



Photoluminescent Lighting Council Standard

PLCS 101 – 2019

Photoluminescent Exit Signs

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PART A - DEFINITIONS

Charging Illuminance Level: means the level of illuminance required to charge a Standard PL Sign, being a minimum illuminance of 100 lux on the face of the sign, either from a Dedicated Light Source (with a colour temperature not less than 4000 K) or otherwise.

Dedicated Light Source: means a new or existing designated light source or designated group of light sources that are assigned to charge one or more Photoluminescent Exit Signs when natural daylight is below the Charging Illuminance Level.

Emergency Visibility Enhancement: means any arrangement of photoluminescent products that enhances emergency visibility and is included in the Installation Documentation. Examples include, but are not limited to, directional signs, low level signs, exit door marking.

Emergency Visibility System: means any system, photoluminescent, electrical or otherwise, that provides visibility in an emergency during failure of the normal lighting system.

Hybrid PL Exit Sign: means a type of Photoluminescent Exit Sign that incorporates an integrated electrical Dedicated Light Source.

Hybrid PL Luminance Test: has the same meaning as defined in ASTM E2073-10 except that Clause 6.1 is replaced with “Method of sampling - for each of 3 representative signs select an area of at least 30mm diameter of the visible photoluminescent portion of the pictorial elements in the sign that receives the least charging light or produces the least luminance”, and Clause 8.3 is replaced with “Activation - activate the 3 samples by connecting to the manufacturer recommended electricity supply for 60 minutes +/- 10 seconds”. A pass shall be a minimum luminance of 30 mcd/m² - for the average of the three samples - at 90 minutes.

Installation Documentation: means the documentation detailed in Part C, clause 2.1.

Lighting Control Systems: means any system, whether automatic, semi-automatic, or manual, that is designed to ensure that the necessary lighting to charge the photoluminescent materials/components is turned on when required, so that the photoluminescent system is sufficiently charged whenever the building is lawfully occupied.

Luminance Test: means either Standard PL Luminance Test or Hybrid PL Luminance Test as appropriate to the type of Photoluminescent Exit Sign.

Managing Entity: means the individual or entity managing the building.

Minor Defect: means a defect which does not cause the entire system to be ineffective. For example, an unclean or obstructed Photoluminescent Exit Sign or failure of a Dedicated Light Source.

Modified: means changed in a way that affects its functionality. For example, a luminaire included in a Dedicated Light Source is moved or replaced with a different type of luminaire.

Outstanding Defects: means those defects recorded from the previous inspection which remain unresolved.

Photoluminescent Exit Sign: means a sign intended to be used as an exit sign as required by the Relevant Building Code, comprising visually contrasting elements, specifically green or black elements and photoluminescent elements, whereby the photoluminescent elements continue to provide visual contrast with the green or black elements when the normal building lighting fails.

Qualified Person: means a person or entity qualified to carry out inspections of Photoluminescent Exit Signs and/or Emergency Visibility Systems.

Relevant Building Code: means the National Construction Code (Australia), the New Zealand Building Code or any applicable building code that specifies Photoluminescent Exit Signs.

Representative Sample: In relation to sampling installed signs in a building this means 1 of 10, 3 of 50 or 4 of 100, or part thereof, for each applicable environment. The chosen sample(s) must represent the most visually degraded signs for the applicable environment. In relation to sampling new (not installed) signs this means samples that the manufacturer or distributor confirms to be representative of a particular sign model or sign range.

Serious Defect: means a defect which causes the entire system to be ineffective. For example, a failed Luminance Test on a Representative Sample.

Standard PL Exit Sign: means a type of Photoluminescent Exit Sign that does not incorporate an integrated electrical Dedicated Light Source.

Standard PL Luminance Test: has the same meaning as defined in ASTM E2073-10 except that the activation illumination in clause 8.3 thereunder is replaced with 54 lux. A pass shall be a minimum luminance of 30 mcd/m² – for the average of the three samples - at 90 minutes.

UV Durability Test: is defined as,

ASTM G 155-2004, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.

1. Test the luminance performance of only 2 Representative Samples of the photoluminescent material used in the installed Photoluminescent Exit Sign(s) as per Luminance Test. (This is an exception to ASTM E2073-10 which stipulates 3 or more samples to be tested.)

2. The 2 specimens shall be exposed for a period of 1000 hours in accordance with ASTM G 155. The specimens shall be subjected to Cycle 1 exposure condition noted in Table X3.1 of such standard.
3. After conclusion of the weathering exposure, such laboratory shall directly send the specimens to the luminance performance testing laboratory.
4. The luminance performance testing laboratory shall perform a Luminance Test. The specimens shall both indicate a luminance of at least 30 mcd/m² at 90 minutes.

1000 Hour UV Durability Test: means the tests defined by UV Durability Test.

2000 Hour UV Durability Test: means the tests defined by UV Durability Test but the exposure time is 2000 hours OR the same samples are subjected to two consecutive 1000 Hour UV Durability Tests.

3000 Hour UV Durability Test: means the tests defined by UV Durability Test but the exposure time is 3000 hours OR the same samples are subjected to three consecutive 1000 Hour UV Durability Tests.

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PART B – PRODUCT SPECIFICATION

SECTION 1 - PRINCIPLES

1.1 Scope

This standard sets out the product specifications for Photoluminescent Exit Signs intended for identifying exits and paths to exits in and around buildings in all conditions of foreseeable use including in an emergency. The standard applies to all Photoluminescent Exit Signs installed to meet the Relevant Building Code.

1.2 Objective

The objective of this standard is to define the product specifications of Photoluminescent Exit Signs, including Standard PL Exit Signs and Hybrid PL Exit Signs, to ensure that exits and paths to exits are identified as required by the Relevant Building Code.

1.3 Application

This standard details the product specifications required for Photoluminescent Exit Signs, and requires that all Photoluminescent Exit Signs are specified, tested and labelled accordingly.

1.4 Referenced Documents

This standard refers to the following regulations or codes:

- a. National Construction Code 2016, Volume 1 “Building Code of Australia, Class 2 to Class 9 Buildings” (NCC).
- b. New Zealand Building Code Clause F8 Signs, 2nd edition, amendment 4, 1 January 2017 (NZBC).
- c. ASTM G155-2013 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
- d. ASTM E2073-10 Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings.
- e. AS/NZS 60598.1 Luminaires Part 1: General Requirements and Tests.
- f. AS/NZS IEC 61347 Lamp Controlgear.
- g. AS/NZS CISPR 15 Limits and Methods of Measurement of Radio Disturbance Characteristics of Electrical Lighting and Similar Equipment.

1.5 Definitions

All defined terms are contained in Part A of this standard.

SECTION 2 - PERFORMANCE REQUIREMENTS

2.1 Testing - Standard PL Exit Sign

To ensure that a Standard PL Exit Sign has sufficient performance to be suitably visible when the normal lighting fails it shall have its performance verified by testing as defined by Standard PL Luminance Test.

2.2 Testing - Hybrid PL Exit Sign

To ensure that a Hybrid PL Exit Sign has sufficient performance to be suitably visible






when the normal lighting fails it shall have its performance verified by testing as defined by Hybrid PL Luminance Test.

SECTION 3 - GRAPHICAL REQUIREMENTS

3.1 Graphical Details

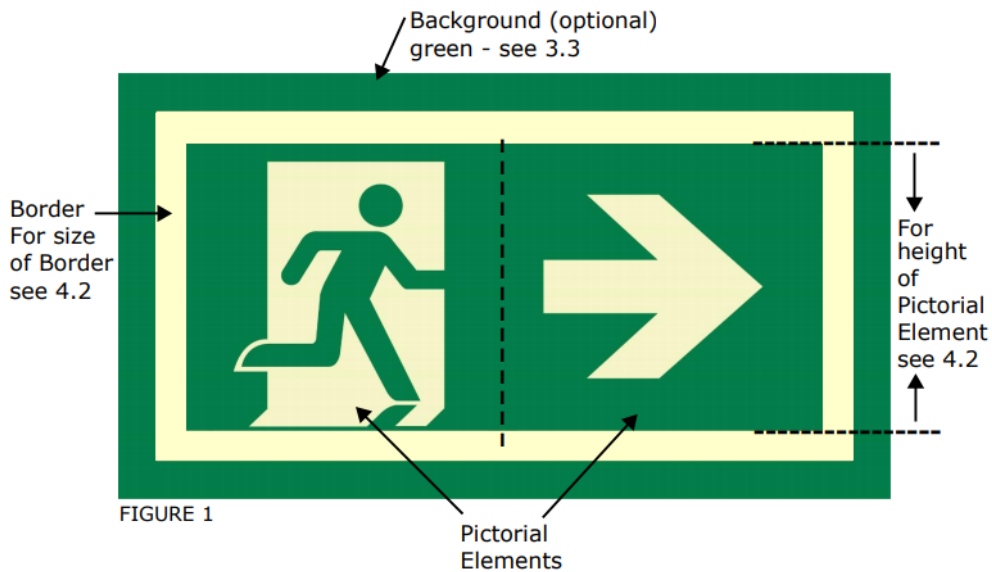
A Photoluminescent Exit Sign shall use the pictorial elements and meanings detailed in Table 1 below.

TABLE 1

Sign Graphics	Meaning	Width – Height Ratio
	Straight on from here	2:1
	Left from here	2:1
	Right from here	2:1
	Left from here	1:2
	Right from here	1:2

3.2 Graphical Dimensions

A Photoluminescent Exit Sign shall have dimensions as detailed in Figure 1.



3.3 Sign Colour

- (a) The pictorial elements and background of a Photoluminescent Exit Sign shall be coloured green as defined by ISO 3864-1 or as defined by the Relevant Building Code.
- (b) All other areas of a Photoluminescent Exit Sign shall be the colour of the photoluminescent material.
- (c) Where a Hybrid PL Exit Sign is installed in a room or area which normally has low levels of illumination the areas coloured green may be coloured black.

3.4 Identification and Markings

- (a) Photoluminescent Exit Signs shall include text in the border no less than 3mm in height and no greater than 8mm in height which details:
- (i) Maximum viewing distance.
 - (ii) Product number.
- (b) Photoluminescent Exit Signs may include text in the border no greater than 8mm in height which details:
- (i) Classification code as detailed in Section 5.
 - (ii) Website for further information.
 - (iii) Other information relevant to the specification or operation of the sign.

SECTION 4 - VIEWING DISTANCE REQUIREMENTS

4.1 Maximum Viewing Distance

The maximum viewing distance for a Photoluminescent Exit Sign shall be determined by the pictorial element height.

4.2 Pictorial Element Height

- (a) Photoluminescent Exit Signs with a pictorial element height up to 260mm shall have a maximum viewing distance as detailed in Table 2.

TABLE 2

Maximum Viewing Distance	Minimum Pictorial Element Height	Minimum Border
16m	130mm	15mm
24m	195mm	15mm
32m	260mm	20mm

(b) For Photoluminescent Exit Signs with a pictorial element height greater than 260mm, the maximum viewing distance shall be calculated by the following equation:

$$\text{Maximum Viewing Distance(m)} = 0.123 \times \text{Pictorial Element Height(mm)}$$

(c) For Photoluminescent Exit Signs with a pictorial element greater than 260mm the minimum border shall be calculated by the following equation:

$$\text{Minimum Border(mm)} = \text{Pictorial Element Height(mm)} \times 0.077$$

SECTION 5 - CLASSIFICATION OF PHOTOLUMINESCENT EXIT SIGNS

5.1 Classification Codes

(a) Photoluminescent Exit Signs shall be classified according to the intended use environment and intended service life.

(b) Table 3 details the testing required to declare each classification code.

(c) Hybrid PL Exit Signs intended for outdoor use must also undergo appropriate electrical safety testing as detailed in Section 6.

TABLE 3

Classification Code	Intended Environment	Intended Service Life	Required Test
I5	Indoors	5 Years	None
I30	Indoors	30 Years	1000 Hour UV Durability Test
X5	Outdoors	5 Years	1000 Hour UV Durability Test
X10	Outdoors	10 Years	2000 Hour UV Durability Test
X15	Outdoors	15 Years	3000 Hour UV Durability Test

SECTION 6 - PARTICULAR REQUIREMENTS FOR HYBRID PHOTOLUMINESCENT EXIT SIGNS

6.1 Electrical Safety Testing

Hybrid PL Exit Signs with LED light sources and electronic drivers shall be tested in accordance with:

AS/NZS 60598.1 Luminaires Part 1: General Requirements and Tests; and

AS/NZS IEC 61347 Lamp Controlgear Part 1 and Part 2.13

Or the equivalent tests as required by the Relevant Building Code.

6.2 Electromagnetic Compatibility Testing

Hybrid PL Exit Signs with LED light sources and electronic drivers shall be tested in accordance with:

AS/NZS CISPR 15 Limits and Methods of Measurement of Radio Disturbance Characteristics of Electrical Lighting and Similar Equipment.

Or the equivalent test as required by the Relevant Building Code.

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PART C - INSPECTION AND MAINTENANCE

SECTION 1 - PRINCIPLES

1.1 Scope

This standard sets out the periodic inspection and maintenance procedures necessary to ensure that Photoluminescent Exit Signs continue to meet the requirements of the Relevant Building Code. The standard applies to all Photoluminescent Exit Signs installed to meet the Relevant Building Code.

1.2 Objective

The objective of this standard is to define the frequency and process for the periodic maintenance of Photoluminescent Exit Signs to ensure that exits and paths to exits are identified.

1.3 Application

This standard details the periodic inspection and maintenance procedures required for Photoluminescent Exit Signs and requires that inspection outcomes are recorded accordingly.

1.4 Referenced Documents

This standard refers to the following regulations or codes:

- a. National Construction Code 2016, Volume 1 “Building Code of Australia, Class 2 to Class 9 Buildings” (NCC).
- b. New Zealand Building Code Clause F8 Signs, 2nd edition, amendment 4, 1 January 2017 (NZBC).
- c. ASTM G155-2013 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
- d. ASTM E2073-10 Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings.

1.5 Definitions

All defined terms are contained in Part A of this standard.

SECTION 2 - FUNDAMENTAL REQUIREMENTS

2.1 Installation Documentation

The following documents are required to be collated by a Qualified Person and/or the Managing Entity on or before the initial installation of any Photoluminescent Exit Sign(s):

- a. Plan detailing the location, brand and model number of the Photoluminescent Exit Sign(s), the installation date of the Photoluminescent Exit Sign(s), the location and type of each luminaire in a Dedicated Light Source and detail of the location of any Emergency Visibility Enhancements.

- b. Details of any Lighting Control Systems.
- c. Luminance Test report(s) traceable to the Photoluminescent Exit Signs as new.
- d. UV Durability Test reports (if available).

The UV Durability Test reports can be provided as an addition to Installation Documentation after installation.

A Qualified Person and/or the Managing Entity shall update the Installation Documentation if any Photoluminescent Exit Signs are replaced or any Dedicated Light Source is Modified or any Lighting Control Systems are Modified.

2.2 Periodic Inspection and Maintenance

Photoluminescent Exit Signs shall be inspected and maintained by a Qualified Person in accordance with the relevant provisions of this standard.

2.3 Periodic Inspection and Maintenance Records

Inspection and maintenance records, as detailed in Section 3 Required Reporting and Records, shall be kept up to date and be accessible at the installation site.

2.4 Frequency of Inspection and Maintenance Procedures

The date of the periodic inspection and maintenance may be advanced or extended by agreement in writing between the Managing Entity and the Qualified Person. However, such advance or extension shall not exceed 14 days for a six month inspection, 21 days for a one year inspection, and 30 days for a 5 year inspection.

SECTION 3 - REQUIRED REPORTING AND RECORDS

3.1 Summary Report

At the completion of the inspection the Qualified Person or representative of the Managing Entity shall provide the Managing Entity with a summary report detailing any unresolved Serious Defects for immediate remedy.

3.2 Detailed Report

Within 72 hours of the inspection the Qualified Person shall provide the Managing Entity with a detailed report containing the following:

- a. Name and/or address of the installation.
- b. Inspection frequency
- c. Inspection date
- d. Applicable building code reference
- e. Serious Defects
- f. Minor Defects
- g. Outstanding Defects
- h. Managing Entity details
- i. Qualified Person details

(NOTE: Example of Detailed Report is contained in Appendix 1.)

SECTION 4 - INSPECTION AND MAINTENANCE PROCEDURES

4.1 Required Inspection and Maintenance Procedures

The inspection and maintenance procedures shall be carried out by a Qualified Person at the frequency and as detailed in Section 4 of this standard.

4.2 Six-monthly Procedures

- a. Refer to the Installation Documentation and check whether the Photoluminescent Exit Signs are in place, legible, not materially damaged, and not obstructed. Fix or report all Minor Defects and all Serious Defects.
- b. Refer to the Installation Documentation and check whether all Dedicated Light Sources are operational and have had no unauthorised alterations. Fix or report all Minor Defects and all Serious Defects.
- c. If there is any visible accumulation of dust or other deposits on the face of the Photoluminescent Exit Sign then clean in accordance with manufacturers cleaning instructions.
- d. Refer to the Installation Documentation and check whether all Lighting Control Systems are operating as designed. Fix or report all Minor Defects and all Serious Defects.

(NOTE: Example of Six-monthly Inspection is contained in Appendix 2.)

4.3 Annual Procedures

- a. Repeat six-monthly procedures detailed in 4.2.
- b. Photoluminescent Exit Signs installed outdoors:
 - i. If no UV Durability Test has been completed (check the Installation Documentation) then complete a Luminance Test on a Representative Sample.
 - ii. If the Photoluminescent Exit Sign(s) has passed the 1000 Hour UV Durability Test (but not a longer UV Durability Test) and the sign(s) has been installed for 5 years or more then complete a Luminance Test on a Representative Sample.
 - iii. If the Photoluminescent Exit Sign(s) has passed the 2000 Hour UV Durability Test (but not the 3000 Hour UV Durability Test) and the sign(s) has been installed for 10 years or more then complete a Luminance Test on a Representative Sample.
 - iv. If the Photoluminescent Exit Sign(s) has passed the 3000 Hour UV Durability Test and the sign(s) has been installed for 15 years or more then complete a Luminance Test on a Representative Sample.
 - v. If in (i) to (iv) above a Luminance Test is indicated but no Luminance Test is undertaken or the test result is a fail then replace the Photoluminescent Exit Sign(s).

(NOTE: Example of Annual Inspection is contained in Appendix 3.)

4.4 Five Yearly Procedures

- a. Repeat six-monthly procedures detailed in 4.2.
- b. Photoluminescent Exit Signs installed indoors:
 - i. If no UV Durability Test has been completed then complete a Luminance Test on a Representative Sample.
 - ii. If the Photoluminescent Exit Sign(s) has passed the 1000 Hour UV Durability Test and the sign(s) has been installed for 30 years or more then complete a Luminance Test on a Representative Sample.
 - iii. If in (i) or (ii) above a Luminance Test is indicated but no Luminance Test is undertaken or the test result is a fail then replace the Photoluminescent Exit Sign(s).

(NOTE: Example of Five Yearly Inspection is contained in Appendix 4.)

APPENDIX 1

Photoluminescent Exit Signs
 Example of Detailed Inspection & Maintenance Report

Photoluminescent Exit Signs – Inspection and Maintenance Report

Building Details

Name of Building: Name of Owner:

Address: Managing Entity:

Inspector Details (Must be a Qualified Person as per 4.1 of Standard)

Name of Inspector: Position/Title:

Address of Inspector: Date of inspection:

Indoor/Outdoor Signs (circle which applies)

6 Monthly Check/Annual Check/5 Yearly Check (circle which applies)

Defects identified during inspection	Action required to rectify defect	Date action completed	Signature

APPENDIX 2

Six-monthly Inspection and Maintenance Checking Procedures for Photoluminescent Signs **Completed**

- There has been no change to the configuration of the building which renders the marked escape routes unusable.
- All signs are still configured as at installation and there is no material damage to any of the signs.
- All signs are clean from general dust build up and any other specific obscuring deposits.
- All signs are clearly visible and have not been covered up.
- All dedicated light sources checked that the positions have not altered from design.
- All dedicated light sources are in working order and clean.
- All automated lighting control systems are operational as per design.

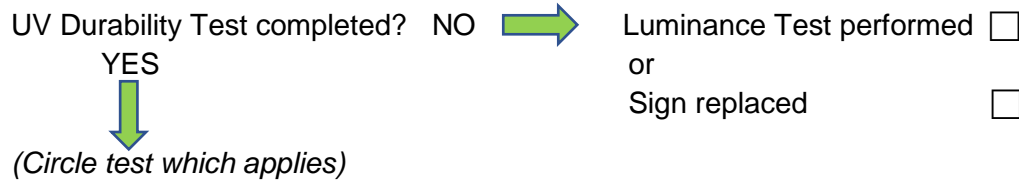
APPENDIX 3

Annual Inspection and Maintenance Checking Procedures for Photoluminescent Signs

Completed

- There has been no change to the configuration of the building which renders the marked escape routes unusable.
- All signs are still configured as at installation and there is no material damage to any of the signs.
- All signs are clean from general dust build up and any other specific obscuring deposits.
- All signs are clearly visible and have not been covered up.
- All dedicated light sources checked that the positions have not altered from design.
- All dedicated light sources are in working order and clean.
- All automated lighting control systems are operational as per design.

If signs are positioned outdoors, the following procedures also apply:



1000 hr UV Durability Test

Signs have been installed 5 years or more – luminance test performed

Not applicable

2000 hr UV Durability Test

Signs have been installed 10 years or more - luminance test performed

Not applicable

3000 hr UV Durability Test

Signs have been installed 15 years or more - luminance test performed

Not applicable



APPENDIX 4

Five Yearly Inspection and Maintenance Checking Procedures for Photoluminescent Signs

Completed

- There has been no change to the configuration of the building which renders the marked escape routes unusable.
- All signs are still configured as at installation and there is no material damage to any of the signs.
- All signs are clean from general dust build up and any other specific obscuring deposits.
- All signs are clearly visible and have not been covered up.
- All dedicated light sources checked that the positions have not altered from design.
- All dedicated light sources are in working order and clean.
- All automated lighting control systems are operational as per design.

If signs are positioned indoors, the following procedures also apply:

UV Durability Test completed? NO  Luminance Test performed
 YES or
 Sign replaced

1000 hr UV Durability Test

Signs have been installed 30 years or more – Luminance Test completed

Not applicable

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