision for connection to two supplies:
‘WARNING: Centrally supplied luminaire—Dual voltages within’

A1 | This marking shall conform with the marking requirements of AS/NZS 60598.1.

APPENDIX A
ESSENTIAL DATA AND PREFERRED FORMAT FOR TEST REPORTS FOR
EMERGENCY LUMINAIRES AND EXIT SIGNS

(Informative)

Successful application of the requirements of AS/NZS 2293.1 depends to a large extent on the use of emergency luminaires and exit signs of the appropriate type and performance. To facilitate the identification of the emergency luminaires and exit signs and authentication of their conformance with the applicable requirements, it is desirable that test information—

- (a) be presented in a simple and uniform manner; and
- (b) be substantiated by reference to test reports from a laboratory that is independently accredited as having competence to carry out the measurements involved.

This Appendix sets out the essential data and preferred format for test reports for emergency luminaires and exit signs, and is primarily aimed at providing the inspecting authority with the information necessary to establish that the emergency luminaire or exit sign is of the correct type and performance when appraising emergency lighting installations for conformance with the requirements of AS/NZS 2293.1.

It is unlikely that one laboratory will be capable of undertaking all of the tests required by this Standard. Test reports from more than one laboratory may therefore be required to provide all of the information listed in this Appendix.

Where test reports from another laboratory are available, the test results may be incorporated as part of a more comprehensive test report provided that the source of the test information and the test report are identified.

Sections of the test report that have not been assessed should be marked 'not tested'. In addition, certain sections of the test report will also not be applicable, e.g. different requirements apply for emergency luminaires and exit signs. In such cases, that section of the test report should be marked 'not applicable'.

Where, for the purpose of testing a range of emergency luminaires or exit signs in accordance with Appendix D, a particular emergency luminaire or exit sign is selected as representative of the 'worst case', separate photometric test reports will be required for each luminaire or exit sign in the range considered although each test report will, under the section on temperature, refer to the results of the tests on the 'worst case'.

It should be noted that a test report of conformance applies only to the emergency luminaire or exit sign to which it specifically refers, including the nominated components. If different components are subsequently to be used, the emergency luminaire or exit sign should be resubmitted to the laboratory responsible for the original tests for assessment of whether the change in components will have a significant effect on performance, and thus require retesting.

The essential data and preferred format for the test reports are set out in the following five sheets:

Manufacturer: Address:								
EMERGENCY LUMINAIRE/EXIT SIGN								
<input type="checkbox"/> Emergency luminaire <input type="checkbox"/> Exit sign <input type="checkbox"/> Dual function exit sign	<input type="checkbox"/> Central <input type="checkbox"/> Self-contained	<input type="checkbox"/> Maintained <input type="checkbox"/> Non-maintained <input type="checkbox"/> Combined						
Catalogue No. Series No. Mains voltage Current Ballast: type, manufacturer and Catalogue No. Mains light sources: type, number, CRI, and rating Emergency light source(s): type, number, CRI and rating Diffuser type	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">ELECTRONIC CONTROL PACK</td> </tr> <tr> <td colspan="2" style="text-align: center;">Manufacturer:</td> </tr> <tr> <td colspan="2" style="text-align: center;">Model No.</td> </tr> </table> <p style="text-align: center;">(Space for drawing or photograph. Alternatively, attach to declaration and include appropriate reference e.g. see Drawing No.)</p>		ELECTRONIC CONTROL PACK		Manufacturer:		Model No.	
ELECTRONIC CONTROL PACK								
Manufacturer:								
Model No.								
BATTERY								
Number of cells Cell type, manufacturer and Catalogue No. Battery pack: manufacturer and Catalogue No. Nominal voltage Battery capacity								

A1		CONFORMANCE WITH AS 60598.2.22 Test Report No. Date of Test Laboratory: Registration No. Address:
A1		The emergency luminaire/exit sign described on Sheet 1 was examined and tested for compliance with AS 60598.2.22, and the result was as follows: <div style="text-align: right; margin-top: 10px;">Pass/Fail</div> Accuracy: The uncertainties were not greater than Authorized signatory: Name: ..... | Phone No. Signature: Date:

LM80 test report for LED lights source(s)	Test Report No.	Date of Test.....
Manufacturer and Test Lab		

Battery specifications (see also Sheet 1):

Maximum charge current	Minimum discharge voltage.....
Maximum charge current	Minimum discharge voltage.....
Maximum charge voltage	Maximum battery case temperature

* Excluding initial surge currents

The self contained emergency luminaire/exit sign described on Sheet 1 or a representative emergency luminaire/exit sign (see below) using the same circuit, components and basic enclosure, was tested in accordance with Appendix D of AS/NZS 2293.3:201X, and the results were as follows:

HIGH TEMPERATURE TEST (40° ±2°C)

Emergency luminaire/exit sign tested:

Catalogue No.	Description.....
Mounting: <input type="checkbox"/> Ceiling <input type="checkbox"/> Wall <input type="checkbox"/> Surface mounted <input type="checkbox"/> Recessed <input type="checkbox"/> Suspended	
Operation: <input type="checkbox"/> Maintained <input type="checkbox"/> Non-maintained <input type="checkbox"/> Combined	

Test results:

Measured parameter	Charge cycle No. 1	Charge cycle No. 2	Charge cycle No. 3
Maximum battery voltage	.....V	.....V	.....V
Maximum battery current	.....A	.....A	.....A
Max. battery/case temp.	.....°C	.....°C	.....°C
Max LED temperature	.....°C	.....°C	.....°C
Max LED current	.....A	.....A	.....A
Measured parameter	Discharge cycle No. 1	Discharge cycle No. 2	Discharge cycle No. 3
Maximum battery current	.....A	.....A	.....A
Battery current at 2 h	.....A	.....A	.....A
Battery volts at 2 h	.....V	.....V	.....V
Battery volts at cut off	.....V	.....V	.....V
Cut off occurred at	.....h min	.....h min	.....h min
Battery drain current	.....A	.....A	.....A

Sheet 2 of 5

TEMPERATURE (continued)

LOW TEMPERATURE TEST (10 ±2°C)

Emergency luminaire/exit sign tested:

Catalogue No.	Description.....
Mounting: [] Ceiling [] Wall [] Surface mounted [] Recessed [] Suspended	
Operation: [] Maintained [] Non-maintained [] Combined	

Test results:

Measured parameter	Charge cycle No. 1	Charge cycle No. 2	Charge cycle No. 3
Maximum battery voltage	..... V	..... V	..... V
Maximum battery current	..... A	..... A	..... A
Maximum battery current	..... A	..... A	..... A
Battery current at 2 h	..... A	..... A	..... A
Battery volts at 2 h	..... V	..... V	..... V
Battery volts at cut off	..... V	..... V	..... V
Cut off occurred at	.....h..... min	.....h..... min	.....h..... min
Battery drain current	..... A	..... A	..... A

Test data for both high temperature and low temperature tests:

- (a) Emergency light source(s) illuminated continuously Yes/No
- (b) Emergency light source(s) reconnected after cut off Yes/No
- (c) Battery current after cut off in accordance with recommendation of cell manufacturer Yes/No
- (d) If LED light source(s) are employed, LM80 temperatures are not exceeded Yes/No
- (e) Maximum temperature of battery or battery case °C
- (f) Test voltage for photometric tests V

Accuracy: The uncertainties were not greater than

Authorized signatory:

Name: Phone No.

Signature:..... Date:

ILLUMINATION AT SWITCH ON Test Report No. Date of Test:

Laboratory: Registration No.

Address:

The emergency luminaire/exit sign described on Sheet 1 was tested in accordance with Clause 2.3/Clause 2.4 of AS/NZS 2293.3:201X, and the results were as follows:

Measured parameter	Cold start	Hot start
Light output after 1 s	Pass/Fail	Pass/Fail
Light output after 15 s	Pass/Fail	Pass/Fail

Nominal battery voltage: V.

Test voltage:..... V.

Accuracy: The uncertainties were not greater than

ILLUMINATION AT SWITCH ON *(continued)*

Authorized signatory:

Name: Phone No.

Signature: Test Report No. Date of Test:.....

Laboratory:..... Registration No.

Address:.....

The emergency luminaire/exit sign described on Sheet 1 was tested in accordance with Appendix C of AS/NZS 2293.3:201X and with AS/NZS 1680.3. The results were as follows:

Test voltage and, for self contained emergency luminaires/exit signs, measured current:

.....V A

(For self contained emergency luminaires and exit signs, see Temperature Test Report No.)

Abridged intensity data (for luminaire classification):

Vertical angle γ degrees	Luminous intensity, cd	
	C ₀ plane	
0 5 10 | (5° steps) | 90		

Maximum assignable classifications:

A..... B..... C..... D..... E.....
F.....

Comprehensive intensity data (for illuminance calculations):

Comprehensive luminous intensity data for the emergency luminaire/exit sign, complying with AS/NZS 1680.3, is available separately in Test Report No.

Accuracy: The uncertainties were not greater than

Authorized signatory:

Name: Phone No.

Signature: Date:

**DIMENSIONS AND ILLUMINATION
(EXIT SIGNS)**

Test Report No. Date of Test

Laboratory Registration No.....

Address:.....

General egress Double sided

Single sided Other.....

Colour contrast: Normal (white/green) Low light level (green/opaque)

Right arrow (show orientation) Left arrow (show orientation) Vertical arrow (show orientation)

Background size (h × w) × mm Height of symbol element of pictorial element(s) mm

The exit sign described above and on Sheet 1 was tested in accordance with Clauses 3.3 and 3.4 of AS/NZS 2293.3:201X, and the results were as follows:

Measured parameter	Result
Shape and proportions of pictorial element(s) and background	Pass/Fail
Luminance of background	Pass/Fail
Luminance of pictorial element(s)	Pass/Fail
Variation of luminance within background	Pass/Fail
Variation of luminance within pictorial element(s)	Pass/Fail
Ratio of luminance of pictorial element(s) to adjacent back ground	Pass/Fail

Maximum viewing distancem

Accuracy: The uncertainties were not greater than

Authorized signatory:

Name: Phone No.....

Signature: Date:

APPENDIX B
 SAMPLE DECLARATION OF CONFORMANCE FOR EMERGENCY
 LUMINAIRES AND EXIT SIGNS

(Informative)

Manufacturer: Address:		
EMERGENCY LUMINAIRE/EXIT SIGN		
<input type="checkbox"/> Emergency luminaire <input type="checkbox"/> Exit sign <input type="checkbox"/> Dual function exit sign	<input type="checkbox"/> Central <input type="checkbox"/> Self-contained	<input type="checkbox"/> Maintained <input type="checkbox"/> Non-maintained <input type="checkbox"/> Combined
Catalogue No. Series No. Mains voltage Current Ballast: type, manufacturer and Catalogue No. Mains light sources: type, number, CRI and rating Emergency light source(s): type, number, CRI and rating Diffuser type	<div style="border: 1px solid black; padding: 5px; text-align: center;"> ELECTRONIC CONTROL PACK Manufacturer: Model No. </div>	(Space for drawing or photograph. Alternatively, attach to declaration and include appropriate reference e.g. see Drawing No.)
BATTERY		
Number of cells Cell type, manufacturer and Catalogue No. Battery pack: manufacturer and Catalogue No. Nominal voltage Battery capacity		

SUMMARY OF TESTS

A1

Test description	Laboratory	Test report No.	Date of issue
Conformance with AS 60598.2.22			
Temperature* (AS/NZS 2293.3:201X, Appendix D)			
Illumination at switch on (AS/NZS 2293.3:201X, Clauses 2.4			
Photometry† (AS/NZS 2293.3:201X, Appendix C, and AS/NZS 1680.3)			
Dimensions and illumination‡ (AS/NZS 2293.3:201X, Clauses 3.3 and 3.4)			
Colour‡ (AS/NZS 2293.3:201X, Clause 3.3.6)			

* Applies only to self contained emergency luminaires and exit signs

† Applies only to emergency luminaires

‡ Applies only to exit signs

DECLARATION OF CONFORMANCE

On the basis of the test reports specified, I declare that the emergency luminaire/exit sign described above complies with the requirements of AS/NZS 2293.3.

Signed: Date:

Title:

This declaration form should be completed in full. The completed form should be considered sufficient to verify conformance with AS/NZS 2293.3. Copies of individual test reports cited in the declaration may be obtained on request.

APPENDIX C

CLASSIFICATION OF EMERGENCY LUMINAIRES AND DUAL FUNCTION EXIT SIGNS

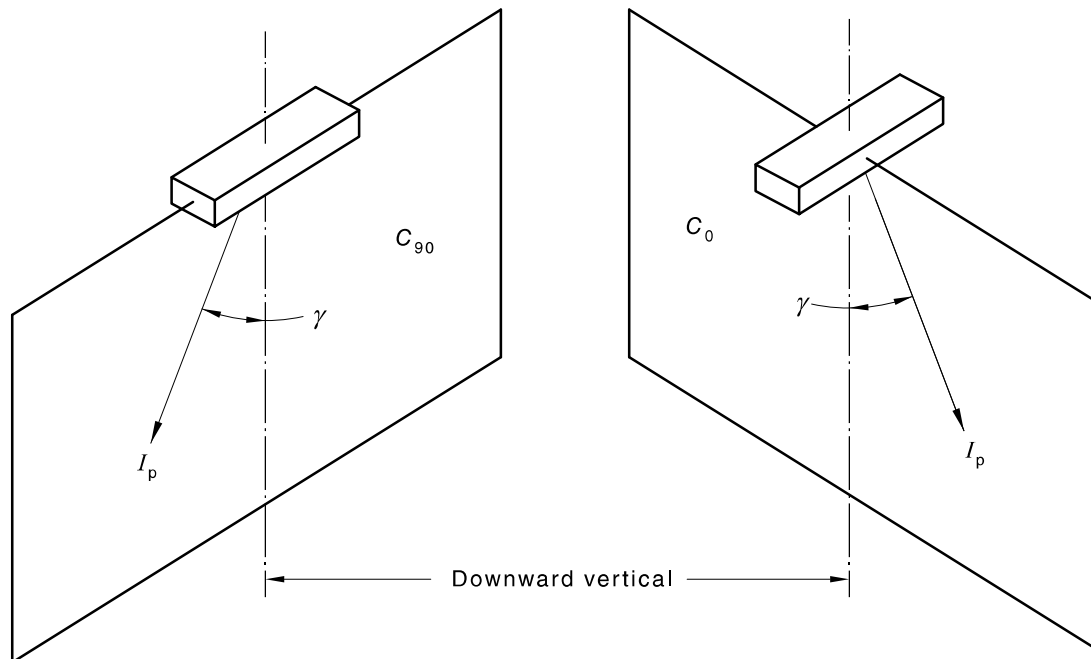
(Normative)

C1 BASIS OF CLASSIFICATION

The system specified in this Appendix for the classification of emergency luminaires and dual function exit signs is based on the following considerations:

- (a) The general shape of the intensity distribution curves in the transverse (C_0) and longitudinal (C_{90}) vertical planes through the luminaire (see Figures C1 and C2). The classification for each plane is considered separately.
- (b) The luminous intensity in the downward vertical direction. This intensity is used for convenience, but is related to the intensities at other angles by the characteristic distribution shape.

The purpose of the classification is to facilitate the specification of requirements, in terms of luminaire mounting height and spacing, to simplify both the design of emergency lighting installations and the assessment of conformance.



I_p = luminous intensity in the measurement direction p , in the relevant plane of measurement (see Paragraph C3.1)

FIGURE C1 VERTICAL PLANES THROUGH EMERGENCY LUMINAIRE OR DUAL FUNCTION EXIT SIGN FOR MEASUREMENTS OF LUMINOUS INTENSITY

C2 TEST CONDITIONS

C2.1 General

The emergency luminaire or dual function exit sign shall be tested in accordance with the requirements of this Appendix under the applicable conditions specified in AS/NZS 1680.3, CIE S025 or IES LM-79.

NOTE: The luminous intensity data required above is of an abbreviated form, for use in establishing the classification of emergency luminaires and exit signs in accordance with this Appendix. Where maximum spacings of emergency luminaires and exit signs are to be determined by illuminance calculations (see AS/NZS 2293.1), more comprehensive luminous intensity data in accordance with CIE S025, AS/NZS 1680.3 or IES LM-79 will be required.

C2.2 Alternative luminaire combinations

Where the emergency luminaire or dual function exit sign is designed for use in several different combinations (e.g. the same basic luminaire with different diffusers or wire guards) each combination shall be tested as specified by the manufacturer. Exit signs shall be tested with a plain running man pictograph diffuser(s).

C2.3 Mounting position

The emergency luminaire or dual function exit sign shall be mounted in the horizontal plane for the purpose of the tests unless of a type which is not designed for this application. Where designed for use in other mounting positions, e.g. on a wall or other vertical surface, the emergency luminaire shall be tested in the most onerous position.

C2.4 Test voltage and current

For the photometry necessary to establish the classification of an emergency luminaire or dual function exit sign, the following conditions shall apply:

- (a) *Centrally supplied luminaires and dual function exit signs* The test voltage shall be as follows:
 - (i) For connection to d.c. supply—80% of the rated voltage of the luminaire.
 - (ii) For connection to a.c. supply from central inverter—90% of the rated voltage of the luminaire.

Where the luminaire is marked for operation within a range of voltages, the lowest marked voltage shall be used as the basis for determining the test voltage.

- (b) *Self-contained emergency luminaires and dual function exit signs* The test voltage shall be as determined in accordance with Paragraph D2 of Appendix D. The batteries shall be disconnected and replaced by a separate d.c. supply of the required voltage.

The current delivered to the luminaire during the test shall be within 5% of the value determined in accordance with Paragraph D2 of Appendix D; however, this requirement need not apply if the tests of this Appendix and Appendix D are conducted sequentially in the same laboratory.

C3 PROCEDURE FOR DERIVING THE LUMINAIRE CLASSIFICATION

C3.1 General procedure

The luminous intensities emitted by the luminaire shall be measured in both the C_0 and C_{90} planes at intervals of not more than 5° , from the downward vertical direction, up to and including 90° above the downward vertical. The luminaire shall then be assigned an alphanumeric classification in accordance with Paragraph C3.2.

Where the luminous intensities emitted on either side of the downward vertical in the C_0 or C_{90} plane differ, i.e. the luminaire has an asymmetric light distribution in the particular plane, the luminous intensities for the half plane which produces the lowest classification shall be used.

The luminaire or exit sign may be assigned more than one classification provided that it complies with the requirements that are applicable for each of the classifications assigned.

Different classifications may be assigned in the C_0 and C_{90} planes (see Figure C1) provided that each classification is specifically related to the relevant plane.

Example

Where a luminaire is assigned a C classification in the C_0 plane and a B classification in the C_{90} plane, the luminaire would be marked as follows:

$C_0/C\dots$

$C_{90}/B\dots$

Where the luminaire is not marked in accordance with Clause 2.7(b) and the location of the C_0 plane is not obvious, luminous intensities shall be measured in at least eight equally-spaced vertical planes. A single classification, corresponding to the lowest classification afforded by any one of the measurement planes, shall be adopted.

Where light sources of differing light output are likely to be used, the luminaire shall be classified separately for each condition of use. Each alternative classification shall be indicated, together with information that will identify the light source to which the particular classification relates.

C3.2 Method of assigning the classification

C3.2.1 General

The classification assigned to an emergency luminaire or dual function exit sign shall comprise the combination of an alphabetic and a numerical designation, determined in accordance with Paragraph C3.2.2 and Paragraph C3.2.3 respectively.

C3.2.2 Alphabetic component of the classification

The alphabetic component of the classification, in the form of the letters A, B, C, D or E, shall be assigned in accordance with the following procedure, based on the general shape of the luminous intensity distribution in the appropriate vertical plane (see Paragraph C3.1).

NOTE: Figure C2 illustrates the characteristic shape of the luminous intensity distribution curves for the general classes of emergency luminaire that are specified in this Standard.

The luminous intensities at each of the measured angles shall be not less than the values determined from the following equations, as applicable.

- (a) For Class A emergency luminaires or dual function exit sign—

$$I_p = I_0 \cos^4 \gamma \quad (\text{for } \gamma \leq 70^\circ) \quad \dots C1$$

- (b) For Class B emergency luminaires or dual function exit sign—

$$I_p = I_0 \cos^3 \gamma \quad (\text{for } \gamma \leq 70^\circ) \quad \dots C2$$

- (c) For Class C emergency luminaires or dual function exit sign—

$$I_p = I_0 \cos^{1.5} \gamma \quad (\text{for } \gamma \leq 70^\circ) \quad \dots C3$$

- (d) For Class D emergency luminaires or dual function exit sign—

$$I_p = I_o \frac{2 + \cos \gamma}{3} \quad (\text{for } \gamma \leq 70^\circ) \quad \dots \text{C4}$$

- (e) For Class E emergency luminaires or dual function exit sign—

$$I_p = I_o \left(1 + \frac{0.04\gamma}{30} \right) \quad (\text{for } \gamma \leq 30^\circ) \quad \dots \text{C5}$$

$$I_p = 1.07 I_o \cos 2.6 (\gamma - 35) \quad (\text{for } \gamma \leq 30^\circ \leq 65) \quad \dots \text{C6}$$

where

I_p = luminous intensity emitted at the particular angle, in candelas (cd)

I_o = luminous intensity in the downward vertical direction, assigned in accordance with Paragraph C3.2.3, in candelas (cd)

γ = angle from the downward vertical at which the luminous intensity is measured, in degrees

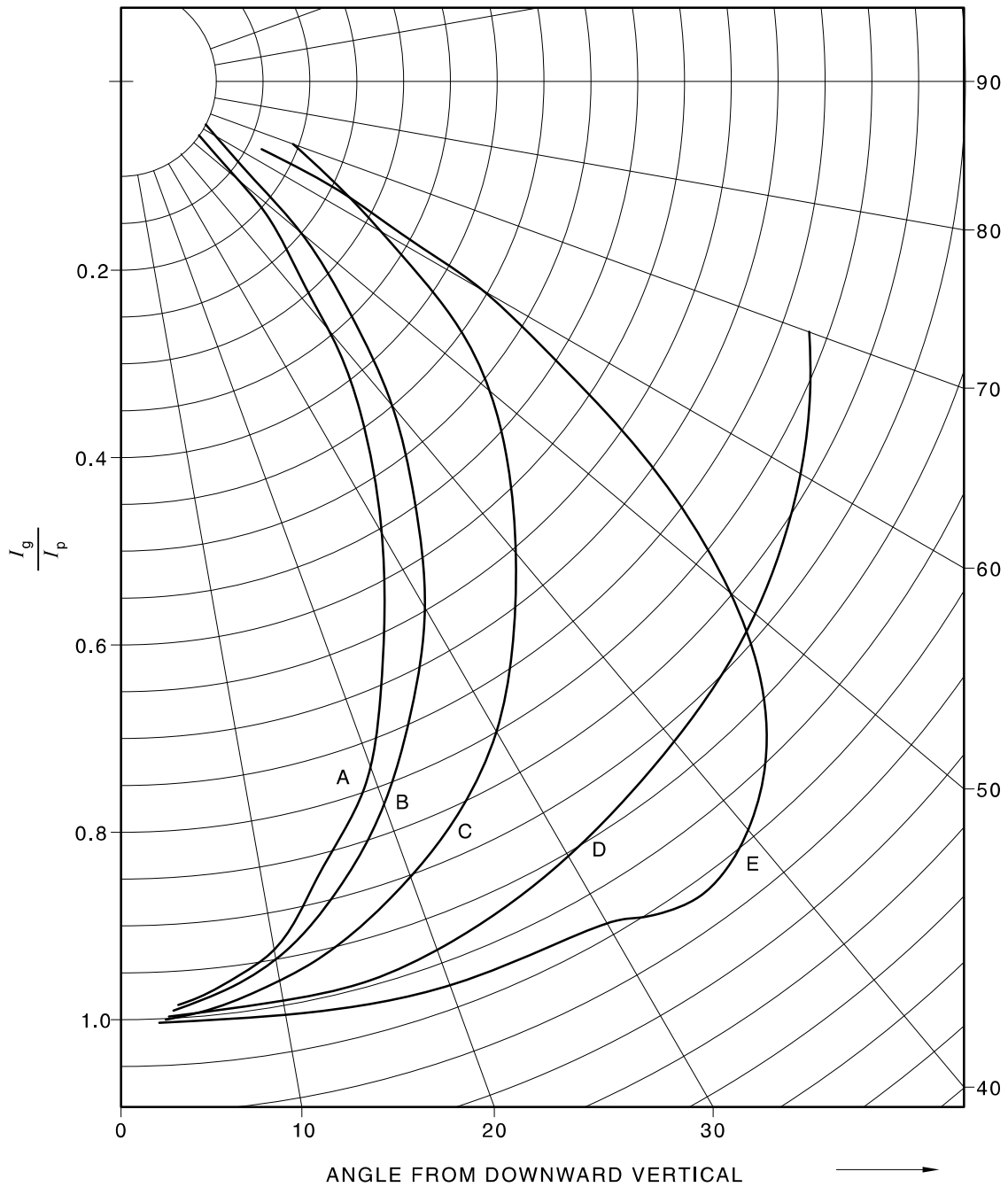
C3.2.3 Numerical component of the classification

The luminous intensity for any one measurement angle up to and including 30° from the downward vertical may, for that angle only, be up to 20% below the minimum value determined from the relevant equation prior to any application of the derating factor.

The numerical component of the classification shall be assigned corresponding to any value in the following series which is equal to or less than the actual luminous intensity in the downward vertical direction:

1, 1.25, 1.6, 2, 2.5, 3.2, 4, 5, 6.3, 8, 10, 12.5, 16, 20, 25, 32, 40, 50 ...

The above values are based on the R10 series of preferred numbers in AS 2752.



NOTES:

- 1 It is not necessary for the intensity distribution curve for an emergency luminaire to precisely match the indicative curves illustrated above, only that the luminous intensities at particular measurement angles be not less than the minimum values determined in accordance with Paragraph C3.2.2.
- 2 For the general classes of emergency luminaire or dual function exit sign specified in paragraph C3.2.2.

FIGURE C2 CHARACTERISTIC SHAPE OF INTENSITY DISTRIBUTION CURVES

C3.3 Glare limitations

In order to restrict disability glare at higher angles, limitations are applied to the luminous intensity of the luminaire based on the mounting height range in accordance with Table C1.

TABLE C1
DISABILITY GLARE LIMITS

Mounting height (H) above floor level m	Maximum luminous intensity from 60 to 90 degrees from nadir (I_{\max}), cd
$H < 2.5$	500
$2.5 \leq H < 3.0$	900
$3.0 \leq H < 3.5$	1600
$3.5 \leq H < 4.0$	2500
$4.0 \leq H < 4.5$	3500
$4.5 \leq H$	5000

C3.4 Colour temperature and colour rendering index

The colour temperature shall fall with the range from 2500 K to 7000 K.

The minimum value of the colour rendering index R_a of the light source utilized in any emergency luminaire shall be greater than 40.

NOTE: The minimum R_a value is to assist in the recognition of safety colours.

APPENDIX D

TYPE TESTING OF SELF CONTAINED EMERGENCY LUMINAIRES AND EXIT SIGNS

(Normative)

D1 TEMPERATURE TESTS

D1.1 Application

Each design/type of self-contained emergency luminaire and exit sign shall be subjected to a high temperature test and a low temperature test, conducted in that order in accordance with Tables D1 and D2 respectively, and shall comply with the appropriate requirements stated therein. These tests shall be carried out at the temperature specified in an environment or enclosure designed to avoid excessive changes in ambient temperature. The sample shall be tested in the most arduous position allowed for in the manufacturer's instructions or as indicated/marked on the product. If there are no instructions or markings, then the product shall be tested in the most arduous position possible.

The design for a draught proof enclosure and luminaire mounting arrangements are given in AS/NZS 60598.1. Other types of enclosures may be used if the results obtained are compatible with those that would be obtained by use of the draught proof enclosure and luminaire mounting arrangement described in AS/NZS 60598.1.

Where a range of self-contained emergency luminaires or exit signs utilize the same circuit, components and enclosure, each luminaire or exit sign need not be tested, provided that—

- (a) the luminaire or exit sign selected for the high temperature test represents the form that will produce the highest internal temperatures, e.g. operate in maintained mode, polished reflector, dense diffuser; and
- (b) the luminaire or exit sign selected for the low temperature test represents the form that will produce the lowest internal temperatures, e.g. operate in non-maintained mode, diffuse reflector, operate without diffuser.

Where there is doubt about which luminaire or exit sign is to be selected in accordance with Items (a) and (b), each luminaire or exit sign in the range shall be operated at an ambient temperature of $25 \pm 2^\circ\text{C}$ and the internal temperatures measured adjacent to the battery, until stable temperature conditions are attained. A change of CCT only for LEDs shall not count as a 'change of component', provided that each CCT version of the luminaire or exit sign is subjected to the measurement above.

Test reports shall clearly indicate, by reference to catalogue numbers or other suitable identification markings, the luminaires or exit signs selected for testing and the range of emergency luminaires or exit signs which they represent. The test report shall also note all allowable mounting orientations where specified by the manufacturer.

The tests conducted under this Appendix give guidance for performance at elevated and reduced temperatures. They do not imply any luminaire temperature rating (T_a) as defined in AS 60598.2.22.

D1.2 General conditioning

The three cycles of each test procedure shall follow sequentially in the order specified. The interval between successive cycles shall not exceed 12 h, during which time the ambient temperature shall be maintained at the specified value.

The battery voltage shall be monitored continuously throughout each cycle. All other parameters shall be monitored at intervals of not more than 5 min.

For the purpose of the tests, the ambient temperature shall be taken as the dry bulb temperature reading within the test room or enclosure under still air conditions. During measurement, the temperature sensing element shall be shielded from radiation from the luminaire or exit sign under test.

All voltage measurements shall be taken while the battery is being charged or discharged.

D2 LIGHT OUTPUT

In addition to complying with this Appendix, each design/type of self-contained emergency luminaire and dual function exit sign shall be tested in accordance with the requirements of Appendix C and assigned an appropriate classification. Self-contained internally-illuminated exit signs shall provide luminance values in accordance with the requirements of Clause 3.4.2. For photometric measurements, the test voltage and current shall be as follows:

- (a) The test voltage shall be the lowest battery voltage measured in any of the discharge cycles specified in Tables D1 and D2, after operation for the initial duration of operation specified in Section 2 of AS/NZS 2293.1.
- (b) The discharge current delivered to the luminaire shall be recorded when operated at an ambient temperature of 25°C. The batteries shall be disconnected and replaced by a separate d.c. power supply at the test voltage determined in accordance with Item (a). The luminaire shall be orientated in its intended mounting position and the discharge current shall be recorded when stable.

D3 LED OPERATING CONDITION TEST

The LED(s) used in emergency luminaires and exit signs shall be tested in order to verify that the operating condition of the LEDs are, as a minimum, within the parameters of the LM80 test report for maintained luminaires and exit signs, and manufacturer's limits for non-maintained luminaires (and in New Zealand non-maintained exit signs).

The attachment point of the fine wire thermocouple shall be as defined in the IES LM80 report for the emergency LED in question.

For maintained emergency luminaires and exit signs, when the luminaire is tested at an ambient temperature of 40°C, the LED case temperature (T_s) and the LED drive current shall be measured. These measurements shall not exceed those values as given in the IES LM80 report.

For non-maintained emergency luminaires (and in New Zealand non-maintained exit signs) when the luminaire is tested at an ambient temperature of 40°C the LED T_s point temperature and the LED drive current shall be measured. These measurements shall not exceed those values as specified by the LED chip manufacturer.

D4 BATTERY CHARGER SHORT CIRCUIT TEST

Each design/type of self-contained emergency escape luminaire and exit sign shall be tested under the following conditions:

- (a) The test shall be conducted in an ambient temperature of 40 ± 2°C.
- (b) The emergency escape luminaire or exit sign shall be connected to a 50 Hz a.c. supply at 106% of the rated voltage.
- (c) The battery shall be disconnected and a short circuit of negligible impedance applied in place of the battery.

The test shall be continued for a period of 24 h and, during the test, there shall be no emission of flames nor molten material nor production of flammable gases. In addition, enclosures shall not have deformed to the extent that access to live parts is made possible by use of the standard test finger, as specified in AS/NZS 60598.1.

The battery charger need not be capable of normal operation after the completion of the test but failure of any component shall not affect conformance with the above.

D5 TEST FOR AUTOMATIC DISCHARGE TEST FACILITIES

Emergency escape luminaires and exit signs that are provided with self contained or centralized facilities for automatic discharge testing shall be subjected to the following additional test; the test shall be conducted at an ambient temperature of $25 \pm 5^{\circ}\text{C}$:

- (a) Connect the emergency escape luminaire or exit sign to the supply at rated voltage for a period of 16 h.
- (b) Initiate the automatic discharge test facility and independently monitor the elapsed time and light output.
- (c) Check that the time taken for the completion of the test and restoration of normal conditions conforms to the general system requirement in Section 4 of AS 2293.1.
- (d) Check that correct indication of operational status is provided both during and after the discharge test.
- (e) Simulate each of the following conditions, in turn, and check that the correct indications of operational status are provided:
 - (i) Operation of the battery low voltage cut off.
 - (ii) Failure of the emergency lamp(s).

**TABLE D1
HIGH TEMPERATURE TEST**

Nature of test	1	2	3	4	5	6	7
	Cycle No. 1		Cycle No. 2		Cycle No. 3		
Test duration	Charge	Discharge	Charge	Discharge	Charge	Discharge	
Test conditions	<p>(a) Ambient temperature 40 ±2°C</p> <p>(b) Mount in designed position*</p> <p>(c) Test voltage 106 ±1% of the rated voltage or of the highest marked voltage, where a voltage range is given</p> <p>(d) Frequency within ±1% of nominal or, if a frequency range is stated and if the frequency can have an adverse effect on battery performance, the frequency that results in the most onerous condition</p> <p>(e) For maintained emergency luminaires and combined emergency luminaires, all light sources that provide normal lighting to be illuminated (not a test condition—covered in test criteria)</p>	<p>(a) Ambient temperature 40 ±2°C</p> <p>(b) Mount in designed position*</p> <p>(c) For maintained emergency luminaires and combined emergency luminaires, all light sources that provide normal lighting to be switched off</p>	<p>As for Cycle No. 1 except that test voltage to be 94 ±1% of the rated voltage, or of the lowest marked voltage, where a voltage range is given</p>	<p>As for Cycle No. 1</p>	<p>As for Cycle No. 2</p>	<p>As for Cycle No. 2</p>	<p>As for Cycle No. 1</p>
Test duration	72 h	Until disconnected by cut off device	16 h	Until disconnected by cut off device	16 h	Until 15 min after disconnection by cut off device	

* If the luminaire or exit sign is designed for mounting in several alternative positions, the position adopted for the test shall be the one that will produce the highest temperature rise of components.

(continued)

TABLE D1 (continued)

1 Nature of test	2	3	4	5	6	7
	Cycle No. 1		Cycle No. 2		Cycle No. 3	
	Charge	Discharge	Charge	Discharge	Charge	Discharge
Test criteria	(a) Charge current and voltage shall be not more than recommended by cell manufacturer	(a) All emergency lighting light sources shall remain illuminated throughout the test.	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 2	As for Cycle No. 1 with the following addition:
	(b) Temperature of battery shall be less than or equal to that specified by the battery manufacturer	(b) Discharge current and voltage shall be not more than recommended by cell manufacturer.				Battery shall remain disconnected from load following operation of cut-off device
	(c) If a maintained LED light source(s) is used, the LED case temperature (T_s point) shall be measured and shall be less than or equal to the requirements of Clause 2.5. The temperature measurement point shall be as specified in the LM80 test report. The LED drive current shall also be measured, or derived from the total drive current for LED arrays, and shall not exceed the LED chip manufacturer's maximum limits	(c) Temperature of battery shall be less than or equal to that specified by the battery manufacturer.				
	(d) Indicating lights to function correctly	(d) If a LED light source(s) is used, the LED case temperature (T_s point) shall be measured and shall be less than or equal to the requirements of Clause 2.5. The temperature measurement point shall be as specified in the LM80 test report. The LED drive current shall also be measured, or derived from the total drive current for LED arrays, and shall not exceed the LED chip manufacturer's maximum limits				

(continued)

TABLE D1 (continued)

1 Nature of test	2		3		4		5		6		7	
	Charge		Discharge		Charge		Discharge		Charge		Discharge	
			(e) Measure and record battery voltage after operation for the initial duration specified in Section 2 of AS/NZS 2293.1:201X		As for Cycle No. 1		As for Cycle No. 1		As for Cycle No. 2		As for Cycle No. 1 with the following addition: Battery shall remain disconnected from load following operation of cut-off device	
			(f) Battery voltage at cut-off shall be not less than recommended by cell manufacturer. (See Clause 4.3.1.)		As for Cycle No. 1		As for Cycle No. 1		As for Cycle No. 2		As for Cycle No. 1 with the following addition: Battery shall remain disconnected from load following operation of cut-off device	
			(g) Monitor operation of cut off arrangement and record time of occurrence.									
			(h) Current drain on battery shall be not more than recommended by cell manufacturer. (See Clause 4.3.1.)									

(continued)

**TABLE D2
LOW TEMPERATURE TEST**

1 Nature of test	2		3		4		5		6		7	
	Charge		Discharge		Charge		Discharge		Charge		Discharge	
Test duration	16 h		Until disconnected by cut off device		16 h		Until disconnected by cut off device		16 h		Until 15 min after disconnection by cut-off device	
Test conditions	(a) Ambient temperature 10 ±2°C		(a) Ambient temperature 10 ±2°C									
	(b) Mount in designed position*		(b) Mount in designed position*									
	(c) Test voltage 94 ±1% of the rated voltage or of the highest marked voltage, where a voltage range is given		(c) For combined emergency luminaires, all light sources which provide normal lighting to be switched off									
	(d) Frequency within ±1% of nominal or, if a frequency range is stated and if the frequency can have an adverse effect on battery performance, the frequency that results in the most onerous condition											
	(e) For maintained emergency luminaires and combined emergency Luminaires, all light sources that provide normal lighting to be switched off											

* If the luminaire or exit sign is designed for mounting in several alternative positions, the position adopted for the test shall be the one that will produce the lowest temperature rise of components.

(continued)

TABLE D2 (continued)

1 Nature of test	2		3		4		5		6		7	
	Charge		Discharge		Charge		Discharge		Charge		Discharge	
Test criteria	(a) Charge current and voltage to be not more than recommended by cell manufacturer	(a) All emergency light sources shall remain illuminated throughout the test	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1	As for Cycle No. 1
	(b) Indicating lights to function correctly	(b) Discharge current and voltage to be not more than recommended by cell manufacturer	(c) Measure and record battery voltage after operation for the initial duration specified in Section 2 of AS/NZS 2293.1:201X	(d) Battery voltage at cut-off shall be not less than recommended by cell manufacturer. (See Clause 4.1.)	(e) Monitor operation of cut off arrangement and record time of occurrence	(f) Current drain on battery shall be not more than recommended by cell manufacturer. (See Clause 4.2.1)						

APPENDIX E
PROJECTION OF LIGHT SOURCE LIFE (LSL) IN LED EXIT SIGNS
 (Normative)

E1 PURPOSE

The purpose of the projection is to provide maintenance personnel with light source life expectancy data for installed exit signs for inclusion in the baseline data required for any installation.

E2 BASIS OF PROJECTION

The system described in this Appendix is for the projection of light source life in LED exit signs based on IES TM-21 methodology. It uses luminance data recorded as part of Clause 3 of this Standard, LED case temperature T_s and LED drive current recorded as part of Appendix D tests and LM-80 test report data for the LED employed. These are used as inputs in calculating the projected lumen depreciation life in exit signs (i.e. the lumen depreciation level that, when reached, would result in the sign being non-compliant with the minimum face luminance requirement of Clause 3).

E3 DATA REQUIRED

The following data is required to calculate the light source life:

- (a) The minimum luminance recorded for the green background (hereafter referred to as LG_{min}).
- (b) The minimum luminance recorded for the white foreground (hereafter referred to as LW_{min}).
- (c) The LED case temperature T_s measured in Appendix D.
- (d) The applicable IES LM-80 report for the LED employed.

E4 METHOD TO DETERMINE LIGHT SOURCE LIFE

E4.1 CALCULATION OF THE MINIMUM FACE LUMINANCE FACTOR

The method in Paragraphs E4.2 and E4.3 shall be used to determine the light source life.

E4.2 CALCULATION OF THE MINIMUM FACE LUMINANCE FACTOR

The maximum maintenance factor is the higher value calculated from both the formulae below:

$$8/LG_{min} = \text{green background luminance factor} \times 100$$

$$32/LW_{min} = \text{white foreground luminance factor} \times 100$$

The maximum of these two factors is used in the light source life calculations. The factor represents the percentage of luminance at which the sign will no longer comply, and is comparable to the LXX lumen depreciation used in general LED lighting.

For example, an LED exit sign has an LG_{min} of 12 cd/m^2 , and an LW_{min} of 60 cd/m^2 .

The green background luminance factor is—

$$8/12 \times 100 = 67$$

Therefore L67 is applicable to green.

The white background luminance factor is—

$$32/60 \times 100 = 53$$

Therefore L53 is applicable to white.

The maximum value is used in the light source life calculations. This is 67 or L67.

E4.3 CALCULATION OF THE LIGHT SOURCE LIFE

A recognized IES TM-21 calculation spreadsheet shall be used to perform the calculation.

The procedure shall be as follows:

Enter the appropriate edata into the spreadsheet. This includes the—

- (a) LM-80 data for the LED being assessed;
- (b) LED T_s temperature measured; and
- (c) operating current.

In the spreadsheet results table:

- (i) Vary the time (t) which estimates lumen maintenance hours (in steps of 1000 hours min) until the Lumen maintenance at time (t)%’ is within ± 2 of the value calculated in E4.1.
- (ii) Time (t) is the light source life in operating hours. Convert time (t) to an xxY/xxM format by rounding up or down to the nearest whole month.
- (iii) Include this value in the test report for Clause 3 requirements and express as ‘Light source life = xxY/xxM’.

Example:

For the purposes of this example, the Energy Star IES TM-21 calculator is used.

Insert into the IES TM-21 inputs sheet the following:

- (A) All appropriate (above) inputs.
- (B) At the cell marked ‘Percentage of initial lumens to project (e.g. for L70 enter 70):’ insert the appropriate value, e.g. 67 (found above).
- (C) In the cell marked ‘Time (t) at which to estimate lumen maintenance (hours):’ the time entered is varied until the cell marked ‘Lumen maintenance at time (t)%:’ reads the appropriate value within ± 2 , e.g. for 67 (65–69).

NOTE: The light source life is the time entered at ‘Time (t)’ rounded to the nearest thousand hours regardless of the time in the cell marked ‘Reported L67 (hours):’ This later cell is limited to 6 times LED test time due to known limitations in the formulae that are not a concern of this Standard.

BIBLIOGRAPHY

- AS
2752 Preferred numbers and their use (withdrawn)
- ISO
3864 Graphical symbols—Safety colours and safety signs
3864-1 Part 1:Design principles for safety signs and safety markings
3864-4 Part 4:Colorimetric and photometric properties of safety sign materials
- 7010 Graphical symbols—Safety colours and safety signs—Registered safety signs
- NZS
6104 Specification for emergency electricity supply in buildings
- ABCB
NCC National Construction Code 2016 (series)

AMENDMENT CONTROL SHEET

AS/NZS 2293.3:2018

Amendment No. 1 (2021)

REVISED TEXT

SUMMARY: This Amendment applies to the Preface, Clauses 1.3, 2.3, 2.4.1, 2.5, 2.7, 3.3.7.3, 3.4.1, 3.6.1, 4.3.1, 4.3.2, 4.4.1, 4.6, 5.3 and Table 3.1.

Published on 14 May 2021.

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