AS/NZS 1158.5:2014

Australian/New Zealand Standard™

Lighting for roads and public spaces

Part 5: Tunnels and underpasses

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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 supersede AS/NZS 1158.5:2007, and provide performance and design requirements for lighting schemes for tunnels and underpasses.

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

This revision provides more explanatory information. It also recognizes that in some situations daylight penetration into an underpass can be significant and that software is readily available to determine the daylight luminance contribution, which may be used to offset some or all of the electric lighting requirements.

Requirements for the tunnel interior lighting are now based on operating speed and in very long tunnels, interior sub zones have been introduced.

A flow diagram has been introduced in Appendix L detailing lighting design steps.

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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FOREWORD

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 categories 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.

For the design of lighting schemes for tunnels, reference was made to CIE 88, *Guide for the lighting of road tunnels and underpasses*, and is also based on considerable national experience. However, the method of determining the light adaptation level of the motorist approaching the tunnel portal (L20) is retained from the first edition (1990) rather than the method of the second edition (2004). This is because the 2004 method is complex, whereas the more simple method of the first edition has given very satisfactory results in practice.

The day lighting for much of the tunnel is predicated on the L20 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, together with those in CIE 88.

For the design of lighting schemes for underpasses, reference was made to BS 5489-2 (2003), *Code of practice for the design of road lighting, Part 2: Lighting of tunnels*. The method of determining the degree of 'see-through' is based on 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.

In general, the light technical parameters for the various zones in the structures are based 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.

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S E C T I O N 1 S C O P E A N D G E N E R A L

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.

NOTE: The basic steps of the design process are set out in a flow diagram in Appendix L.

This Standard does not deal with lighting schemes for underpasses catering solely for pedestrians/cyclists, 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. Current practice for underpasses within roads designated Category P is not to provide daytime lighting, and no recommendations are offered.

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 1158.1.2 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 1158.1.2.

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 category 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.