

Road lighting —

Part 10: Code of practice for lighting for motorways

Committees responsible for this British Standard

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- Automobile Association
- British Lighting Association for the Preparation of Standards (Britlaps)
- British Precast Concrete Federation Ltd.
- Chartered Institution of Building Services Engineers
- Council for the Protection of Rural England
- County Surveyors' Society
- Department of Transport
- Institution of Civil Engineering Surveyors
- Institution of Civil Engineers
- Institution of Electrical Engineers
- Institution of Lighting Engineers
- Institution of Mechanical Engineers
- Lighting Industry Federation Ltd.
- Royal Fine Art Commission
- Scottish Office (Building Directorate)

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Foreword

This Part of BS 5489 has been prepared under the direction of the Electrical Illumination Standards Policy Committee and is a new edition of BS 5489-10:1990 which is withdrawn.

This Part can be applied to all-purpose dual carriageway traffic routes not falling within the scope of BS 5489-2.

Because the motorist's driving task is more critical on a motorway, where the average speed of traffic is greater than on other roads, better lighting is needed and the effect of related aspects such as visual guidance, route selection and breaks in the lighting becomes more pronounced.

This new edition incorporates editorial improvements but it does not reflect a full review or revision of the standard, which will be undertaken in due course.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 5489 gives recommendations for the lighting of motorways of various widths and can be applied to the lighting of all-purpose dual carriageway traffic routes outside the scope of BS 5489-2, i.e. dual carriageways where each carriageway is in excess of 11 m in width.

The procedure for determining photometric quantities is given in appendix A.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 5489 the definitions given in BS 5225-1, BS 5489-1 and BS 5489-2 and in BS 6100-2.4.1 apply, together with the following.

2.1

axial median lighting

a system of lighting in which the luminaires are in a single line along the axis of the central reserve, with the longitudinal axis of each luminaire parallel to the axis of the road

2.2

conventional lighting

a system in which main carriageway lighting is provided by luminaires on single or double arm columns, with the longitudinal axis of each luminaire perpendicular to the axis of the road

2.3

floodlighting

an area lighting mode in which purpose-designed luminaires are used

2.4

high mast lighting

a system of lighting for large areas in which masts giving a mounting height of 18 m, or more, carry clusters of high output luminaires

2.5

junction

a motorway junction at which either connections with the all-purpose road network, or interconnections between motorways, are made

2.6

link road

that part of a motorway providing a motorway to motorway connection at a junction

2.7

slip road

length of one-way road at a junction that connects roads usually at different levels

2.8

width of carriageway (W_k)

the sum of widths of traffic lanes (one carriageway only)

2.9

width of hard shoulder (W_{hs})

width of the surfaced strip adjacent to and abutting a carriageway intended for use by vehicles in the event of difficulty or during obstruction of the carriageway

2.10

width of single traffic lane (W_l)

the distance between traffic lane markings

2.11

luminaire

apparatus which controls the distribution of light given by a lamp or lamps and which includes all the components necessary for fixing and protecting the lamps and for connecting them to the supply circuit

2.12

berm

a strip of horizontal ground interrupting a slope or at the top or bottom of a slope

3 Design performance

3.1 General

Generally the principles laid down in BS 5489-1 apply and practices are similar to those given in BS 5489-2 but, as the driving task is more critical because the average speed of traffic is higher, better lighting levels are required. The calculation procedure for this Part of BS 5489 is given in appendix A. Exceptions are the long crossovers layouts described in 6.1.4.

3.2 Lighting of the road surface

To be visually satisfactory, the level and uniformity of road luminance should be in accordance with the recommendations of Table 1, which are maintained values. Calculations should be based on the initial luminous flux of the lamp with due allowance being made for the lamp flux and luminaire maintenance factors (see 8.2 in BS 5489-2:1992).

Generally the design procedure for lighting a new road should be based on the actual road surface to be provided. A black-top surface is covered by the term "representative British road surface" CIE type C2, see CIE Publication No. 66 (1984)¹⁾. The corresponding r-table is given as Table 3 in BS 5489-2:1992.

NOTE See also appendix A of BS 5489-1:1992.

¹⁾ Obtainable in the UK from NIC (GB), Delta House, 222, Balham High Road, London SW12 9BS.

Table 1 — Lighting requirements for motorways

Description	Maintained average luminance $\bar{L}$ cd/m ²	Overall uniformity ratio U_0	Longitudinal uniformity ratio U_L	Examples
Main carriageway (traffic lanes)	2.0	0.4	0.7	Motorways, link roads at motorway to motorway interchanges
Slip road	1.5	0.4	0.7	Single and 2-lane access and exit slip roads
Hard shoulder	0.5	0.4	0.7	Emergency stopping lane; generally stationary vehicles but occasional use as running lane
NOTE The lighting performance values given are minimum design values including a maintenance factor. For an example of calculation procedure see appendix A.				

For a concrete road surface, its enhanced reflection properties can be represented by an alternative r-table, as given in Table 2 of this Part of BS 5489. This table may be used with advantage for lighting design calculations. However, for existing concrete roads the likelihood of a black-top overlay being put down during structural maintenance, within the expected life of a lighting system, should be taken into account.

Surfaces immediately over structures, such as bridges and viaducts, can be expected to be restricted to the more flexible black-top in most cases, whether on new construction or on existing motorways.

Because the viewing distance for long crossovers (6.1.4) falls outside the scope of r-tables, illuminance is used as a design parameter for these crossovers.

3.3 Limitation of glare

3.3.1 Disability glare

Disability glare, defined and discussed in BS 5489-1, reduces the contrast between objects and their background, so that their visibility is decreased. An object that is just visible (that is at the threshold of visibility) when there is no disability glare will, in the presence of disability glare, merge into the background. The percentage by which the background luminance has to be increased to render the object just visible again is known as the threshold increment (TI). This provides a notional measure of disability glare from installations.

The value of the TI depends on the light distribution from the luminaire between 70° and 90° in elevation in the vertical plane at which the luminaire is observed, usually within 10° of azimuth of the transverse axis of the luminaire. It also depends on the road luminance, the layout of the luminaires, the mounting height and the observer position.

3.3.2 Discomfort glare

Control of the TI within the limits recommended in 3.3.3 will generally ensure that discomfort glare, defined in BS 5489-1, will be adequately controlled.

3.3.3 Recommended threshold increment

The threshold increment should not exceed 10 % with the luminaire in a clean state and the lamp emitting its initial luminous flux, as in this state the maximum disability glare will be produced.

NOTE Other special requirements may be imposed as described in BS 5489-1, BS 5489-5, BS 5489-6 and BS 5489-8.

3.4 Visual guidance

The lighting installation should give visual guidance by revealing the run of the road, particularly at junctions and bends. This visual guidance is the aspect of the lighting which complements the lane and edge of carriageway markings.

To avoid misleading patterns of luminaires, any change in lighting system along the motorway should be visually linked with the road layout. Unexpected breaks should be avoided, for example, by continuing lighting for one or two columns past any overbridges, gantries and large traffic signs, until drivers using vehicle lights have an unambiguous view of the road at the end of the lighting.

NOTE Transition lighting by gradual reduction at the end of lit sections has been considered but has been shown to be ineffective.

3.5 Lighting of surroundings

The lighting of the hard shoulder will provide a sufficiently bright background for revealing objects viewed towards the outer edge of the carriageway, but that lighting should be restricted beyond the hard shoulder.

3.6 Aesthetics

For considerations of lighting in environmentally sensitive areas, see the principles set out in BS 5489-1.