

**BRITISH STANDARD**

# **Miscellaneous road traffic signs and devices – Requirements and test methods**

ICS 93.080.30

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# Foreword

## Publishing information

This British Standard was published by BSI and came into effect on 31 October 2006. It was prepared by Subcommittee B/509/3, *Construction of road traffic signs*, under the authority of Technical Committee B/509, *Road equipment*. A list of organizations represented on this committee can be obtained on request to its secretary.

## Supersession

Together with BS EN 1463-1:1998, BS EN 1463-2:2000 and BS EN 12899-1:2001, the British Standard supersedes BS 873-1:1983, BS 873-2:1984, BS 873-4:1987 and BS 873-7:1984, which are withdrawn.

BS 873-3 is to be replaced by BS EN 12899-2, which is currently in preparation; BS 873-5 and BS 873-6 have been withdrawn and superseded by BS EN 12899-1; and BS 873-8:1985 has been withdrawn and superseded by BS EN 13422.

BS 873 was first published in 1939 in response to a request from the Association of Road Traffic Sign Makers, and was revised in 1959 and 1970. It was reissued in eight parts between 1980 and 1987. As much of it has been superseded by various European Standards, BS 8442 revises and brings together in a single document all the material not covered elsewhere.

## Product certification/inspection/testing

Users of this British Standard are advised to consider the desirability of third-party certification/inspection/testing of product conformity with this British Standard. Appropriate conformity attestation arrangements are described in BS EN ISO/IEC 17025. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

## Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

*Commentary, explanation and general informative material is presented in notes in smaller italic type, and does not constitute a normative element.*

### **Contractual and legal considerations**

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

### **Compliance with a British Standard cannot confer immunity from legal obligations.**

In particular, attention is drawn to the following statutory regulations:

The Traffic Signs Regulations and General Directions 2002 [1]

The Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997 (Pedestrian Crossings Regulations), as amended [2]

The School Crossing Patrol Sign (England and Wales) Regulations 2006 [3]

The School Crossing Patrol Sign (Scotland) Regulations 2002 [4]

# 1 Scope

This standard specifies requirements and tests (see Note) for rigid and flexible portable signs, barriers, self supporting portable signs, “Stop/Go” signs, school crossing patrol signs, flat traffic delineators, flap signs, pedestrian crossing and refuge beacons, internally illuminated posts, twin amber flashing light units, non-retroreflecting road studs and retroreflective self-righting bollards. Active road studs (incorporating light emitting devices) are not covered in this standard.

*NOTE The tests given in this standard are suitable for both initial type testing and production testing.*

# 2 Normative references

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

BS 3424-5, *Testing coated fabrics – Part 5: Methods 7A, 7B and 7C – Methods for determination of tear strength*

BS 4148, *Specification for the abbreviation of title words and titles of publications*

BS 7263-1, *Precast concrete flags, kerbs, channels, edgings and quadrants – Precast concrete paving flags and complementary fittings – Part 1: Requirements and test methods*

BS 8408:2005, *Road traffic signs – Testing and performance of microprismatic retroreflective sheeting materials – Specification*

BS EN 485-1, *Aluminium and aluminium alloys – Sheet, strip and plate – Part 1: Technical conditions for inspection and delivery*

BS EN 12332-1:1999, *Rubber- or plastics-coated fabrics – Determination of tensile strength and elongation at break – Part 1: Steel ball method*

BS EN 12767, *Passive safety of support structures for road equipment – Requirements and test methods*

BS EN 12899-1:2001, *Fixed, vertical road traffic signs – Part 1: Fixed signs*

BS EN 13032-1, *Light and lighting – Measurement and presentation of photometric data of lamps and luminaires – Part 1: Measurement and file format*

BS EN 50293, *Electromagnetic compatibility – Road traffic signal systems – Product standard*

BS EN 55014-1, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission – Product family standard*

BS EN 60529, *Specification for degrees of protection provided by enclosures (IP code)*

BS EN 60598-1, *Luminaires – Part 1: General requirements and tests*

BS EN ISO 1421:1998, *Rubber- or plastics-coated fabrics – Determination of tensile strength and elongation at break*

BS EN ISO 2286-2:1998, *Rubber- or plastics-coated fabrics – Determination of roll characteristics – Part 2: Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate*

prEN 12899-2:2006, *Fixed, vertical road traffic signs – Part 2: Transilluminated traffic bollards*

CIE 15:2004 (third edition), *Colorimetry*

CIE 17.4, *International lighting vocabulary*

CIE 54.2, *Retroreflection: Definition and measurement*

*NOTE* All CIE documents are available from the International Commission on Illumination, CIE Central Bureau, Kegelstrasse 27, A-1030 Vienna. AUSTRIA +43 (01) 714 31 87/0 or [www.cie.co.at](http://www.cie.co.at)

## 3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 4148 and CIE 17.4 and the following apply.

### 3.1 base housing

that part of an RSRB containing the self-righting equipment which is fixed to the refuge, traffic island or carriageway

### 3.2 coefficient of retroreflection

$R_A$

luminous intensity of a surface in the direction of observation, divided by the product of the illuminance on a plane perpendicular to the direction of incident light and the area of the surface

*NOTE*  $R_A$  is expressed in candelas per lux per square metre ( $\text{cd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$ ).

### 3.3 conspicuity panel

that part of an RSRB above the ground line which enhances the conspicuity of the RSRB in all ambient lighting conditions

### 3.4 entrance angle

$\beta$

angle between the illumination axis and the retroreflector axis

*NOTE* In signing applications the entrance angle is less than  $90^\circ$ .

### 3.5 fluorescence

attribute of daytime appearance based on absorption of light at shorter wavelengths and emission at longer wavelengths

### 3.6 ground line

level of the surface on which a device is mounted

### 3.7 luminance

physical measure of optical stimulus which produces the sensation of brightness measured by the luminous intensity of light emitted or reflected in a given direction from a surface element divided by the area of the element projected in the same direction

*NOTE* The unit of measurement is candelas per square metre ( $\text{cd} \cdot \text{m}^{-2}$ ).

**3.8 luminance factor** $\beta$ 

ratio of the luminance of a surface to that of a perfect diffuse reflector, identically illuminated and viewed

**3.9 observation angle** $\alpha$ 

angle between the illumination axis and the observation axis

**3.10 retroreflection**

reflection in which the reflected rays are preferentially returned in directions close to the opposite of the direction of the incident rays, this property being maintained over wide variations in the direction of the incident rays

**3.11 retroreflector**

retroreflective device or material capable of reflecting light back in the general direction of the light source

**3.12 rotation angle** $\varepsilon$ 

angle in a plane perpendicular to the retroreflector axis from the observation half plane to the datum axis, measured counter-clockwise from the viewpoint of the source

**3.13 substrate**

rigid material which supports the sheeting

**3.14 traffic sign**

object or device, either fixed or portable, for warning, regulating, guiding or informing road users

**3.15 retroreflective self-righting bollard (RSRB)**

retroreflective self-righting device normally mounted on a refuge or a traffic island

*NOTE An RSRB may contain a prescribed traffic sign or a plain white area.*

**3.16 road stud**

device that is bonded to or anchored within the road surface in order to warn, guide or inform road users

**3.17 RSRB body**

that part of an RSRB above the base housing

## **4 Information and requirements to be agreed and documented**

**4.1 Information to be supplied by the purchaser**

The following information to be supplied by the purchaser shall be fully documented. For compliance with the standard both the definitive requirements specified throughout the standard and the following documented items shall be satisfied.

- a) The properties of the microprismatic material (see 5.2.2.2).
- b) The level of protection against electric shock (13.1).

- c) The degree of ingress protection required if it is higher than that specified in **13.2.1**, **13.3.1** and **13.4.1**.
- d) The length of a zebra crossing or refuge beacon post above ground within the limits prescribed by the Pedestrian Crossings Regulations and the Traffic Signs Regulations and General Directions (see **13.3.2.1** and **13.3.2.2**).
- e) The method of securing a flashing amber light unit to a post (see **13.4.1**).

## **4.2 Items to be agreed**

The following item to be agreed between the contracting parties are specified in the clauses referred to and shall be fully documented. For compliance with the standard both the definitive requirements specified throughout the standard and the following documented item shall be satisfied.

- a) If testing of sign face material is to be carried out with the sample attached to a substrate other than 3 mm aluminium sheet (see **5.1.2**).

# **5 Sign face materials**

## **5.1 Sampling**

### **5.1.1 Test samples**

Samples for performance testing shall be selected randomly, e.g. in accordance with one of the sampling procedures given in the BS 6001 and BS 6002 series of standards, and shall be representative of the normal production of the sheeting materials to be tested.

*NOTE Guidance on the selection of sampling procedures from BS 6001 and BS 6002 is given in BS 6000.*

### **5.1.2 Mounting of samples**

If it is necessary for the material under test to be mounted on a substrate, the material to be tested in accordance with this standard shall be applied to 3 mm aluminium sheet conforming to BS EN 485-1 or other agreed substrate in accordance with the material manufacturer's instructions [see **4.2a**)]. Any protective coatings required by the material manufacturer shall be applied in accordance with the manufacturer's instructions.

## **5.2 Visual performance**

### **5.2.1 Chromaticity**

#### **5.2.1.1 Daylight chromaticity**

#### **5.2.1.2 Non-retroreflective signs**

When tested in accordance with BS EN 12899-1:2001, **5.2.1.1**, the chromaticity and the luminance factor shall conform to BS EN 12899-1:2001, Table 3.

### 5.2.1.2.1 Retroreflective sign face materials

#### 6.2.1.2.1.1 Glass bead

When tested in accordance with BS EN 12899-1:2001, **5.2.1.2**, the chromaticity and the luminance factor shall conform to BS EN 12899-1:2001, Table 5.

#### 6.2.1.2.1.2 Microprismatic

When tested in accordance with BS 8408:2005, **5.2.1.1**, the chromaticity and the luminance factor for non-fluorescent microprismatic material shall conform to BS 8408:2005, Table 2.

*NOTE The chromaticity boxes for non-fluorescent materials in BS 8408:2005 and BS EN 12899-1:2001 are the same.*

When tested in accordance with BS 8408:2005, **5.2.2.1**, the chromaticity and the luminance factor for fluorescent microprismatic material shall conform to BS 8408:2005, Table 4.

### 5.2.1.3 Night-time chromaticity of microprismatic material

*NOTE Non-retroreflective signs may be illuminated by external lighting at night. At present, there is no test for the night-time chromaticity of glass bead sign face materials. As a result, this sub-clause is limited to microprismatic sign face material.*

When tested in accordance with BS 8408:2005, **5.2.1.2**, the chromaticity and the luminance factor for non-fluorescent microprismatic material shall conform to BS 8408:2005, Table 3.

When tested in accordance with BS 8408:2005, **5.2.1.2**, the chromaticity and the luminance factor for fluorescent microprismatic material shall conform to BS 8408:2005, Table 5.

## 5.2.2 Photometric requirements

### 5.2.2.1 Glass bead sign face materials

When measured in accordance with the procedure in CIE 54.2, using CIE standard illuminant A, the coefficient of retroreflection ( $R_A$ ) of retroreflective glass bead material shall conform to BS EN 12899-1:2001, Table 8 or 9, as required.

### 5.2.2.2 Microprismatic sign face materials

Microprismatic materials shall be assessed and rated in accordance with the procedures in BS 8408. The materials shall have the characteristics specified by the purchaser [see **4.1a**) and BS 8408:2005, Annex I].

## 5.3 Physical performance

### 5.3.1 Salt spray resistance of microprismatic sign face materials

Microprismatic materials shall conform to BS 8408:2005, **4.3.2**.

### 5.3.2 Resistance to impact of retroreflective and non-retroreflective sign face materials

5.3.2.1 Sign face materials shall conform to BS EN 12899-1:2001, 5.3.7.

### 5.3.3 Resistance to weathering of the sign face of retroreflective sign face materials

#### 5.3.3.1 Resistance of microprismatic sign face materials to accelerated artificial weathering

*NOTE This test is optional for early evaluation purposes.*

Microprismatic materials shall conform to BS 8408:2005, 4.3.5.

#### 5.3.3.2 Resistance to accelerated natural weathering

5.3.3.2.1 Glass bead materials shall conform to BS EN 12899-1:2001, 5.3.6.

5.3.3.2.2 Microprismatic materials shall conform to BS 8408:2005, 4.3.6.

Table 1 Exposure period for accelerated natural weathering

| Class | Period |
|-------|--------|
|       | Years  |
| T1    | 2      |
| T2    | 3      |

## 6 Self-supporting rigid portable signs, other than barriers

### 6.1 General

The sign shall be constructed in such a way that, when erected, the lowest edge of the sign, or of any supplementary plate, shall be not less than 300 mm above the supporting surface. The sign shall be so constructed that, when erected, the sign face is either normal to the supporting surface or inclined so that the top of the sign leans away from the viewer, at an angle not greater than 22.5° from the normal to the supporting surface when observed from the front.

*NOTE 1 Vertical mounting is recommended as this improves the retroreflective performance of virtually all sign face materials.*

The sign assembly shall be so designed as to allow the use of ballasting which will permit the sign assembly to resist the wind forces it is likely to experience in any location in which it is eventually deployed. The sign assembly manufacturer shall indicate the minimum recommended ballast required, and its positioning on the sign assembly's supports, for the sign assembly to resist the wind speed class(es) for which it is designed [see Table 2, 15.1e) and Annex A].

The minimum recommended ballast required for the sign assembly to resist Class A, Class B and Class C wind speeds shall be calculated using the methods described in Annex B.

*NOTE 2 The front of any backing board or background against which the sign is displayed is required by the Traffic Signs Regulations and General Directions 2002 [1] to be grey or yellow.*

Table 2 Classification of effective wind speeds  $V_e$ 

| Class of wind speed | Effective wind speed $V_e$<br>ms <sup>-1</sup> |
|---------------------|------------------------------------------------|
| A                   | 26.3                                           |
| B                   | 17.6                                           |
| C                   | 8.7                                            |

*NOTE 3 Pressure due to passing vehicles is small by comparison and has been ignored. A guide to wind speed classes is given in Annex C.*

## 6.2 Visual performance of sign face material

The visual performance of the sign face material shall conform to 5.2.

## 6.3 Physical performance of the sign face

The physical performance of sign face material shall conform to 5.3.

When tested in accordance with Annex D, the sign assembly shall not:

- begin to overturn by rotating at the back of the base when the force is applied from the front;
- begin to overturn by rotating at the front of the base when the force is applied from the back;
- slide along the surface if the force is applied in either direction.

# 7 Portable barriers

## 7.1 General

*NOTE Barrier units incorporating traffic signs intended to close a traffic lane, or guide traffic or pedestrians past works, are regulated by the Traffic Signs Regulations and General Directions 2002 [1].*

Barrier units, comprising barrier boards, tapping rails, supports and bases, shall be capable of being incorporated into systems which are used to mark part of a highway which is closed to traffic or to guide traffic or pedestrians past an obstruction.

The barrier unit shall be constructed so as to allow the use of ballasting. The manufacturer shall indicate the minimum recommended ballast required, and its positioning on the barrier assembly's supports, for the barrier assembly to resist the wind speed class(es) for which it is designed [see Table 2, 15.1e) and Annex E].

The minimum recommended ballast required for the barrier assembly to resist Class A, Class B and Class C wind speeds shall be calculated using the methods described in Annex F.

## 7.2 Visual performance

The visual performance of any traffic sign incorporated into portable barriers shall conform to 5.2.

## 7.3 Physical performance

The physical performance of portable barriers shall conform to 5.3.