

Australian/New Zealand Standard™

Lighting for roads and public spaces

Part 5: Tunnels and underpasses



AS/NZS 1158.5:2007

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee LG-002, Lighting for Roads and Public Spaces, to provide performance and design requirements for lighting schemes for tunnels and underpasses.

This Standard incorporates Amendment No. 1 (March 2011). 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.

Tunnels and underpasses, including underbridges, are road elements where simple accidents can have a serious effect on the smooth operation of the associated road network. Lighting design for these elements is essentially to overcome the daylight problems of the 'black hole' seen on the approach to a tunnel portal on the one hand and on the other, shadowing of objects within an underpass. These potential effects result from the, often, high light adaptation of the motorist's vision and then may only be overcome by the application of very high levels of lighting in the relevant zones of the structures.

Since the structures in question are mainly located on heavily trafficked urban roads, the specific lighting subcategories are based on the structural design details, i.e. length for tunnels and the degree of 'see-through' for underpasses, and not on traffic characteristics.

This Standard is for the use of designers, consultants, owners and operators of lighting schemes for tunnels and underpasses. However the design of tunnel lighting schemes is complex and involves the use of specialist computer software and should be undertaken only by experienced designers.

The design of lighting schemes for tunnels is based largely on CIE 88 and on considerable national experience. However the method of determining the light adaptation level of the motorist approaching the tunnel portal (L_{20}) is retained from the 1st edition (1990) rather than the method of the 2nd edition (2004). This is because the given method is complex and untried—the more simple method of the 1st edition has given very satisfactory results in practice.

The day lighting for much of the tunnel is predicated on the L_{20} value in the particular situation. Therefore the luminances of the various elements, in particular that of the sky, making up the relevant field of view of the motorist must be known with accuracy. The Standard contains indicative values based on a program of sky measurements and more abbreviated measurements of other structural elements, taken in Australia and those in CIE 88.

The design of lighting schemes for underpasses is based on BS 5489-2 (2003) and the method of determining the degree of 'see-through' on considerable national experience.

The compliance values of the light technical parameters are the minimum to be maintained through the life of the installation; an effective maintenance regime for the lighting scheme is essential, particularly in the case of tunnels. The values given are the minimum necessary to ensure sufficient safety and comfort.

The light technical parameters for the various zones in the structures are based, in general, on the following:

- (a) The luminance level of the road and walls.
- (b) The uniformity of luminance of the road and walls.
- (c) Limitation of glare from the luminaires.
- (d) Limitation of the flicker effect from luminaires.

Other requirements, such as luminaire IP ratings and maximum acceptable maintenance factor (MF) need to be considered.

Information is given on how motorist's perceptions are influenced by tunnel design and operation, on mains failure lighting, tunnel signage, tunnel lighting maintenance and on the design brief and compliance documentation.

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 5: Tunnels and underpasses

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies performance and design requirements for lighting schemes for tunnels and underpasses. It also specifies the luminaire data and other design data that is needed to facilitate the lighting design and the assessment of compliance with the requirements of this Standard.

This Standard does not deal with lighting schemes for underpasses catering solely for pedestrian/cyclist, which are covered by AS/NZS 1158.3.1. Underpasses and shorter tunnels are often designed to carry a mixture of motorized traffic, cyclists and pedestrians but long tunnels typically exclude all but motorized traffic.

This Standard is intended to be read in conjunction with AS/NZS 1158.0, AS/NZS 1158.1.1, AS/NZS 1158.2, AS/NZS 1158.1.3 and AS/NZS 1158.6.

NOTE: Computer based design calculation procedures are given in AS/NZS 1158.0, AS/NZS 1158.2 and Appendices E and H of this Standard. Guidance on the design, installation, operation and maintenance of lighting schemes is given in AS/NZS 1158.1.3.

1.2 APPLICATION

Subject to the requirements of applicable laws, the choice of whether to install a lighting scheme in compliance with this Standard and if so which subcategory of lighting is appropriate, rests with the client (usually the applicable road controlling authority). In the application of this particular Standard the decision is based solely on the structural characteristics of the road element.

1.3 REFERENCED DOCUMENTS

A list of the Standards and other documents referred to in this Standard is given in Appendix A.

NOTE: A number of additional documents which are considered useful sources of information are listed in Appendix B.

1.4 DEFINITIONS

For the purpose of this Standard the definitions given in AS/NZS 1158.0 plus those in the supplementary list below apply.

1.4.1 Access zone

Part of the road immediately outside (in front of) an entrance portal, covering the distance over which an approaching driver should be able to see into a tunnel.

1.4.2 Access zone length

Distance between the stopping sight distance point ahead of an entrance portal, and the entrance portal itself.