

NZIA CPD Presentation

Ecoglo Photoluminescent Solutions

to meet

NZBC F8 'Signs'

and

NZBC F6 'Visibility in Escape Routes'

 ecoglo®
VISIBLY BETTER

Ecoglo Photoluminescent Solutions



Background

Company Profile

- Ecoglo is a New Zealand manufacturer based in Christchurch which has been designing and installing engineered solutions since 1997 to meet the NZ building code.
- Ecoglo's proprietary manufacturing process involves embedding customised glow pigments in customised polyester carriers to integrally bond the active ingredients into aluminium following heat curing at 180°C.
- Ecoglo products have been designed for outdoor durability and high visibility.
- Ecoglo products comprise rapid charge and high specification.



Ecoglo Photoluminescent Solutions



Worldwide Installations

All products are manufactured and supplied from Christchurch, New Zealand.

Listed here is a range of some of Ecoglo's international projects:

- Sydney Olympic Arena
- Time Warner Center (NYC)
- London Underground
- Burj Khalifa, Dubai (pictured)* – 12,000 steps
- Singapore Supreme Court
- St Louis Metro
- Wellington Hospital
- Royal Navy vessel refits
- Yamuna Sports Complex (New Delhi)

*The line shown indicates the height of the Auckland Sky Tower.

Suitable Building Types

- Schools
- Early childcare centres
- Typical tilt slab warehouse with office
- Multi storey buildings with stairs
- Factories
- Storage facilities
- Hospitals & medical centres
- Large DIY retail outlets
- Arenas, stadiums, public assembly facilities



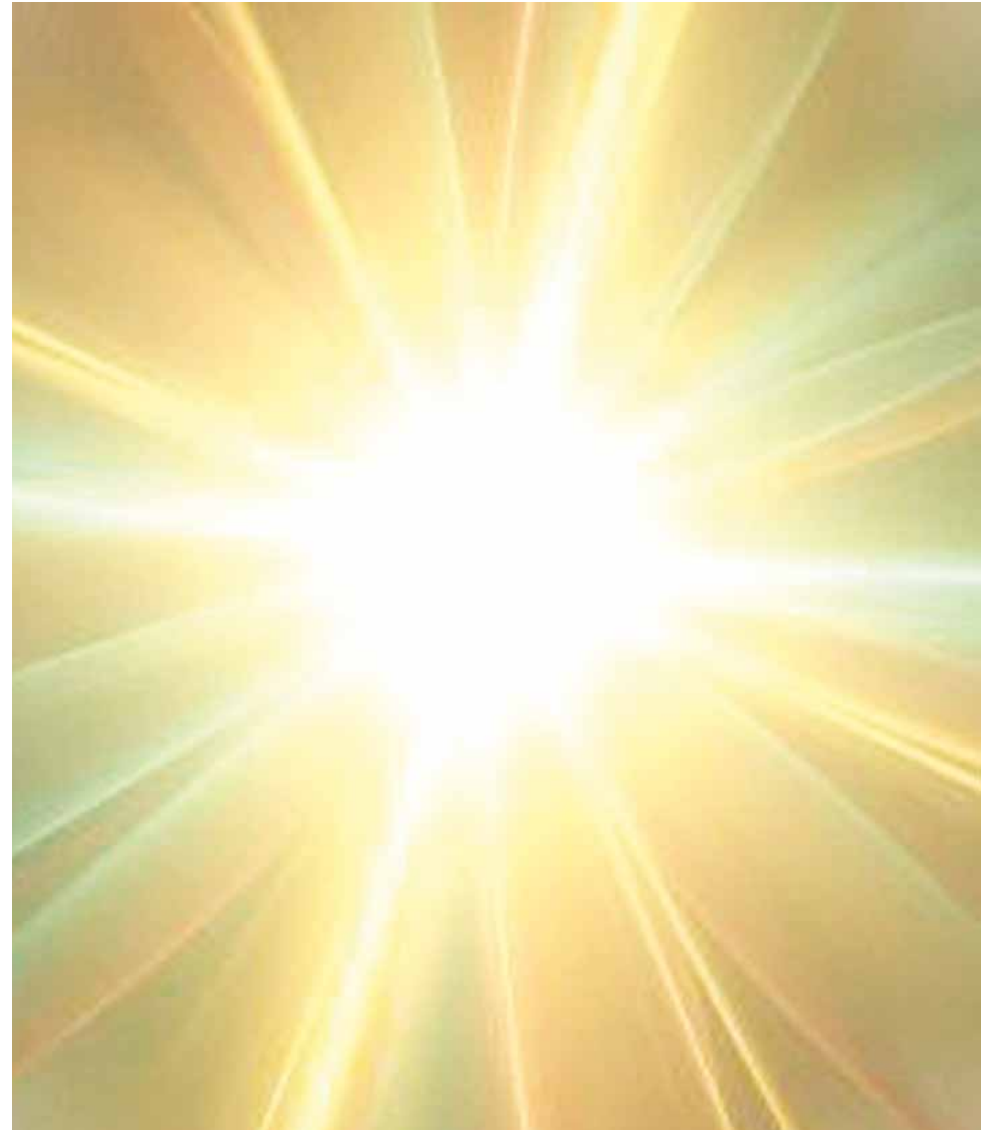
Technical Background

What is photoluminescence?

- Photoluminescence is the ability of a material to be charged up by light and then glow for a long time after the charging light has been turned off.
- Made from mined earth elements and commonly known as PLM (**P**hoto**L**uminescent **M**aterial) or PL (**P**hoto**L**uminescent)
- Absorbs light and UV rays then re-emits as visible light
- The light that charges the PL can be either artificial or natural light

Another term used instead of photoluminescence is “long afterglow phosphorescence”, because the only difference between a phosphor, as used on the surface of many electrical lamps (eg fluorescent, most LED, and most metal halide), and a photoluminescent material, is the time delay between receiving incident radiation and the emission of the useful light.

For normal phosphors the time delay is normally measured in fractions of a second, whereas with photoluminescent phosphors the delay ranges from fractions of a second through to hours and even days. It is this feature which is utilized to make materials that glow for a useful time after normal lighting is extinguished. The brightness and the time of the useful glow depend on the properties of the photoluminescent material itself, as well as the type of light that is being used to “charge” the phosphor, the brightness of that charging light, and the charging time.



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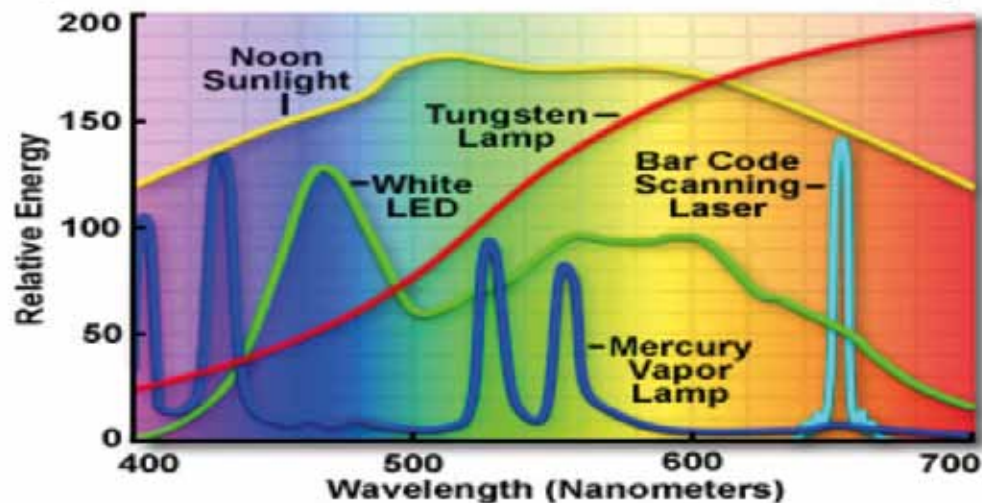


Technical Background

What type of light is suitable to charge PLM?

- PLM is typically charged up by wavelengths from 315nm (nanometers) through to 475nm, i.e. mid-blue through to UV-through-window-glass.
- Any lights with a colour temperature of 4000K or greater are good charging sources

Spectra From Common Sources of Visible Light



White electric lamps are specified by colour temperature.

A low colour temperature (2700K-3500K) produces noticeably yellow light, often called 'warm white'.

A medium colour temperature (3500K-5000K) produces less yellow light, often called 'cool white'.

A high colour temperature (5000K-6500K) produces a non-yellow light, often called 'daylight' (the sun in the middle of the day provides light at around 6500K).

Low colour temperature lamps usually do not have as much emission in the 315-475nm range as medium and high colour temperature lights, so are not as good at charging PLM. Conversely, high colour temperature lamps are normally very good at charging PLM.

International standards such as ASTM E2073 Standard Test Method for Photopic Luminance of Photoluminescent Markings, and UL924 Exit Signs specify a fluorescent charging lamp of approximately 4000K colour temperature. This is typical of most office, commercial, and industrial lighting.

Current technology LED lamps usually do not have any UV emissions, but their emissions in the violet-blue region (400-475nm) are sufficient for useful charging of PLM, especially those of medium and high colour temperatures.



NZBC F8 Signs

Key Provisions

- F8.1 Objective – to safeguard people from injury
- F8.2 Functional Requirement – to identify escape routes, emergency related safety features, potential hazards and accessible routes
- F8.3 Performance - Signs must be clearly visible and readily understandable under all conditions of foreseeable use, including emergency conditions

Clearly Visible for the purposes of Clause F8 and in relation to a sign means the nearest such sign is visible and readable at the maximum distance from which it needs to be viewed, to a person who either does not have a visual impairment, or uses corrective lenses.

F8/AS1 Clause 4.5.4

Photoluminescent signs shall, in the event of a power failure, continue to provide a minimum luminance of 30 mcd/m² for the duration prescribed in NZBC Clause F6 whenever the building/space is occupied.

Illumination for charging the photoluminescent signage shall be not less than 100 lux and suitable for charging photoluminescent material.

Suitable charging lamps: 4000K minimum colour temperature

- Cool white, daylight fluorescent tubes
- LEDs
- Metal Halides

What is the difference between Ecoglo code compliant signs and any others?

- Ecoglo designs and manufactures Ecoglo signs in New Zealand, to meet NZ conditions, and to meet the NZ building code.
 - Ecoglo products are backed up by a professional design and specification team, familiar with the NZ building code environment.
 - All Ecoglo products are aluminium based which allows for long life economic sustainability.
 - Ecoglo signs have a proven track record, installed in compliance with the NZ building code in thousands of buildings since 2010.
-
- ∅ Ecoglo PL technology is designed, tested, and proven to be suitable for long term use outdoors, and is expected to last the life of the building when installed indoors
 - ∅ Ecoglo signs are the brightest, quickest to charge, and longest glowing PL signs available.
 - ∅ We know of no other PL sign in the NZ market that could be relied on to meet any of the above.

Ecoglo Photoluminescent Solutions



Key Benefits of Ecoglo Signs

- Ecoglo signs require no maintenance, i.e. no bulbs and no batteries to check or change. This allows for substantial financial savings for building owners and managers.
- There is no documented failure of PL technology in the world, where they have been correctly installed.
- If a blackout occurs and lasts for 2 hours, Ecoglo signs will require approximately 2 – 3 minutes to re-charge to the level required by code.
- Ecoglo signs cannot fail to operate if they have been in a lit environment – occupied spaces are always lit

Note: A powered/battery back-up sign will require many hours to re-charge to full rated capacity. Consider what may happen if the mains supply is lost within that time and the building needs to be evacuated!



30 Year Maintenance Cost Estimate for 1000 EXIT signs

Electrical battery back up signs

Initial Capital Cost:

1000 signs @ approximately \$500 per unit = \$500,000

The average life time of each sign is 5 years which will result in around 200 signs being replaced annually.

200 units @ \$300 (installed price) = \$60,000

Total Maintenance Cost over 30 years = \$1,800,000

Ecoglo PL signs

Initial Capital Cost:

1000 units @ \$60each = \$60,000

The figure above is a one off cost as no signs will require replacing or costly maintenance (see maintenance requirements on next page).

Total Maintenance Cost over 30 years = \$0

Summary

Without taking into account the substantial capital cost savings of using Ecoglo signs, the savings in maintenance costs alone amount to \$1,800,000 over 30 years!

Ecoglo Photoluminescent Solutions



Maintenance

F8 'Signs' Compliance Checklist

6 Monthly Maintenance Check

(to be carried out by the Owner or their appointed agent)

Action

Complete

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 lights checked that the positions have not altered from design.



All lights are in working order and clean.



All automated lighting control systems are operational as per design.



Inspection

F8 'Signs' Compliance Checklist

Annual Inspection

(to be carried out by an IQP)

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Ecoglo Photoluminescent Solutions



What advantages can PL Exit signs offer over electrical exit signs?



Smaller environmental footprint with whole of life economic sustainability.

Reliability – Provided the Ecoglo sign has been installed as per instructions, it will always work.

Electrical Signs are not fail-safe. If there is a failure of the mains power supply, it can take many hours to re-charge the batteries.

What happens if the battery fails just after having passed its regular check? In this case it may take up to 6 months before this problem is found.

Examples of electrical emergency lighting failures

2008 Toronto Black-out – Survey showed 1 in 3 electrical emergency lighting systems failed

2011 Christchurch Earthquake – Christchurch Hospital experienced electrical emergency lighting failure

2014 North Island Outage – Hastings Hospital experienced electrical emergency lighting failure

Everybody in the industry knows that electrical exit signs are not fail-safe, even if maintained properly.

An independent survey in Georgia, USA, found that 27% of exit fixtures failed a functionality test.

If there is a blackout lasting 2 hours or more, properly maintained battery-back-up fixtures will take up to 16 hours to recharge.

What happens if people return to the building when the lights come back on, but the exit fixtures haven't re-charged?

Remember, every time the regular discharge testing is done, the building will have to be locked off from occupants for up to 16 hours before the battery is fully charged and the sign compliant again.

What happens if this testing can't be performed during the weekend?



NZBC F6 Visibility in Escape Routes

- ‘Visibility’ rather than illumination now referred to
- F6 requires lighting systems, other systems, or both
- Defined terms:

Specified features **Reasonably visible**

F6.3.1 *Specified features* in escape routes must, when the systems for visibility are at their design level, be *reasonably visible*.

Specified features

- Stairs and ramps
- Safety features required by NZBC e.g. handrails as required by D1; F4
- Changes in direction
- Escape doors
- Entries to a safe place
- Obstructions

Reasonably visible

Reasonably visible in relation to a specified feature and for the purposes of Clause F6, means that the specified feature is visible to a person who:

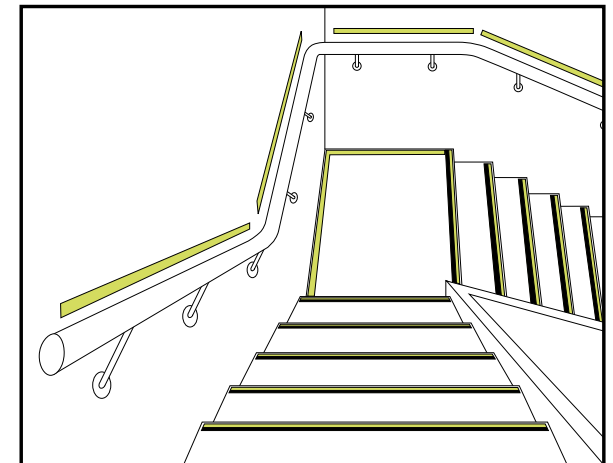
- (a) is 10 metres from it, or the greatest distance from it that it is possible to go in the open space surrounding it, whichever is the lesser; and
- (b) has sight that is not defective, or is corrected (for example, by an optical appliance).

Ecoglo Photoluminescent Escape Path Markings

- Ecoglo designs and manufactures Ecoglo markings in NZ, to meet NZ conditions, and to meet NZ building code.
- Ecoglo PL technology is designed, tested, and proven to be suitable for long term use outdoors, and is expected to last the life of the building when installed indoors.
- Ecoglo escape path markings will always meet the NZ building code in outdoor situations 24/7.
- Ecoglo products are backed up by a professional design and specification team, familiar with the NZ building code environment.
- Ecoglo markings have a proven track record, installed to NZ building code regulations, in and around hundreds of buildings since 2000.

Example of stairway marked up for NZBC F6 compliance

Various PL products make ‘specified building features’ visible when the mains lighting fails.



Ecoglo Emergency Lighting Design

Engineered Solution – (not AS/1)

- 100s of buildings have been approved for a photoluminescent design
- Buildings such as schools, warehouses, multi-storey buildings with stairs, pre-schools and kindergartens, hospitals, DIY outlets and general retail
- Any outdoor area of an escape route, particularly with a change of level, as Ecoglo will remain “reasonably visible” till daylight the next day
- A 3-4 step change of level is a simple example of where suited

For comparison consider the cost of wiring electrical emergency lighting, plus the ongoing maintenance, plus the cost of step nosings to comply with D1 “Access” VERSUS 3-4 Ecoglo step nosings that will comply with F6/D1/B2 for a cost of less than \$250.

Ecoglo F6 Design Process

Alternative Solution

- Fire Report sent to Ecoglo plus Lighting Plan
- Design undertaken by Ecoglo Engineer
- PS1 signed off by Ecoglo Engineer
- Documents sent to BCA for Consent
- When job is completed, an inspection is carried out to ensure installation is as per PS1 design.
- Ecoglo Engineer will finalise with sign off of PS4

The process taken to obtain a design needs to be undertaken by an IPENZ registered engineer who is recorded on the Auckland Council accredited authors list.

The following pages are examples of designs prepared by an Ecoglo Engineer.

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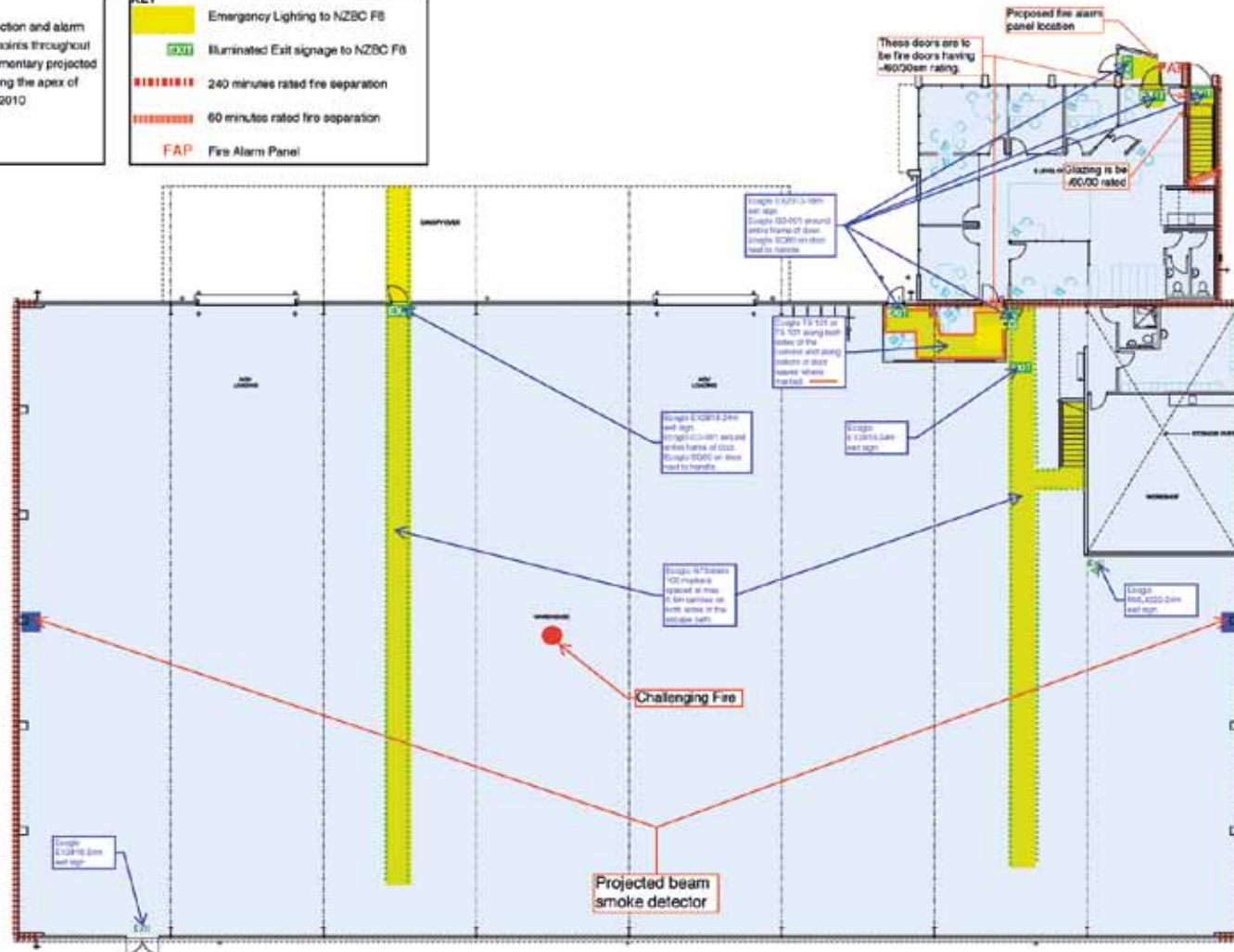
The design and its details are the property of Ecoglo. It shall not be reproduced, in whole or in part, without the written consent of Ecoglo.

NOTE
Install a Type 3 heat detection and alarm system with manual call points throughout the building and a supplementary projected beam smoke detector along the apex of warehouse to NZS 4512:2010

KEY

	Emergency Lighting to NZBC F8
	Illuminated Exit signage to NZBC F8
	240 minutes rated fire separation
	60 minutes rated fire separation
	Fire Alarm Panel

ALL Ecoglo COMPONENTS MUST BE INSTALLED IN ACCORDANCE WITH Ecoglo INSTALLATION INSTRUCTIONS



100/00 Fire Plan overall page 1 of 3

OVERALL FLOOR PLAN



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Traditional Emergency Lighting

The image on this page illustrates that the installed outdoor electrical emergency lighting will not provide 1 lux on each change of level as required by the building code.

Cost disadvantages in comparison to a PL code compliant design:

- the initial capital cost of the twin spotlight unit
- the installation cost of the electrical wiring required for a separate emergency lighting circuit
- on-going maintenance costs of the lamps and battery

Important note:

Code compliant Ecoglo PL nosings could have been used in lieu of the installed step edge contrast product for approximately the same cost. However, the advantage of an Ecoglo product is that it will comply with 3 sections of the NZ building code, i.e. B2; D1; and F6.

B2 requires that Building Elements must continue to meet the Building Code for (the lesser of) the life of the building, or:

5 years if those elements are easy to access and replace, and failure would be easily detected during normal use of the building; or

15 years if those elements are easy to access and replace, but failure would go undetected during normal use of the building (but be easily detected during normal maintenance).

D1 requires that Access Routes have stair treads with a leading edge that can be easily seen and have adequate slip-resistant walking surfaces under all conditions of normal use.



Ecoglo Photoluminescent Solutions



Maintenance

F6 'Visibility in Escape Routes' Compliance Checklist
6 Monthly Maintenance Check
(to be carried out by the Owner or their appointed agent)

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All products are clean from general dust build up and any other specific obscuring products.	<input checked="" type="checkbox"/>
All products are clearly visible and have not been covered up by carpet or other materials.	<input checked="" type="checkbox"/>
All products mark a clear path and have not been obstructed by physical hazards such as trolleys, machinery, partitions, etc.	<input checked="" type="checkbox"/>
All lights checked that the positions have not altered from design.	<input checked="" type="checkbox"/>
All lights are in working order and clean.	<input checked="" type="checkbox"/>
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Inspection

F6 'Visibility in Escape Routes' Compliance Checklist
Annual Inspection
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The checklists above highlight the negligible volume of cost-free maintenance required of Ecoglo products.

NZGBC Green Star V3

Where does PL design fit?

‘Innovation Challenge’

- This category has been included to recognise initiatives that don't currently fit in to the Green Star 4 category model.
- The New Zealand Green Building Council (NZGBC) believe the ‘Innovation Challenge’ category is important to encourage and recognise any environmental, social and economic sustainability initiatives.

The Innovation Challenge process:

- to encourage a project team to perform a holistic whole-of-building, whole-of-life assessment of their project to establish a life cycle assessment (LCA).
- Compare the results of the LCA to a reference case. Points are awarded based on the extent of environmental-impact reduction in 6 available categories.

F6 & F8 Design Product Enhancements for 2016

- Custom architectural **black** step nosings
- Custom architectural **blue** photoluminescent strip
- Side and top **mounting brackets** for signs – enhancements on existing brackets
- **Hybrid signs** for areas that do not have the required lighting for charging a standard Ecoglo pl sign

