

Australian/New Zealand Standard™

Lighting for roads and public spaces

Part 6: Luminaires



AS/NZS 1158.6:2010

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee LG-002, Lighting for roads and public spaces. It was approved on behalf of the Council of Standards Australia on 16 December 2009 and on behalf of the Council of Standards New Zealand on 23 December 2010.
This Standard was published on 5 February 2010.

The following are represented on Committee LG-002:

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This Standard was issued in draft form for comment as DR 09007.

Australian/New Zealand Standard™

Lighting for roads and public spaces

Part 6: Luminaires

Originated in Australia as AS 3771—1990.
Originated in New Zealand as NZS 6705.2.3:1986.
AS 3771—1998 and NZS 6705.2.3:1986 jointly revised, amalgamated
and redesignated as AS/NZS 1158.6:2004.
Second edition 2010.

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Jointly published by Standards Australia, GPO Box 476, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6140

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee LG-002, Lighting for Roads and Public Spaces, as a revision of AS/NZS 1158.6—2004, *Lighting for roads and public spaces*, Part 6: *Luminaires*.

This Standard forms part of the AS/NZS 1158 series, which covers lighting schemes for the generality of roads and outdoor public areas.

AS/NZS

- 1158 Lighting for roads and public spaces
- 1158.0 Part 0: Introduction
- 1158.1.1 Part 1.1: Vehicular traffic (Category V) lighting—Performance and installation design requirements
- 1158.1.3 Part 1.3: Vehicular traffic (Category V) lighting—Guide to design, installation, operation and maintenance
- 1158.2 Part 2: Computer procedures for the calculation of light technical parameters for Category V and Category P lighting
- 1158.3.1 Part 3.1: Pedestrian area (Category P) lighting—Performance and design requirements
- 1158.4 Part 4: Lighting at pedestrian crossings
- 1158.5 Part 5: Tunnels and underpasses
- 1158.6 Part 6: Luminaires (this Standard)

The objective of this Standard is to set out the requirements for the design, construction, performance and testing of road lighting luminaires to ensure that they will be suitable for the operating and environmental conditions to which they will be subjected in service.

Road lighting luminaires must withstand, and be capable of operating under, adverse conditions, including the effects of salt spray, industrially contaminated atmospheres, fog, smoke, dust storms, snow, ultraviolet radiation, driving rain, wind and traffic-induced vibration.

The requirements of this Standard have been formulated on the basis that luminaires will have a target service life of at least 20 years. These requirements specify the use of materials recognized at the time of writing to be effective for the relevant application. This is not intended to discourage the introduction of new technology, but new materials and methods of construction will be considered for future inclusion only after evidence of satisfactory long-term performance has been provided.

The significant technical change made in this Standard is to include specifications for other than what have been, until recently, the traditional road lighting luminaires. There is a growing emphasis on energy efficiency in road lighting and the consequential reduction in greenhouse gas emissions. Of particular interest is the availability of luminaires with T5 linear or compact fluorescent lamps. The use of these lamps and the associated electronic control gear offers significant energy savings in Category P lighting schemes. Major trials of these luminaires suggest that these luminaires are as reliable as those currently installed and that there is no technical reason preventing their wide-scale installation*.

Other emerging technology, not yet proven for general use by field experience, is discussed in Appendix A. These include new generation metal halide and LED lamps, and centralised electronic internet based road lighting control systems for monitoring lighting schemes.

* Alec Fisher, Michael Brien and Karman Wang. *Energy efficient luminaires for local road lighting—a trial*, (IESANZ, 28,4,2008).

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.

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Australian/New Zealand Standard
Lighting for roads and public spaces**Part 6: Luminaires**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard applies to all luminaires, with or without integral control gear, that are intended for use in Category V lighting schemes in accordance with AS/NZS 1158.1.1 and in Category P schemes in accordance with AS/NZS 1158.3.1.

The requirements set out are, in general, based on engineering practices, construction materials and components that practical experience in the field over many years has shown to be most conducive to luminaires achieving their target service life. An example of this approach is the inclusion in this Standard of luminaires with T5 linear or compact fluorescent lamps and the associated electronic control gear after satisfactory performance over several years in a major trial.

It should be noted that departure from these requirements can affect the life of the luminaire, in some cases significantly. Careful evaluation of newer approaches is required to ensure that the expected performance outcomes are realistic and that the risks of implementation are well considered.

NOTE: Guidance on some alternative materials and technologies is given in Appendix A.

1.2 APPLICATION

Reference is made in a number of places in this Standard to AS/NZS 60598.1. Where any conflict arises between AS/NZS 60598.1 and this Standard, the requirements of this Standard shall apply.

1.3 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix B.

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 1158.0 and, where applicable, AS/NZS 60598.1 apply. If it occurs that the relevant definitions in these two Standards conflict, those in AS/NZS 1158.0 shall take precedence.

1.5 ENVIRONMENTAL CONDITIONS

It is anticipated that a luminaire conforming to this Standard will be capable of having an effective service life of at least 20 years under the following environmental conditions:

- (a) Ambient temperature (shade)
 - (i) In Australia from -10°C to 40°C .
 - (ii) In New Zealand from -10°C to 25°C .

NOTE: In Australia summer temperatures may exceed 40°C in some locations.

- (b) Solar radiation up to 1000 W/m².
- (c) Wind velocity up to 150 km/h.
NOTE: Winds designated as cyclonic are typically in excess of this figure.
- (d) Relative humidity up to 90% average.
- (e) Marine environments.

1.6 MARKING

1.6.1 General

The requirements of AS/NZS 60598.1, Section 3, shall apply. Additional information shall be provided as specified in Clauses 1.6.2 to 1.6.4.

1.6.2 Information on interior of luminaire

The luminaire and any replaceable components therein shall be legibly and indelibly marked with the following information, as applicable:

- (a) Located inside the luminaire, close to and visible to a person accessing the supply terminals, information in accordance with the requirements of AS/NZS 60598.1, Clause 3.4, which includes—
 - (i) the name or registered trade name or mark of the manufacturer;
 - (ii) the catalogue number;
 - (iii) the rated operating voltage and current;
 - (iv) the batch code, serial number, or other marking to identify the month and year of manufacture;
 - (v) the regulatory requirement markings for Australia and New Zealand, e.g. C tick, RCM;
 - (vi) the IP rating; and
 - (vii) the IK rating.
- (b) Located in the optical compartment or otherwise readily visible when the lamp is being replaced, the following information—
 - (i) the lamp type(s) and ratings(s) and, where necessary for specific compatibility between the lamp and control gear and the luminaire's optical system, the appropriate manufacturer's code or the International Lamp Coding System (ILCOS) as specified in AS/NZS 61231;
 - (ii) reference to the applicable luminous intensity distribution data, i.e. the manufacturer's I-table number; and
 - (iii) for luminaires fitted with multiple T5 lamps, fit a label showing the required lamp orientation for optimal lumen output.
- (c) Located on the electronic control gear tray/assembly/cassette, the manufacturers batch code, serial number or other marking to identify the month and year of manufacture of the control gear. The label is to be readily visible when the electronic control gear tray/assembly/cassette is being replaced without the need to open/disassemble the electronic control gear tray/assembly/cassette unit.

1.6.3 Coded information on exterior of luminaire

The following information shall be either indelibly marked on the luminaire body or, for luminaires where aesthetic considerations are deemed by the client to be an important factor, shall be indelibly marked on a plate or adhesive label provided with the luminaire for location by others:

- (a) The lamp type and rating.
- (b) Where applicable, the lamp envelope type, e.g. clear or diffuse.
- (c) In Australia, the year of manufacture of the luminaire. (Provision of this information is optional in New Zealand.)

The marking required by Items (a) and (b) shall be in the form shown in Figure 1.1. The marking required by Item (c) shall be in the form of a 2-digit number corresponding to the year of manufacture, e.g. 09, and it shall be clearly separated from the other coded information provided (refer to Figure 1.1).

The marking shall be at least 35 mm high for luminaires of mass greater than 7 kg and 20 mm high for luminaires of mass not greater than 7 kg. When located on the luminaire, the marking shall be positioned so as to be clearly visible from beneath the luminaire when installed as in normal service.

NOTES:

- 1 This external marking is required to assist in the routine procedures that are carried out throughout the life of a luminaire, such as maintenance and energy audits.
- 2 The minimum character heights specified above refer to solid fonts without the breaks typical of stencilling systems. Fonts with such breaks are not recommended for use with these minimum-sized characters.
- 3 Where the external markings are not located on the luminaire, the plate or label provided should be located as agreed by the client and in a position to facilitate reading from ground level. Suggested locations include on the outside of the pole or on the inside of the pole access door.
- 4 Refer to Appendix C for information to be provided by the client with the enquiry or order.

1.6.4 Additional internal marking for luminaires with high pressure sodium lamps

Further to the requirements of Clause 1.6.2(b), luminaires that utilize high pressure sodium lamps shall be marked with the following symbols, as appropriate (refer also to Paragraph A6.2):

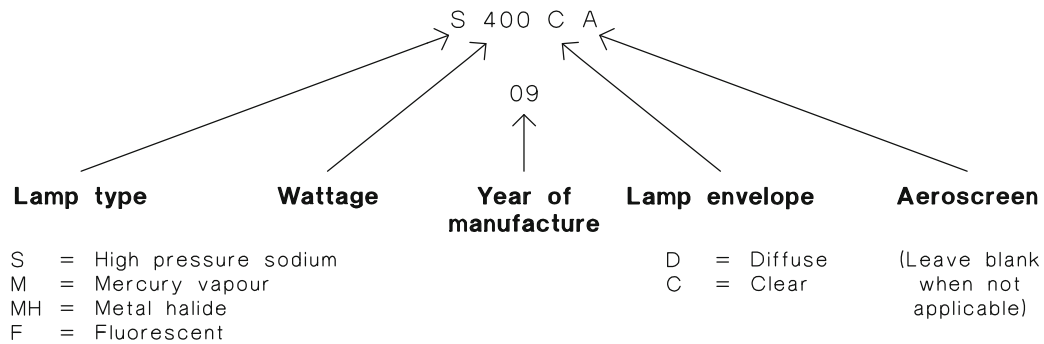
- (a) Luminaires that utilize high pressure sodium lamps requiring an ignitor that is external to the lamp—



- (b) Luminaires that utilize high pressure sodium lamps provided with an internal starting device—



The symbol shall be located in the lamp chamber in a position where it will be clearly visible when the lamp is being replaced.



NOTE: The exact positioning of the various codes may vary from that shown above, but appropriate spacing between codes is required in all cases.

FIGURE 1.1 EXAMPLE OF LUMINAIRE IDENTIFICATION CODE FOR EXTERNAL MARKING

1.7 ADDITIONAL INFORMATION

In addition to the requirements of Clause 1.6, all details that are necessary to ensure proper installation, use and maintenance shall be given on the luminaire or on built-in control gear or in the manufacturer's instructions provided with the luminaire.

These details shall include fixing information as necessary to maintain the luminaire's IP rating and the information required to maintain the luminaire's designated photometric performance. (Refer to Clause 2.6.)

SECTION 2 MECHANICAL AND PHYSICAL REQUIREMENTS

2.1 SCOPE OF SECTION

This Section specifies the mechanical and physical requirements that apply to the design and construction of luminaires for road and public space lighting.

2.2 GENERAL DESIGN AND ARRANGEMENT

2.2.1 Form and construction

The form and construction of the luminaire shall be such as to ensure that—

- (a) rain will not collect on the luminaire;
- (b) protection is provided against rain from any direction above the horizontal impacting directly on the joint between the luminaire body and the visor and coverplates; and
- (c) potential damage to the luminaire as a result of vandalism and external impact is minimized.

2.2.2 Required ingress protection

The luminaire shall be provided with not less than the following degrees of protection when tested in accordance with Clause 5.6:

- (a) *Lamp chamber: IP54* Although IP54 meets the basic requirements of this Standard, clauses in AS/NZS 1158.1.1 and AS/NZS 1158.3.1 describe maintenance of light technical parameters and the ensuing benefits, such as an increased maintenance factor and increased maintenance intervals, that apply to luminaires with a degree of protection of IP6X.

NOTES:

- 1 The IP rating refers only to the interior of the lamp chamber and the potential protection afforded to the optical components inside. It gives no indication of the reliability of external optical components, such as an external reflector (see Clause 2.6), nor does it indicate the cleaning properties of the light emitting faces, which could be horizontal facing upward (see Clause 2.5.2.1).
- 2 To ensure that the luminaire IP rating is maintained as far as possible after the luminaire visor has been opened for maintenance purposes, seals (see Clause 2.4.3) and clips (see Clause 2.4.2) should be correctly repositioned when the visor is closed (see Clause 1.7).

- (b) *Control gear chamber: IP24.*

The manufacturer's instruction sheet and the test conditions shall take account of the possibility of dust and insects entering the lamp chamber via the mounting arrangement.

2.3 CONSTRUCTION

2.3.1 Resistance to vandalism

When tested in accordance with Clause 5.7, all relevant parts and surfaces shall achieve a rating of resistance to external impact, in accordance with IEC 62262, of not less than IK04.

Where higher levels of resistance to vandalism are required, the applicable levels from Table 2.1 may be claimed, provided the specified IK rating has been achieved during testing in accordance with Clause 5.7 and the relevant test report is available upon request.

TABLE 2.1
RESISTANCE TO VANDALISM—ADDITIONAL LEVELS

Level of resistance	Minimum IK rating
Moderate	IK06
High	IK08

2.3.2 Other aspects

The luminaire construction shall also comply with the requirements of AS/NZS 60598.1 unless specifically modified by this Standard.

2.4 LUMINAIRE BODY

2.4.1 Material

The material of the luminaire body, without any additional surface protection, shall be of aluminium alloy complying with AS 1874 and having a copper content of not greater than 0.3%. Where additional surface protection is applied to the luminaire body, the copper content may exceed 0.3% but shall not exceed 1%. The additional protective treatments shall be applied to all outside surfaces of the luminaire body such that the body so treated performs satisfactorily when tested in accordance with ISO 9227.

While it is expected the generality of luminaires will be constructed in accordance with the above requirement, there may be instances, e.g. for aesthetic reasons, where a material other than aluminium is deemed appropriate for the luminaire body. If a material other than aluminium is used, e.g. stainless steel, it is important that a material with properties likely to ensure the luminaire's long-term integrity be chosen. Nonetheless, the use of material other than aluminium may reduce the luminaire's life to a significant extent.

NOTE: Refer also to Appendix A for use of material other than aluminium.

2.4.2 Component fixing devices

All components and ancillaries shall be securely fixed in place, and the fixing devices used shall be compatible with the materials to be joined. Parts intended to be opened or removed for inspection or maintenance, excluding the visor, shall be fixed with machine screws or captive type catches.

Other components may be riveted or otherwise fixed permanently. Machine screws shall be provided with lock washers or shake-proof nuts.

Where machine screws are threaded into aluminium, unless the attachment is intended to be permanent, the mating threads shall be lightly smeared with a grease with non-oxidizing properties or sealed with an impregnated polymer coating. (Suitable types of grease include lanolin grease and lithium-based compounds.)

All screws, nuts and washers in locations external to the luminaire shall be of stainless steel of a grade not less than 304, excepting that, for non-load-bearing items, such as covers, that are retained by hinges or lanyards fixing devices made of alternative corrosion-resistant materials may be used.

All fasteners required to be removed for maintenance purposes shall be of the captive type.

On luminaires to be used in marine and other highly corrosive environments, it is recommended that latches, rather than screws, be used for all external joints.

The luminaire body does not include the visor or any non-load-bearing covers. These may be constructed of other materials of proven durability. (Refer also to Clause 2.5.)

2.4.3 Seals and gaskets

2.4.3.1 Gaskets

Gaskets used to seal the lamp chamber and other chambers shall be of silicone rubber and shall maintain an effective seal during the luminaire's target service life (see Clause 2.5.2). The gaskets shall be—

- (a) securely fixed to the body of the luminaire or visor or other chamber covers so they will remain in place when the visor or cover is opened; and
- (b) continuous or, if joined, in such a way that the gasket ends shall provide an effective seal.

NOTE: To provide the intended 20 year service life, the silicone rubber used in the gaskets should have the following properties:

- (i) It should be resistant to heat, ultraviolet radiation and ozone.
- (ii) It should be impermeable to water.
- (iii) It should not lose appreciable tensile strength or resilience as it ages.
- (iv) It should not emit any corrosive gas under normal operating conditions.

2.4.3.2 Sealing of spigot entry

The design of the spigot entry or, in the case of top-mounted luminaires, the spigot shall be such that, when the luminaire is installed as in normal service, the ingress protection required by Clause 2.2.2 is maintained, including the incoming supply cable path. (Refer also to Clause 1.7 regarding information to be provided on or with the luminaire to facilitate correct installation.)

2.5 VISORS

2.5.1 Attachment to luminaire body

All visors or translucent covers that can be opened for the purpose of lamp replacement shall seal by means of a gasket complying with Clause 2.4.3. They shall be secured to the luminaire body by quick-release stainless steel latches or other appropriate means that allow ease of access for maintenance purposes.

Any cover that is not safely restrained when opened shall be fitted with a safety lanyard.

The design and arrangement of the pivots and fixings shall ensure that—

- (a) they cannot work loose under service conditions;
- (b) they cannot be damaged or strained by opening the cover to its fullest extent;
- (c) the ingress protection required by Clause 2.2.2 is maintained in service by compensating for loss of resilience of the visor gasket over time;
- (d) the act of closing of the visor does not roll or dislodge the gasket, nor subject the gasket restraint to excessive stress; and
- (e) they allow easy removal of the visor and any retaining lanyard, where fitted, for maintenance and replacement purposes.

2.5.2 Materials and construction

2.5.2.1 General

Visors shall be constructed of borosilicate glass, tempered glass or acrylic, except in the circumstances outlined below.

While it is expected the generality of luminaires will be constructed in accordance with the above requirement, there may be instances, e.g. for increased vandal resistance, where a material other than that specified above is deemed appropriate for the visor. If another material is used, e.g. polycarbonate or modified or high impact acrylic, it is important to ensure the material properties are likely to provide the desired long-term integrity and performance of the luminaire. Nonetheless, the use of a material other than that specified may reduce the luminaire's life to a significant extent, e.g. through loss of transmittance, unless the visor is replaced periodically as required.

Visors shall be designed and profiled so as to not soften, crack or discolour during the luminaire's service life. The visor shall not easily be incorrectly closed or otherwise distorted in a way that would affect the integrity of the seal between the visor and the luminaire.

All visors shall have high light transmission characteristics in the wavelength range 410 nm to 760 nm.

NOTES:

- 1 The visor should be designed and integrated with the luminaire body in such a way that there are no recesses, apertures or hollows in which spiders can shelter and spin webs. Flying insects attracted to the lighted luminaire and trapped by webs can significantly reduce light output.
- 2 The profile of the body and visor should be such as to—
 - (i) reduce dirt build-up on the visor and facilitate washing by rain; and
 - (ii) minimize potential impact damage due to vandalism.
- 3 Refer also to Appendix A, Paragraph A4.

2.5.2.2 Requirement for acrylic visors

Where the visor is acrylic, the material shall have the following properties:

- (a) *Luminous transmittance* For a test sample of 2 mm thickness, tested in accordance with ASTM D1003, the total luminous transmittance shall—
 - (i) be not more than 0.2 at a wavelength of 380 nm and not more than 0.85 at a wavelength of 400 nm; and
 - (ii) be not less than 0.88 at wavelengths of between 410 nm and 760 nm.
- (b) *Deflection temperature* When tested in accordance with ASTM D648-01, the deflection temperature shall be not less than 90°C.

2.5.2.3 Requirements for tempered glass visors

Tempered glass visors shall comply with the requirements of AS/NZS 2208 for toughened safety glass.

2.5.2.4 Requirement for borosilicate glass visors

Borosilicate glass visors shall comply with ISO 3585.

2.6 OPTICAL SYSTEM

No field adjustment to the optical system shall be required during installation to match the photometric performance marked as per Clause 1.6.2(b)(ii). Where alternative settings are available, instructions shall be provided to enable the installers to confirm that the optical system agrees with the manufacturer's *I*-table as referred to in that Clause. (Refer to Clause 1.7).

Reflector or refractor materials, including paint finishes used to enhance photometric performance, shall be suitable for use in environments subject to heat, change of temperature, ultraviolet radiation, ozone, salt spray, airborne industrial contamination and motor vehicle exhaust emissions. The materials or finishes used should be durable and shall not discolour with age.

NOTE: Particular attention should be paid to the durability of reflector components of the optical system external to the luminaire body.

If the lampholder does not ensure the lamp is maintained in the correct position within the optical system, an adequate supporting device shall be provided. Refer to the particular requirements of Clause 3.5.1.2.

2.7 CONTROL GEAR, SUPPLY CABLING TERMINATION COMPARTMENT

The control gear supply cabling termination compartment shall be of sufficient size to allow ease of supply cable termination. The supply cable termination path shall be clear from internal components and internal wiring from the luminaire cable entry to the supply termination block.

2.8 COMPARTMENT COVERS

Covers designed to be removed for installation or maintenance purposes and not safely restrained shall be fitted with a detachable safety catch or lanyard sheathed with a flexible non conducting material.

They shall be secured to the luminaire by quick release latches or other appropriate means that allow ease of access for maintenance purposes over the service life of the luminaire.

Covers to fit positively and easily into operational position and not distort over the service life of the luminaire.

The design and arrangement of hinging pivots and fixings shall ensure that—

- (a) they cannot work loose under service conditions;
- (b) they cannot be damaged or strained by opening the cover to the fullest extent;
- (c) the ingress protection required under Clause 2.2.2 is maintained for the service life of the luminaire;
- (d) where seals are fitted for ingress protection, the ingress protection required under Clause 2.2.2 is maintained in service by compensating for loss of the cover gasket over time;
- (e) the act of closing the cover does not roll or dislodge the gasket, nor subject the gasket fixing to excessive stress; and
- (f) they allow easy removal of the cover and any retaining lanyard where fitted for maintenance and replacement purposes.