Design Manual for Roads and Bridges

Road Lighting
Design

TD 501
Road lighting design

(formerly TD 23/99, TD 34/07, TA 49/07, IAN 167/12)

Revision 0

Summary
This document contains the requirements for the design of new and replacement road lighting on motorways and all-purpose trunk roads.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Mar 2020	TD 501 replaces TD 23/99, TD 34/07, TA 49/07 and IAN 167/12. This full document has been re-written to make it compliant with the new Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes TD 23/99, TD 34/07, TA 49/07 and IAN 167/12.

This document references the European Commission's Green Public Procurement Criteria for Street Lighting and Traffic Signals GPP [Ref 4.I] as well as EU and UK road lighting standards and national guidance documents.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This document provides the requirements for the design of the road lighting asset. It specifically addresses the high level approach for lighting requirements as well as the competencies of those involved in this area of the service.

The development of this document draws on the European Commission Green Public Procurement Criteria for Street Lighting and Traffic Signals GPP [Ref 4.I] to inform the design process in order that the lighting provision takes account of the task and performance criteria throughout its operational life, and is designed, maintained and operated to be energy and sustainability efficient based upon a whole life costing and asset condition assessment.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 5.N] apply to this document.

This document is written for the competent lighting professional / practitioner in order that lighting installations are designed that are suitable for motorway and all-purpose trunk roads.

Mutual recognition

Where there is a requirement in this document for compliance with any part of a "British Standard" or other technical specification, that requirement may be met by compliance with the Mutual Recognition clause in GG 101 [Ref 5.N].

Abbreviations

Abbreviations

Abbreviation	Definition
AOR	Artificial Optical Radiation
CIE	International Commission on Illumination
GPP	EU Green Public Procurement Directive GPP [Ref 4.I]
IEng	Incorporated Engineer
ILP	Institution of Lighting Professionals
MILP	Member of the Institution of Lighting Professionals

Terms and definitions

Terms and definitions

Term	Definition
Competent person	Person who has training and experience relevant to the matter being addressed and an understanding of the requirements of the particular task being approached.
Concept design	Early phase of the design process, in which the broad outlines of function and form of the installation are determined/considered.
Conflict area	Conflict areas are typically junctions, intersections, roundabouts and pedestrian crossings, where significant streams of motorised traffic intersect with each other or with other road users such as pedestrians and cyclists.
Geometry	Interrelated linear dimensions and characteristics of the road lighting system, i.e. spacing, mounting height, transverse position and arrangement.
Glare	A form of pollution where the brightness presented to viewers is a visual distraction and can present a hazard.
Light pollution / Obtrusive light	A term that describes the release of light that serves no useful purpose as it falls outside the required area.
Light source	The smallest physical unit that can be readily removed from the containing product without permanent mechanical damage of the light source and that meets the definition of light source.
Mounting height	Nominal vertical distance between the photometric centre of a road lighting luminaire and the surface of the road.
Photo-biological risk	The term applied to risk associated to the eye when exposed to blue and short wavelength light sources.
Road lighting	A fixed lighting installation intended to provide good visibility to users of outdoor public traffic areas during the hours of darkness to support traffic safety, traffic flow and public security.
Sky glow	The release of light into the night sky brightening the horizon, creates what is known as sky glow (as can been seen over most towns and cities) and reduces the enjoyment of the night sky reducing the visibility of stars.
Traffic flow	Number of vehicles passing a specific point, at a specific time, in a stated time.

1. Scope

Aspects covered

1.1 The requirements in this document shall be followed for the design of new and replacement road lighting on motorways and all-purpose trunk roads.

NOTE 1 The requirements for the assessment of the need for road lighting can be found in TA 501 [Ref 12.N].

NOTE 2 This document does not cover the requirements related to the design of lighting for long road tunnels (refer to BS 5489-2 [Ref 1.N] and CD 352 [Ref 3.I]).

NOTE 3 For the requirements relating to equipment specification not directly related to photometric performance, refer to the relevant clauses from MCHW SHW [Ref 7.N].

NOTE 4 This document does not cover the design of road lighting power distribution networks.

Implementation

1.2 This document shall be implemented forthwith on all schemes involving the design of road lighting on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 5.N].

Use of GG 101

1.3 The requirements contained in GG 101 [Ref 5.N] shall be followed in respect of activities covered by this document.

Health and safety

1.4 The design of the road lighting installation shall make certain that no artificial optical radiation (AOR) hazard (photo-biological) risk exists in accordance with BS EN 62471 [Ref 9.N] Photo-biological safety of lamps systems.

Competency

1.5 All organisations and personnel delivering the road lighting design service shall be registered with an appropriate professional institution, the Engineering Council (ECUK) and hold the competencies relating to their discipline and role with a record made available to the Overseeing Organisation.

NOTE Mutual recognition of professional qualifications under TFEU [Ref 9.I]Art 53 of TFEU is applicable.

1.6 The lead in the lighting design process shall be at least MILP (or equivalent), IEng and experienced in the design and implementation of road lighting systems and associated infrastructure.

2. Performance requirements

General

2.1 Lighting performance shall fulfil the requirements of BS 5489-1 [Ref 2.N], BS EN 13201 [Ref 11.N], PD CEN/TR 13201-1 [Ref 8.I] and the requirements set out in this document.

2.1.1 Where available, applicable national guidance should be followed.

NOTE *National guidance includes technical reports and professional lighting guides such as those published by the ILP as well as Highways England research papers.*

2.2 Lighting on motorway and all-purpose trunk roads shall mitigate obtrusive lighting and sky glow effects in accordance with BS 5489-1 [Ref 2.N] road lighting and good practice.

NOTE *Good practice guidance includes CIE 150 [Ref 6.I] Guide on the limitation of the effects of obtrusive light from outdoor lighting installations, CIE 126 [Ref 7.I] Guidelines for minimising sky glow and ILP GN01 [Ref 5.I] ILP Guidance notes for the reduction of obtrusive light.*

Core principles

2.3 The development and delivery of road lighting shall follow the European Commission Green Public Procurement (GPP) Criteria for Street Lighting and Traffic Signals GPP [Ref 4.I].

2.4 The required task lighting performance and related environmental impact mitigation requirements relating to the road lighting shall be determined.

2.5 The lighting design shall be developed using a life cycle assessment coupled with a whole life costing analysis.

2.6 Whole life costing shall follow ISO 15686 [Ref 2.I] based upon a study period equating to the fatigue design life of a column.

2.7 The correct lighting system shall be chosen for the intended application and the installation optimised for energy efficiency parameters in accordance with the requirements of this document and TA 501 [Ref 12.N].

NOTE *The most sustainable lighting installation when considering whole life costing might not be the most cost effective to construct.*

Non-quantifiable performance requirements

2.8 Installation appearance shall be appropriate for the landscape in which it is located.

NOTE *Installation appearance can be influenced by the choice of light source, luminaire optics at night and the choice of mounting height, style of luminiare by day.*

2.8.1 In instances of specific fauna and flora presence, national guidance should be followed to mitigate any adverse effects ILP BAW CoP [Ref 1.I].

2.9 In instances of historical significance, specific lighting treatments shall be required and subject to the agreement of the Overseeing Organisation.

Equipment performance requirements

2.10 Equipment shall meet the requirements as specified within the MCHW [Ref 6.N].

3. Decisions prior to design

General

3.1 Designs of road lighting installations shall provide sustainable solutions which are economically viable for their expected lifetime, have minimal impact on the environment and minimise the risk to the workforce and stakeholders.

NOTE *Environmental impact includes for energy and carbon conservation, mitigating obtrusive lighting effects and the effects of fauna and flora.*

3.2 At design initiation, those undertaking the design shall contact the Overseeing Organisation for the project requirements.

NOTE *It is essential to understand the Overseeing Organisation's requirements relating to materials, specification and operational procedures to inform the road lighting design.*

3.3 Full on-site surveys shall be undertaken as part of the design development.

Lighting arrangement and column location

3.4 The off-set distance of lighting columns from the carriageway shall be determined in accordance with the requirements for road restraint systems CD 377 [Ref 10.N] and BS 5489-1 [Ref 2.N].

3.5 Passively safe lighting structures shall be selected and deployed in accordance with BS EN 12767 2007 [Ref 8.N] and the Institution of Lighting Professional's technical report on Guidance on the implementation of passive safe lighting columns and signposts TR 30 [Ref 3.N].

Selection of lighting class

3.6 Selection of the applicable lighting class shall be taken from BS 5489-1 [Ref 2.N] based on road hierarchy and traffic data from the Overseeing Organisation.

Maintenance factor

3.7 Maintenance factors shall be determined in accordance with BS 5489-1 [Ref 2.N].

3.7.1 The requirements and frequency for any light source change and luminaire cleaning should be determined from the project requirements.

Extent of lighting

3.8 For conflict areas of any type, the extent of the lighting shall be in accordance with BS 5489-1 [Ref 2.N] and The application of conflict areas on the highway PLG 02 [Ref 14.N].

3.9 There shall not be an unlit gap of less than four times the safe stopping sight distance between lit sections.

Control

3.10 The lighting installation shall employ a road lighting control system which will be agreed with the Overseeing Organisation.

3.11 Luminaire control gear shall enable adaptive lighting, intelligent and remote management and monitoring of the lighting installation.

Columns

3.12 Columns shall be specified in accordance with Guidance on the use of BS EN 40-3-1 PD 6547 [Ref 4.N] and Guidance on the use of BS EN 40-3-1 and BS EN 40-3-3 PD 6547 [Ref 4.N] and include for attachments.

NOTE 1 *Attachments include signage, traffic monitoring equipment and other infrastructure mounted upon the column.*

NOTE 2 *Smart motorway and smart cities technologies relate to attachments to the luminiare supports to ensure that the structures can accommodate the additional loading and the provision of power and communications can be facilitated.*

3.13 Column deflection class shall be class 2.

4. Design process

Outline design process

4.1 The design process within Appendix E of BS 5489-1 [Ref 2.N] shall be followed for the design of road lighting installations.

Sustainability

4.2 Energy performance indicators shall be calculated in accordance with BS EN 13201-5 [Ref 13.N].

Design for maintenance

4.3 Road lighting installations shall be designed taking account of road geometry so that they are safe for road workers and stakeholders who operate on the motorway and all-purpose trunk road network and permit coordination with other operational activities.

4.4 All equipment and components shall comply with the BS Standards and European Standards as specified within the MCHW [Ref 6.N].

4.5 Existing and proposed vegetation shall be identified and assessed when locating new equipment.

Design documentation

4.6 Upon completion of the design, a design skill and care certificate shall be provided to the Overseeing Organisation.

4.6.1 The design skill and care certificate template in Appendix A may be used to demonstrate completion of the design.

4.7 A full record of the decisions, consultations, access report and design shall be compiled in a technical file and retained for inspection.

Environmental impact

4.8 Lighting and day time environmental impacts shall be mitigated as part of the design.

5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	BSI. BS 5489-2, 'Code of Practice for the Design of Road Lighting – Part 2: Lighting of Tunnels'
Ref 2.N	BSI. BS 5489-1, 'Code of practice for the design of road lighting, Part 1: Lighting of roads and public amenity areas'
Ref 3.N	Institution of Lighting Professionals. TR 30, 'Guidance on the implementation of passive safe lighting columns and signposts'
Ref 4.N	BSI. PD 6547, 'Guidance on the use of BS EN 40-3-1 and BS EN 40-3-3.'
Ref 5.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 6.N	Highways England. MCHW, 'Manual of Contract Documents for Highway Works'
Ref 7.N	Highways England. MCHW SHW, 'Manual of Contract Documents for Highway Works Volume 1: Specification for Highway Works'
Ref 8.N	BSI. BS EN 12767, 'Passive safety of support structures for road equipment. Requirements, classification and test methods.' , 2007
Ref 9.N	BSI. BS EN 62471, 'Photobiological safety of lamps systems'
Ref 10.N	Highways England. CD 377, 'Requirements for road restraint systems'
Ref 11.N	BSI. BS EN 13201, 'Road Lighting'
Ref 12.N	Highways England. TA 501, 'Road lighting appraisal'
Ref 13.N	BSI. BS EN 13201-5, 'Road Lighting; Part 5 Energy performance indicators'
Ref 14.N	Institution of Lighting Professionals. PLG 02, 'The application of conflict areas on the highway'

6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Institution of Lighting Professionals. ILP BAW CoP, 'Bats, fauna & flora and lighting'
Ref 2.I	ISO. ISO 15686, 'Buildings and constructed assets - Service life planning'
Ref 3.I	Highways England. CD 352, 'Design of road tunnels'
Ref 4.I	European Commission. GPP, 'Green public procurement criteria for street lighting and traffic signals'
Ref 5.I	Institution of Lighting Professionals. ILP GN01, 'Guidance notes for the reduction of obtrusive light'
Ref 6.I	CIE. CIE 150, 'Guide on the limitation of the effects of obtrusive light from outdoor lighting installations'
Ref 7.I	CIE. CIE 126, 'Guidelines for minimising sky glow'
Ref 8.I	BSI. PD CEN/TR 13201-1, 'Road lighting: Guidelines on selection of lighting classes'
Ref 9.I	European Commission. TFEU, 'Treaty on the Functioning of the European Union'

Appendix A. Designer statement

A1 Skill & care certificate

To be completed at each iteration of the road lighting design.

SKILL AND CARE CERTIFICATE

ROAD LIGHTING DESIGN

We certify that reasonable professional skill and care have been used in the preparation of the public lighting and electrical design of the scheme noted below.

Scheme title: ……

Location: ……

We certify that:

i. the design has been undertaken by competent designers as defined under TD 501 section 1 scope clauses 1.4 to 1.5;

ii. that reasonable professional skill and care were used to ensure that the road lighting design has been carried out in accordance with the requirements of TD 501 road lighting;

iii. that the site has been visited and build-ability and maintainability checks have been undertaken;

iv. it has been accurately translated into contract drawings, which have also been checked. The unique numbers of these drawings are:

……

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……

Name of Consultant [1]/ Contractor [1]: ……..……..

Name: …… Signed:……

Lighting Design Team Leader [2]

Engineering Qualification .....

Date: .....

Notes

[1] Delete as appropriate

[2] In accordance with TD 501 Clauses 1.4 and 1.5