

Specification for

Road traffic signals

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- Department of Employment and Productivity*
- Department of the Environment
- Department of the Environment, Building Research Station
- Department of Trade and Industry
- Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales
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The Government department and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- Association of Chief Police Officers
- Automobile Association
- British Electrical and Allied Manufacturers' Association
- Electricity Supply Industry in England and Wales
- Public Road Transport Association
- Road Research Laboratory (Department of the Environment)
- Vehicle, Actuated Road Signal Development Association

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Foreword

This revision of BS 505:1939 has been prepared with the primary objective of introducing the higher optical requirements which recent research by the Road Research Laboratory has shown to be essential for modern traffic systems control. The opportunity has also been taken to delete reference to hand-operated fixed-time signals, as these are no longer in use. Detailed operating requirements for controllers have also been removed at the request of the Department of the Environment, since this subject is covered in greater detail than can be included in a British Standard in their own specification¹⁾.

NOTE Attention is drawn to certification facilities offered by BSI; see the back cover of this standard.

This standard makes reference to the following British Standards:

BS 88, *Cartridge fuses of voltage ratings up to 660 volts.*

BS 88-1, *Performance and dimensions of fuse links.*

BS 381C, *Colours for specific purposes.*

BS 555, *Tungsten filament miscellaneous electric lamps.*

BS 729, *Zinc coatings on iron and steel articles.*

BS 800, *Limits of radio interference.*

BS 861, *Air-break switches and isolators.*

BS 873, *The construction of road traffic signs and internally illuminated bollards.*

BS 873-1, *General traffic signs.*

BS 892, *Glossary of highway engineering terms.*

BS 1376, *Colours of light signals.*

BS 1449, *Steel plate, sheet and strip.*

BS 1452, *Grey iron castings.*

BS 1470, *Wrought aluminium and aluminium alloys. Plate, sheet and strip.*

BS 1490, *Aluminium and aluminium ingots and castings.*

BS 1615, *Anodic oxidation coatings on aluminium.*

BS 1871, *Minimum requirements for silvering for glass reflectors for lighting purposes.*

BS 2011, *Methods for the environmental testing of electronic components and electronic equipment.*

BS 2011-2A, *Cold.*

BS 2011-2B, *Dry heat.*

BS 2214, *The performance of power transformers (not exceeding 2 kV A rating) for radio and allied electronic equipment.*

BS 2569, *Sprayed metal coatings.*

BS 2569-1, *Protection of iron and steel by aluminium and zinc against atmospheric corrosion.*

BS 2782, *Methods of testing plastics.*

BS 3871, *Miniature and moulded case circuit-breakers.*

¹⁾ Copies of the appropriate specification may be obtained from the Department of the Environment, St. Christopher House, Southwark Street, London, S.E.1.

BS 4300/2, *Aluminium alloys suitable for bright trim / reflector applications. Sheet and strip.*

BS 6004, *PVC-insulated cables (non-armoured) for electric power and lighting.*

BS 6007, *Elastomer-insulated cables for electric power and lighting.*

BS 6346, *PVC-insulated cables for electricity supply.*

CP 1013, *Earthing.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 28 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 General

1.1 Scope

This British Standard specifies requirements for fixed and portable electric light signal installations operated from a mains, generator or battery supply, for controlling road traffic. It also includes reference to operational requirements for the signals and their controller. Appendix A covers information which should be given with enquiries and orders for equipment, and typical symbols which should be used in drawing up plans are given in Appendix B.

NOTE The titles of the British Standards referred to in this standard are listed on pages iii and iv.

1.2 Definitions

For the purposes of this British Standard the definitions given in BS 892 apply, together with the following:

optical system

an assembly of components to produce a light or light pattern of specified size, colour, intensity and shape

restrictive traffic signal

the light signals exhibited by a signal face at any given time, consisting of or including one or more optical systems presenting a symbolic appearance when such light signals are required to have application only to a particular class of traffic or to a particular movement of traffic

beam axis

the straight line passing through the light centre of the optical system in the direction of maximum intensity of the beam

geometric axis

a straight line passing through the centre of the lens and perpendicular to it

visor

a hood attached to the signal face to minimize phantom effects due to extraneous light sources and to reduce the possibility of a signal being seen by traffic for which it is not intended

isolated controller

a device which governs the time of the cycle and changes the signals without reference to any other controller

local controller

a device which controls the signals and which is subject to the governing influence of another controller, a master controller or central co-ordinating equipment

master controller

a device which governs the time of the cycle and the changes of signals controlled by local controllers in a local co-ordinated control system

co-ordinated control system

a system, in which the changes of the signals at a series of road junctions are interrelated

way

the term “one-way”, “two-way”, etc., as applied to signals, indicates the number of signal faces used in a signal head assembly

nominal time

a given time period which may be selected from a range of available timed periods

2 Optical requirements

2.1 Distribution of light

2.1.1 Optical systems for providing non-restrictive traffic signals. When fitted with the appropriate standard lamp in accordance with the requirements of 3.5; with a coloured lens such that the colour of the light transmitted falls within the limits specified in 2.7 for the red, amber and green signals as appropriate; and without any signal visor the distribution of light shall, for red and green signals, be not less than the values set out in Table 1 for signals on normal roads or in Table 2 for signals on high-speed roads²⁾; and for amber signals shall be not less than twice the values set out in Table 1 and Table 2 respectively.

Each signal shall present a uniform appearance, free from excessively bright spots or sectors, over the whole area of the lens when viewed from any direction within the cone of directions for which the intensities are specified in Table 1 or Table 2. Polar curves shall be reasonably smooth and reasonably free from secondary maxima.

Table 1 — Distribution of red and green light for signals on normal roads (candelas)

Vertical	Horizontal		
	On geometric axis	10° on either side of geometric axis	25° on either side of geometric axis
On geometric axis	400	150	25
1° below geometric axis	475	200	30
10° below geometric axis	200	100	25

Table 2 — Distribution of red and green light for signals on high-speed roads (candelas)

Vertical	Horizontal		
	On geometric axis	10° on either side of geometric axis	25° on either side of geometric axis
On geometric axis	800	380	50
10° below geometric axis	375	200	40

Phantom effects, when measured by the method specified in 4.8, shall not, for signals on normal roads and on high-speed roads, have an intensity greater than 1.5×10^{-3} cd/lx of incident light.

The lamp intensities shall be capable of an automatic reduction during the hours of darkness to between $\frac{1}{4}$ and $\frac{1}{12}$ of the normal intensities. When the light intensity of any signal is so reduced it shall still comply fully with the requirements as to colour set out in 2.7. The means of controlling the lamp intensities shall be provided unless otherwise specified.

The light intensity requirements of this subclause will not necessarily apply to traffic signals at railway level crossings or to portable signals.

2.1.2 Optical systems for providing restrictive traffic signals

2.1.2.1 Green arrow and pedestrian optical systems. When fitted with the appropriate standard lamp in accordance with the requirements of 3.5; with a coloured lens such that the colour of the light transmitted falls within the limits specified for the green arrow or pedestrian symbol in 2.7; and without any signal visor the mean minimum luminance values shall be as set out in Table 3 when tested in accordance with the requirements of 4.6.

The lamp intensities shall be capable of an automatic reduction during the hours of darkness to between $\frac{1}{4}$ and $\frac{1}{12}$ of the normal intensities. When the light intensity of any signal is so reduced it shall still comply fully with the requirements as to colour set out in 2.7. The means of controlling the lamp intensities shall only be provided when specified.

²⁾ Normally, high-speed road optical systems will be appropriate where approach speeds greater than 80 km/h are expected and where signals are visible on approaches greater than 200 m.

Table 3 — Minimum values of luminance for green arrow and red and green pedestrian signals (candelas per square metre)

Vertical	Horizontal		
	On geometric axis	10° on either side of geometric axis	30° on either side of geometric axis
On geometric axis	3 500 ^a	2 200	700
10° below geometric axis	2 500 ^a	1 350	600
15° below geometric axis	1 500 ^a	1 000	400

^a The variation of luminance over the surface of the green arrow or pedestrian symbol shall not exceed the ratio 10 : 1, at the test points marked with an asterisk.

Each signal shall present a uniform appearance, free from excessively bright spots or sectors, over the whole area of the signal face when viewed from any direction within the cone of directions for which luminance values are specified in Table 3. Polar curves shall be reasonably smooth and free from secondary maxima.

Phantom effects, when measured by the method specified in 4.8, shall not, for green arrows and green and red pedestrian signals, have a luminance greater than 4×10^{-2} cd/m² per lux of incident light. Where in particular situations due to exceptional site conditions optical systems complying with this requirement give rise to unacceptable phantom effects, agreed means of reducing the phantom effect shall be provided.

2.1.2.2 Optical systems for providing other restrictive traffic signals. These shall conform to the requirements of 2.1.2.1 so far as is practicable, unless otherwise specified.

2.1.2.3 Prescribed traffic signs, internally illuminated. For the requirements of prescribed traffic signs which may require to be fitted in association with traffic signals, reference should be made to BS 873-1.

2.2 Directions of beam

2.2.1 Light signals intended for drivers. On high-speed roads, the light signals shall be directed at a point approximately 200 m from the primary signal face and approximately 1.5 m above ground level at the centre line of the carriageway allocated to approaching traffic. Where signals are mounted above the carriageway on mast arms or gantries or suspended on catenaries, the light signals shall be directed at a point approximately 1.5 m above the carriageway allocated to approaching traffic between 200 m and 400 m (depending on site conditions) from the primary signal face. In other situations, the corresponding distances from the primary signal face shall be approximately 50 m for post-mounted signals and approximately 100 m for overhead signals. These dimensions may be varied where special circumstances require otherwise.

2.2.2 Light signals intended for pedestrians. The light signals shall be directed towards the centre line of that part of the carriageway allocated to pedestrian movement unless special circumstances require otherwise.

2.3 Arrangement of optical systems

2.3.1 Traffic signals at road junctions, road works, etc., and/or pedestrian crossings

2.3.1.1 Light signals intended for drivers. Each signal face shall, unless otherwise specified, contain three optical systems arranged vertically, each having a diameter of not less than 200 mm nor more than 215 mm. The coloured lens of the upper optical system shall be red, the middle one amber, and the lower one green. Where green arrows are used they shall have an optical system having a diameter of not less than 295 mm nor more than 305 mm, which shall incorporate green arrows in accordance with the requirements of 2.4. The green arrows may either replace the green light or be additional to such light in one of the permitted arrangements shown in Figure 1. Where prescribed traffic signs are incorporated in the signal face they shall be internally illuminated and shall have an optical system having a diameter not less than 295 mm nor more than 305 mm, and shall comply with the requirements of BS 873-1. The optical system spacings shall be in accordance with the dimensions given in Figure 2.

2.3.1.2 Light signals intended for pedestrians. Each signal face shall contain two optical systems arranged vertically, each having a diameter of not less than 295 mm nor more than 305 mm, which shall incorporate pedestrian symbols in accordance with the requirements of 2.5. The upper optical system shall illuminate a red symbol and the lower one a green symbol. The optical system spacings shall be in accordance with the details given in Figure 3.

2.3.2 Traffic signals at level crossings, aircraft crossings, swing bridges, etc. (WIG-WAG signals). Each signal face shall, according to specific requirements, contain either:

- 1) two optical systems arranged horizontally, each having a diameter of not less than 200 mm nor more than 215 mm, the coloured lenses of the optical system being red, or
- 2) three optical systems arranged in the form of an inverted triangle, each having a diameter of not less than 200 mm nor more than 215 mm, the coloured lenses of the two upper horizontally mounted optical systems being red and the lower optical system being amber.

The optical system spacings shall be in accordance with the details given in Figure 4.

2.4 Green Arrow

Where an optical system incorporating a green arrow is used, the background for the arrow shall be obtained by coating the lens or filter as may be appropriate with heat-resisting black paint or enamel, or by other suitable means. The green arrow shall be of the shape and dimensions shown in Figure 5.

2.5 Pedestrian signal

Where optical systems incorporating red or green pedestrian symbols are used, the background for the symbols shall be obtained by coating the lens or filter as may be appropriate with heat-resistant black paint or enamel, or by other suitable means. The red and green symbols shall be of the shape and dimensions shown in Figure 3a and Figure 3b.

2.6 Pedestrian push-button box

The dimensions and layout of the front of the pedestrian push-button box are shown in Figure 8a and Figure 8b. Means shall be provided for securing the box to the signal post.

Provision shall be made to illuminate internally that part of the front panel bearing the legend "WAIT", which shall be white on a blue background, colour 8-087 of BS 2660.

The lamp to illuminate the panel shall be of clear uncoloured glass and shall meet the requirements of BS 555. The lamp shall be rated 65 W having either:

- 1) a light centre length of 62 mm and being fitted with an Edison screw cap, or
- 2) a light centre length of 85 mm and being fitted with a bayonet cap.

Push-button plungers and mountings shall be so designed as to minimize the risk of jamming by foreign objects, moisture or the products of corrosion. They shall be weather-proof and reasonably dust-proof and adequately insulated from all electrical contacts and connections. No voltage in excess of 60 V shall be connected to push-button terminals.

2.7 Limits of chromaticity of signals

The colour of the light transmitted by the signals shall comply with the limits set out in British Standard 1376, Table 1, as follows:

- 1) *Vehicle signal*

Red:	Signal Red Class B1
Amber:	Signal Yellow Class A
Green:	Signal Green Class B
Green arrow:	Signal Green Class B
- 2) *Pedestrian signal*

Red symbol:	Signal Red Class B1
Green symbol:	Signal Green Class B

2.8 Height of signal

2.8.1 Post-mounted traffic control light signals

2.8.1.1 Fixed light signals intended for drivers. The height of signals shall be such that when erected the centre of the amber optical system shall be not less than 2.4 m nor more than 4 m above the carriageway level. Where no amber signal is installed (i.e. certain WIG-WAG signals) these dimensions apply to the centre of the red signal.

2.8.1.2 Portable light signals intended for drivers. The height of the signals shall be such that when erected the centre of the amber optical system shall be not less than 1.5 m nor more than 3.5 m above the carriageway level.

2.8.1.3 Light signals intended for pedestrians. The height of signals shall be such that when erected the height of the lower edge of the housing enclosing the green signal shall be not less than 2.1 m nor more than 2.6 m above the carriageway level.

2.8.2 Overhead mounted traffic control light signals. The height of overhead mounted signals shall be such that when erected the centre of the amber optical system shall be not less than 6.1 m nor more than 9 m above the carriageway level.

NOTE 1 Variations from the minimum height should only be contemplated when there are definite reasons for making such variations obligatory.

NOTE 2 These dimensions are replacement metric dimensions which are being substituted for imperial dimensions in Parliamentary Legislation (S.I. 1964, No. 1857). Until the replacement Statutory Instrument comes into operation and S.I. No. 1857 is revoked, it will be a requirement to meet the metric or imperial dimensions, whichever are the more stringent.

3 Constructional requirements

3.1 Signal head assembly

The signal head assembly shall be suitable for the type of mounting specified by the purchaser. The signal head, the fixing brackets and the necessary parts thereof shall be so designed that, when installed, the signals shall be capable of adjustment both vertically and horizontally to meet the requirements of 2.2 in respect of all approach roads and pedestrian crossings to which the signals apply. The adjustment shall be such that no signal shall obstruct the view of optical systems of any other signal head within 25° of the axis of the beam. The signal head assembly shall be capable of being locked securely after adjustment.

Unless otherwise specified a backing board (see Figure 4a) shall be provided with each signal face intended for vehicle drivers, extending not less than 300 mm above the centre of the upper optical system nor less than 230 mm below the centre of the lower optical system. It shall extend not less than 280 mm horizontally either side of the vertical centre line of the optical system, unless there is an adjacent backing board associated with another signal face in which case this dimension may be reduced to 220 mm on the adjacent side. Where there are subsidiary signal heads attached to the main signal head the backing board shall extend not less than 230 mm vertically above the centre of the upper subsidiary signal optical system and below the centre of the lower subsidiary signal optical system, and horizontally not less than 230 mm from the vertical centre line of the subsidiary signal optical system. The backing board shall have a white border not less than 45 mm nor more than 55 mm wide. Backing boards are not required with portable signals.

For WIG-WAG signals where two flashing red signals are employed, the backing board shall extend not less than 300 mm in the vertical and horizontal directions from the centres of the optical systems. The backing board shall have a white border not less than 45 mm nor more than 55 mm wide. See Figure 4b.

For WIG-WAG signals where two flashing red signals and an amber signal are employed, the backing board shall extend not less than 300 mm above the centres of the red optical systems and not less than 300 mm below the centre of the amber optical system. The overall width of the backing board shall be not less than 1.31 m. The backing board shall have a white border not less than 85 mm nor more than 95 mm wide. See Figure 4c.

All parts of the signal head assembly shall be finished matt black with the white border of the backing boards on the front face only.

All screws and fixings shall be non-corrodible.