

BS 559:2009



# BSI British Standards

## Specification for the design and construction of signs for publicity, decorative and general purposes

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 20, an inside back cover and a back cover.

## Foreword

### Publishing information

This British Standard is published by BSI and came into effect on 31 August 2009. It was prepared by Technical Committee CPL/34, *Lamps and related equipment*. A list of organizations represented on this committee can be obtained on request to its secretary.

### Supersession

This British Standard supersedes BS 559:1998, which is withdrawn.

### Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- requirements for the calculation of resistance to wind pressures (6.2.1);
- requirements for foundations for fixed free standing signs (6.2.2);
- protection against corrosion (6.2.4) and protection from damage by birds and rodents (6.2.5);
- requirements for LEDs (7.2);
- guidance on working with vinyl films (Annex A).

### Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

### 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 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.**

## 1 Scope

This British Standard specifies requirements for the design and construction of signs for publicity, decorative or general purposes, at internal or external locations. It is applicable to illuminated and non-illuminated signs, fixed or portable.

This standard is not applicable to road traffic signs, safety signs or fire safety signs.

*NOTE* Other standards are available for road traffic signs (e.g. BS 8442 and BS EN 12899) and safety signs, including fire safety signs (e.g. BS 5499).

Guidance on working with vinyl films is given in Annex A.

## 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 476-7:1997, *Fire tests on building materials and structures – Part 7: Method of test to determine the classification of the surface spread of flame of products*

BS 4533-102.1, *Luminaires – Part 102: Particular requirements – Section 102.1: Specification for fixed general purpose luminaires*

BS 5950-1:2000, *Structural use of steelwork in building – Part 1: Code of practice for design – Rolled and welded sections*<sup>1)</sup>

BS 6206, *Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings*

BS 6262, *Code of practice for glazing for buildings*<sup>2)</sup>

BS 6496, *Specification for powder organic coatings for application and stoving to aluminium alloy extrusions, sheet and preformed sections for external architectural purposes, and for the finish on aluminium alloy extrusions, sheet and preformed sections coated with powder organic coatings*

BS 7671, *Requirements for electrical installations – IEE Wiring Regulations*

BS 8004, *Code of practice for foundations*

BS 8417, *Preservation of timber – Recommendations*

BS EN 1090-2:2008, *Execution of steel structures and aluminium structures – Part 2: Technical requirements for the execution of steel structures*

BS EN 1396, *Aluminium and aluminium alloys – Coil coated sheet and strip for general applications – Specifications*

BS EN 1991-1-4, *Eurocode 1 – Actions on structures – Part 1-4: General actions – Wind actions* (including the National Annex)

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<sup>1)</sup> It is anticipated that BS 5950-1 will be withdrawn in due course. Up to date information can be obtained from BSI Customer Services.

<sup>2)</sup> It is anticipated that BS 6262 will be withdrawn on publication of BS 6262 Parts 1–7.

BS EN 12373-1, *Aluminium and aluminium alloys – Anodizing – Part 1: Method for specifying decorative and protective anodic oxidation coatings on aluminium*

BS EN 13438, *Paints and varnishes – Powder organic coatings for galvanized or sherardised steel products for construction purposes*

BS EN 50107-1, *Signs and luminous-discharge-tube installations operating from a no-load rated output voltage exceeding 1 kV but not exceeding 10 kV – Part 1: General requirements*

BS EN 60529:1992, *Specification for degrees of protection provided by enclosures (IP code)*

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

BS EN 60598-2-4, *Luminaires – Part 2: Particular requirements – Section 2.4: Portable general purpose luminaires*

BS EN 60598-2-5, *Luminaires – Part 2-5: Particular requirements – Floodlights*

BS EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods*

### 3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

#### 3.1 signs

##### 3.1.1 sign

word, letter, model, emblem, border, outline, box, device, representation, announcement or direction, fixed or free standing, including a framework together, where necessary, with a means of attachment to a building or supporting structure

##### 3.1.2 illuminated sign

sign with means of illumination, such means being either an integral part of the sign or external to the sign

*NOTE 1 External illumination might be in the form of floodlighting luminaires.*

*NOTE 2 Integral illumination might consist of light sources within the sign, providing back illumination of a translucent (or transparent) face carrying the sign message; or might consist of light sources fixed to the sign face and comprising an integral part of the message.*

##### 3.1.3 sign installation

sign consisting of many separate parts and intended to be assembled and wired at the installation site

##### 3.1.4 self-contained sign

sign, usually small, in which the housing, legend, means of illumination and wiring are supplied as a complete unit requiring merely to be connected to a mains supply

*NOTE A self-contained sign might be portable or might be intended to be permanently fixed to its mounting surface.*

- 3.1.5 portable sign**  
small self-contained sign which is supplied as a complete unit and is intended to be placed in position and, if illuminated, connected to a mains supply, usually by unskilled personnel
- NOTE* A portable illuminated sign is usually supplied with an integral lead for connecting to the mains supply and this often includes a mains plug.
- 3.2 parts of signs**
- 3.2.1 backing panel**  
part behind a sign or fitting which might also act as a means of support
- 3.2.2 face panel**  
part of the sign which usually contains the message, and is directed towards the observer
- 3.3 illuminated signs**
- 3.3.1 low voltage**  
nominal voltage normally exceeding extra-low voltage but not exceeding 1 000 V a.c. or 1 500 V d.c. between conductors, or 600 V a.c. or 900 V d.c. between conductors and earth
- 3.3.2 luminaire**  
equipment which distributes, filters, or transforms the light from one or more tubes, and which includes any parts necessary for supporting, fixing and protecting the tubes, but not the tubes themselves, and, where necessary, circuit auxiliaries together with the means for connecting them to the supply
- 3.3.3 light-emitting diode (LED)**  
solid state device embodying a p-n junction, emitting optical radiation when excited by an electric current  
[IEC 60050-845:1987 and BS EN 62031:2008, 3.1]
- 3.3.4 LED module**  
unit containing one or more LEDs supplied as a light source
- NOTE* In addition to one or more LEDs, it might contain further components, e.g. optical, mechanical, electrical and electronic, but excluding the control gear.  
[BS EN 62031:2008, 3.2, modified]
- 3.3.5 cold cathode**  
lamp electrode operating by field emission
- 3.3.6 hot cathode**  
lamp electrode operating by thermionic emission
- 3.4 materials**
- 3.4.1 plastic materials**  
polymeric materials
- 3.4.2 flexible plastic**  
plastic material which is essentially flexible and requires a tensioning system when used in a sign face
- 3.4.3 rigid plastic**  
plastic material which is essentially rigid and does not require a tensioning system when used as a sign face

**3.4.4 aluminium composite material (ACM)**

sheet material comprising an aluminium skin or skins on a rigid or semi-rigid core of a different material

*NOTE* ACM is typically a polyethylene core with a laminated pre-coated aluminium skin on each face.

**4 Service life**

The service life of the sign shall be either:

- a) as specified by the purchaser on the order; or
- b) as agreed between the purchaser and the manufacturer; or
- c) as specified by the manufacturer to the purchaser; or
- d) if not specified or agreed in accordance with a), b) or c), 10 years.

**5 Sign materials****5.1 General**

Materials used in the construction of a sign shall meet the minimum requirements of the service life of the sign (see Clause 4).

*NOTE* Due to the large number of types of vinyl graphics materials, substrates, manufacturers and application methods, it is impractical to give precise requirements. Guidance on working with vinyl films is given in Annex A.

The materials of construction shall conform to BS 476-7 for surface spread of flame.

In addition, signs for petrol filling stations shall conform to Table 1 or to the purchaser's specification.

Table 1 Surface spread of flame for signs on petrol filling stations

Sign type	BS 476-7:1997 Minimum class	Remarks
Canopy cladding	3	All edges of plastic materials protected by metal trims
Light units	3	Positioned to prevent spread of flame from one another
Light boxes above dispensers	3	Small, isolated from the dispensing equipment and positioned so as to prevent spread of flame from one another. All edges of plastic materials protected by metal trims
Column cladding	1	When forming part of dispensing equipment
Pole and price signs	3	Standing apart from the canopy

*NOTE* See the Association of petroleum and explosives administration (APEA) and the Energy Institute (EI) publication [1], Section 12 "Canopies and Buildings".



## 5.2 Metals

**5.2.1** The structural integrity of the sign shall not be adversely affected by corrosion of any part of the sign.

All visible and exposed surfaces and edges of the sign shall be corrosion free for the service life of the sign.

**5.2.2** Metals intended for external use shall:

- a) be inherently corrosion-resistant for the service life of the sign; or
- b) conform to **6.2.4**.

**5.2.3** Metals with a significant difference in electrochemical potential shall be insulated from one another to avoid galvanic corrosion.

## 5.3 Wood and wood laminates

Wood, wood laminates and fibreboard used in the construction of signs shall be protected in accordance with BS 8417.

*NOTE* Guidance on appropriate preservative treatment is also given in BS 5589.

## 5.4 Plastics

Plastics used in the construction of a sign shall retain their physical properties for the service life of the sign. In particular, the manufacturer shall ensure that the application of the sign and/or its maintenance does not adversely affect its structural integrity, appearance and function.

## 5.5 Glass

Glass panels for signs shall be made of safety glass conforming to BS 6206.

*NOTE 1* Guidance on applications, thickness and manifestation is available in BS 6206 and in the UK national building regulations [2–4].

*NOTE 2* Edging requirements depend on the glass type and if necessary, specialist advice should be sourced and followed.

## 5.6 Aluminium composite material (ACM)

ACM shall be finished in accordance with BS EN 1396 for pre-coated aluminium.

# 6 Sign design and construction

## 6.1 General

**6.1.1** Signs which are to be used out of doors (external signs) and signs that are to be used indoors (internal signs) but are still subjected to wind pressure shall conform to **6.2.1** and to **6.2.2** to **6.13**. Signs which are to be used indoors and are not subject to wind pressure shall conform to **6.2.2** to **6.13**.

**6.1.2** Where thickness dimensions are specified for materials such as glass, plastics, wood and metal, these shall be regarded as the nominal dimensions and normal commercial tolerances shall be permitted.

## 6.2 Structure

### 6.2.1 Resistance to wind pressures

The imposed wind load for an external sign or an internal sign that is subjected to wind pressure shall be calculated in accordance with BS EN 1991-1-4 such that the sign withstands the wind load at the site of installation.

The basic wind speed ( $v_b$  m/s) and the type of terrain and building category shall be as specified by the purchaser.

The resulting wind pressure on the sign ( $p$ ) shall be multiplied by the total area of the sign ( $A_e$ ) (including the sign face and any exposed supporting structure) resulting in the total pressure on the sign ( $P$ ).

The steel supporting structure shall be designed in accordance with BS 5950-1.

An overall load factor ( $\gamma_f$ ) of 1.4 shall be used to calculate the ultimate limit state (ULS). The design strength of the selected steel grade shall not be exceeded.

The serviceability load state (SLS) shall be taken as an unfactored load state and used to calculate the temporary deflection of the sign.

The temporary deflection of the sign or part of the sign shall not cause any part of the sign to fail, be dislodged or become unsafe during its service life.

*NOTE* The suggested limit of temporary deflection for a cantivered sign (pole sign, projecting sign or a similar free standing/supported sign) is given in BS 5950-1:2000, Table 8, as:  $\text{Length}/180$ . Circumstances might arise where greater or lesser deflection values would be more appropriate and this would normally be determined by the flexibility and fit of the cladding materials and the permissible stress and in service fretting of the fixings. The suggested minimum temporary deflection is:  $\text{Length}/120$ .

### 6.2.2 Foundations for fixed free standing signs

Foundations for fixed free standing signs shall conform to BS 8004.

*NOTE 1* Where concrete foundations are used, they should be designed in accordance with the code of practice appropriate to the loading assumptions, e.g. BS 8110-1.

*NOTE 2* The foundations for free standing signs would typically be pad type either of mass concrete or reinforced concrete. For soft natural ground a suitably designed raft or even pile type foundations might be required.

Foundation-bearing pressure shall be as specified or determined by soil investigation. Where the allowable ground-bearing pressure is not specified or determined, reference shall be taken to be the presumed allowable bearing value as given in BS 8004.

Concrete foundations shall be designed for the effects of factored loading.

Where holding-down bolts are used, they shall be designed for the effects of factored loading and be anchored into the foundation by use of suitable anchor plates or by an embedded steel cage.

*NOTE 3* Expanding and resin grouted anchors can be used, provided that it can be demonstrated that the required performance can be achieved.

Base plates shall be either tightened down to the top of the foundation or, if raised off the top of the foundation for the purposes of levelling, shall be grouted beneath.

### 6.2.3 Thickness of components

The minimum thicknesses of cladding materials shall either be:

- a) calculated in accordance with BS EN 1991-1-4; or
- b) as specified in 6.5 to 6.10.

### 6.2.4 Protection against corrosion

The sign shall be designed so that it is protected against harmful aesthetic and structural effects of corrosion.

Supporting steel structures shall have a protective treatment conforming to BS EN 1090-2:2008, Annex F.

Steel substrates shall be protected by an appropriate paint, zinc rich primer, hot zinc application or electrochemical plating to effectively seal and insulate the steel, and/or prevent direct contact with dissimilar metals and fixings that could otherwise result in galvanic corrosion.

Hot dipped galvanized steel components shall conform to BS EN ISO 1461 with the corrosion class specified by the purchaser.

Any part of an aluminium post that is placed under the ground shall be protected by an appropriate anti-corrosion treatment, e.g. a coating of tar.

External signs shall have drainage sufficient to avoid dirt, debris or water entrapment between or within materials and/or components.

Where used, coil-coated aluminium sheet and strip shall conform to BS EN 1396.

### 6.2.5 Protection from damage by birds and rodents

Unless otherwise specified by the purchaser, where the issues of potential damage by birds and rodents are prevalent, measures shall be applied to prevent fouling and nesting birds and rodents and their adverse effect on the appearance of the sign and their potential to cause a public nuisance.

*NOTE Examples of preventative measures include spikes and wires across ledges and horizontal perch surfaces, netting across recessed areas of installations or discouragement/deception devices.*

### 6.2.6 Thermal expansion and contraction

Where sign components are made from a combination of different materials (such as plastics and metal) with different values of linear thermal expansion, provision shall be made for movement between the components and for the means of accommodating that movement to ensure that:

- a) gaps do not occur between adjacent panels at the minimum temperature specified in 6.4.1;
- b) there is adequate room within the sign frame to allow for the maximum expansion at the highest temperature within the sign or the surface of the face panel specified in 6.4.2.

### 6.2.7 Joints in signs

Joints shall fulfil the aesthetic requirements as specified by the purchaser and the service life of the sign (Clause 4).

Welding, brazing or soldering of joints in metallic signs shall be carried out in accordance with the recommendations of the suppliers of the welding, brazing or soldering systems.

### 6.2.8 Mechanical properties

Where structural components are made from materials (such as plastics materials) that deteriorate over the service life of the sign, the designer shall obtain relevant life data from the supplier of those materials. This shall include details of the deterioration of mechanical properties through life. The minimum value of the mechanical properties occurring during the service life and the minimum and maximum temperatures specified in 6.4.1 and 6.4.2, respectively, shall be used in the design calculations referred to in 6.2.1.

Structural plastic materials used in signs shall be ultraviolet (UV) stabilized or protected from UV deterioration by other means.

### 6.2.9 Adhesives

Where adhesives are an essential part of the structural integrity of the sign, the sign designer shall obtain from the adhesive supplier written evidence of satisfactory performance of the adhesive over the service life of the sign (Clause 4) at:

- a) the minimum and maximum temperatures specified in 6.4.1 and 6.4.2, respectively;
- b) the wind load specified in 6.2.1;
- c) the structural loading of the sign as specified by the sign designer.

The minimum value of bond strength occurring over the specified service life at the minimum and maximum temperatures specified in 6.4.1 and 6.4.2, respectively, shall be used in the design calculations referred to in 6.2.1. Adhesives shall be applied in accordance with the recommendations of the supplier.

*NOTE It is essential that the correct adhesive is chosen based on the materials to be joined, and that the materials are correctly prepared.*

### 6.2.10 Support of face panels

Face panels of rigid plastics materials shall have their edges supported, and, if necessary, the whole panel shall be supported, by means of anti-deflection props (fixed to the sign face and the sign structure), to ensure that the deflection of the panel at any point does not exceed 5 times the thickness of the panel when subjected to the pressure and suction forces calculated in accordance with 6.2.1. Spacing between anti-deflection props shall not exceed 1 000 mm.

## 6.3 Protection against ingress of dust and water

**6.3.1** The minimum level of protection of unprotected electrical equipment within an external sign shall be IP23 in accordance with BS EN 60529:1992, or greater as specified by the purchaser.

**6.3.2** Sign enclosures intended for external use shall be:

- a) sealed against the entry of water to a degree of protection of IPX5 as specified in BS EN 60529:1992; or
- b) sealed against the entry of water to a degree of protection of IPX3 as specified in BS EN 60529:1992 and provided with one or more drain holes, as appropriate (see Note), having a diameter of not less than 5 mm.

*NOTE* The number of drain holes needed depends on the shape of the device, letter or enclosure and the number of places where water might collect. For example, the letter "S" needs only one drain hole but the letter "M" needs three.

## 6.4 Heating of components

**6.4.1** The minimum temperature shall be as specified by the purchaser of the sign, or, if no minimum temperature is specified by the purchaser, shall be  $-20\text{ }^{\circ}\text{C}$  for external signs and  $0\text{ }^{\circ}\text{C}$  for internal signs.

**6.4.2** The maximum temperature within the sign shall not exceed the maximum service temperature of any materials or components in its construction, as specified by the suppliers of the materials or components. Ventilation shall be provided if service temperatures might be exceeded.

**6.4.3** Sign enclosures housing electrical components shall be such that the temperature of the air within the enclosure does not exceed:

- a) the  $t_a$  rating of the electrical component where this is marked on its rating plate; or
- b) the maximum ambient temperature specified by the supplier of the electrical component; or
- c)  $50\text{ }^{\circ}\text{C}$ , where no information on the temperature rating of the component is available.

**6.4.4** Where electrical components that produce heat (e.g. transformers or other lamp ballasts) are installed in cupboards or similar enclosed situations, through-flow ventilation shall be provided. The enclosure and the arrangement of the components in the enclosure shall conform to the following.

- a) Enclosures for sign transformers and heat-producing components shall have air inlet holes or slots situated below the heat-producing items and air outlet holes or slots above them. The total cross-sectional area of the inlet or outlet holes shall be not less than  $25\text{ cm}^2$  per transformer or ballast with a rated input greater than 200 VA and not less than  $15\text{ cm}^2$  per transformer or ballast with a rated input less than 200 VA.
- b) The number of transformers mounted one above the other shall not exceed four.
- c) Power-factor correction capacitors and other components vulnerable to the effects of heat shall be mounted below the transformers or other heat producing components.

**6.4.5** Materials used in the construction of signs shall be protected from heated parts of the installation which could raise the material to its ignition temperature or cause the material to be deformed or

decomposed. Heated parts shall be spaced from the surface of the material by a minimum of 30 mm.

*NOTE* An example of a heated part is a tube electrode, where the outer surface of the glass tubing around the electrode can reach a temperature of 150 °C.

## 6.5 Flat letters and devices

### 6.5.1 General

Illuminated or non-illuminated flat letters or devices shall be made from steel (see 6.5.2), aluminium (see 6.5.3), plastics materials (see 6.5.4) or wood, wood laminates or fibreboard (see 6.5.5).

### 6.5.2 Steel

Flat letters or devices manufactured from steel shall have a thickness of not less than 0.9 mm. If either the width or the height exceeds 600 mm, they shall be stiffened by reinforcement or fixings spaced not more than 600 mm apart.

### 6.5.3 Aluminium

Flat letters or devices manufactured from aluminium shall have a thickness of not less than 2.0 mm. If either the width or the height exceeds 600 mm, they shall be stiffened by reinforcement or fixings spaced not more than 600 mm apart.

### 6.5.4 Plastics materials

Flat letters or devices manufactured from acrylic sheet (or similar plastics materials) shall have a thickness of not less than:

- a) 3 mm if the height of the letter or device is 600 mm or less;
- b) 5 mm if the height of the letter or device is more than 600 mm but not more than 1 000 mm;
- c) 6 mm if the height of the letter or device is more than 1 000 mm.

If either the width or the height of the letters or devices exceeds 600 mm, they shall be stiffened by reinforcement or fixings spaced not more than 600 mm apart.

### 6.5.5 Wood, wood laminates and fibreboard

Flat letters or devices manufactured from wood, wood laminates or fibreboard shall have a thickness of not less than:

- a) 20 mm if the height of the letter or device is 1 000 mm or less;
- b) 25 mm if the height of the letter or device is more than 1 000 mm but not more than 1 500 mm;
- c) 30 mm if the height of the letter or device is more than 1 500 mm but not more than 2 000 mm.

Flat letters or devices manufactured from wood, wood laminates or fibreboard with heights exceeding 2 000 mm shall have a thickness of not less than 25 mm and shall be stiffened by reinforcement of fixings spaced not more than 600 mm apart.

## 6.6 Fabricated letters

**6.6.1** Fabricated letters or devices manufactured from metal and having a channel or H-section shall have a minimum thickness of metal and a minimum depth of return as specified in Table 2.

Table 2 **Minimum sheet thickness and depth of return for metallic letters formed in channel or H-section**  
Dimensions in millimetres

Height or width (whichever is the greater) of the letter or device	Minimum sheet thickness		Minimum depth of return
	Steel	Other metal	
Less than 230	0.55	0.90	Not specified
230 up to and including 600	0.55	0.90	25
Over 600 up to and including 1 200	0.70	1.50	38
Over 1 200 up to and including 2 000	0.90	1.50	50

**6.6.2** Fabricated letters manufactured from plastics materials and having a channel or H-section shall have a minimum sheet thickness and a minimum depth of return as specified in Table 3.

Table 3 **Minimum sheet thickness and depth of return for letters of plastics materials formed in channel or H-section**  
Dimensions in millimetres

Height or width (whichever is the greater) of the letter or device	Minimum sheet thickness	Minimum depth of return
Less than 230	3	Not specified
230 up to and including 600	3	25
Over 600 up to and including 1 200	5	38
Over 1 200 up to and including 2 000	6	50

**6.6.3** Fabricated letters or devices with heights exceeding 2 000 mm shall be stiffened by reinforcement or fixings spaced not more than 600 mm apart.

## 6.7 Face panels of rigid plastics materials

**6.7.1** Face panels manufactured from rigid plastics materials shall have a thickness of not less than:

- 3 mm if the minimum dimension (height or width) of the panel is 600 mm or less;
- 5 mm if the minimum dimension (height or width) of the panel is more than 600 mm but not more than 1 000 mm;
- 6 mm if the minimum dimension (height or width) of the panel is more than 1 000 mm but not more than 1 200 mm.

For panels with minimum dimensions (height or width) greater than 1 200 mm, the recommendations of the supplier of the plastics materials shall be followed.

*NOTE 1* Face panels can be flat or moulded and manufactured from, for example, acrylic or polycarbonate sheet. They could be part of a box sign and carry the sign legend or be face panels of, for example, individual letters.

*NOTE 2* For face panels with minimum dimensions (height or width) greater than 1 200 mm, the necessary thickness of the panel depends on the effectiveness of stays and supports. The advice of the supplier of the plastics materials should be obtained.

**6.7.2** Where a face panel consists of two or more overlaid sheets of plastics in close contact with each other, provision shall be made to prevent the entry between them of dust and moisture, in accordance with degree of protection IP65 as specified in BS EN 60529:1992.

## **6.8 Face panels of flexible plastics materials**

*NOTE* Flexible plastics materials suitable for sign faces include fibre-reinforced PVC sheet and fibre-reinforced polyester sheet.

**6.8.1** Face panels of flexible plastics materials shall be installed with frames and tensioning devices as necessary or as specified by the suppliers of the materials.

**6.8.2** Decoration of the faces of flexible plastics materials by means of painting, heat-transfer inks or by the application of other self-adhesive flexible plastics materials, shall be carried out in accordance with the recommendations of the supplier of those materials. Paints, heat-transfer inks and flexible plastics materials selected shall be compatible with the base material.

**6.8.3** A means of suitable access shall be provided for the maintenance of the sign for the duration of its service life (see Clause 4).

## **6.9 Glass panels**

The types, thickness and methods of supporting glass panels shall conform to BS 6262.

## **6.10 Backing panels**

**6.10.1** Backing panels used for supporting signs that are not installed within a box or similar protective arrangement (e.g. backing panels for posters), shall conform to the following.

- a) Panels of metal or metal/plastics laminates shall have a thickness of not less than:
  - 0.9 mm if manufactured from steel;
  - 2.0 mm if manufactured from aluminium;
  - 3.0 mm if manufactured from a metal/plastics laminate.
- b) If either the width or the height of the metal panel exceeds 600 mm, it shall be stiffened by reinforcement or fixings spaced not more than 600 mm apart.
- c) Panels of plastics materials shall:
  - have a minimum thickness of not less than 5 mm; and
  - be stiffened by reinforcement or fixings spaced not more than 600 mm apart.



- d) Panels of wood, wood laminates or fibreboard shall:
- have a thickness of not less than 20 mm if either dimension (horizontal or vertical) is 300 mm or greater;
  - have a thickness of not less than 16 mm if either dimension (horizontal or vertical) is less than 300 mm.

**6.10.2** A panel used as the means of backing in a fascia box or a similar sign enclosure which has means to provide support around at least 80% of the edge of the panel shall have a minimum thickness of 0.5 mm and a maximum unsupported area of 1.5 m<sup>2</sup>.

## 6.11 Fixings

**6.11.1** Metal used for fixings shall conform to **5.2**.

**6.11.2** Plastics materials used for fixings shall conform to **5.4**.

**6.11.3** Screws used for the assembly of a sign, other than self-tapping or thread forming screws, shall be provided with lock washers or thread-locking devices.

## 6.12 Means of attachment

**6.12.1** Suspended signs or luminaires having a flexible means of suspension shall be provided with at least two means of attachment. The two means of attachment shall operate independently of each other and shall be such that should one fail, the strength of the remaining means of attachment ensures that the sign or luminaire remains suspended.

**6.12.2** Safety bolts or other means of locking shall be fitted to the hooks of a suspended sign or luminaire to prevent accidental unhooking.

**6.12.3** Where hanging hooks are fastened to the top of a sign or luminaire, the load shall be spread by using washers both inside and outside the body of the sign or luminaire. The diameter of these washers shall be not less than 3 times the diameter of the bolt. Where the weight of the sign or luminaire is greater than 11 kg, the hanging bolts shall be fixed directly into a reinforcing plate within the sign or luminaire.

**6.12.4** Individual letters, luminaires, backing panels for signs and individual components of a sign shall be provided with a minimum of two means of attachment to a wall or supporting structure. The maximum spacing between fixing centres shall not exceed 600 mm.

**6.12.5** Conductors carrying the electrical supplies to a sign shall not be used as means of suspension or attachment for that sign, unless specifically designed to carry the weight of the sign, e.g. low voltage busbars, low voltage suspension cables.

## 6.13 Finishing

**6.13.1** If paints or other finishing treatments are to be used, such treatments shall only be used if the supplier is able to provide written evidence of the satisfactory performance of their products over a period corresponding at least to the service life of the sign (see Clause 4).

**6.13.2** Pre-treatment, paint application and curing shall be carried out in accordance with the recommendations of the paint supplier.

**6.13.3** Unless other finishing treatments are specified by the purchaser, or otherwise considered appropriate, paint finishes shall be of a type which can be repaired or otherwise treated on site using an air-drying brush-applied treatment.

**6.13.4** The quality and thickness of any anodic oxidation coating to be applied to aluminium shall be agreed between the sign supplier and the purchaser in accordance with BS EN 12373-1.

*NOTE* The thickness and other parameters should be agreed on the basis of the environmental conditions and pollution levels expected at the installation site.

**6.13.5** Powder organic coatings applied to aluminium or galvanized steel shall conform to BS 6496 or BS EN 13438, as appropriate.

**6.13.6** Where paints or inks are applied to non-flammable materials, such as metals, the resulting surface shall have a surface spread of flame of not lower than class 1 of BS 476-7:1997. Where paints and inks are applied to the surfaces of flammable materials, e.g. acrylics, the resulting surface shall have a spread of flame of not worse than that of the underlying substrate.

**6.13.7** Where paints and inks are to be used on plastics materials, the sign manufacturer shall obtain from the supplier written evidence that they are compatible with the plastics materials to be painted and that they will not cause surface crazing.

**6.13.8** Where plastics materials are formed prior to painting, the materials shall be annealed in accordance with the recommendations of the suppliers of the plastics materials so as to avoid surface crazing after the application of paints or inks.

**6.13.9** Flux residues remaining after soldering, brazing or welding operations carried out during the construction of a sign shall be either removed or effectively neutralized before a finish is applied.

## 7 Illuminated signs

### 7.1 General

Illuminated signs shall give even and consistent luminance unless otherwise agreed with or specified by the purchaser.

*NOTE 1* Refer to the local planning authority for guidance on the maximum permissible luminance for the sign. (See also Institute of Lighting Engineers Technical Report No. 5 [5].)

*NOTE 2* There is an environmental impact through light pollution by badly positioned and overly bright signs. The unnecessary use of powerful uplighters should be discouraged. Considerately and effectively illuminated signs will create a better overall effect and will preserve the general amenity of the surrounding area, with the effect of increasing positive planning application results and improving neighbouring site relations.

Light pollution can be minimized, by, for example:

- a) correct alignment and spacing of luminaires;
- b) the use of light sensors, time switches and passive infrared (PIR) movement detectors;
- c) the use of shields and cowls.

## 7.2 LEDs

7.2.1 LED modules and associated electrical components shall either:

- a) conform to IPX3 in accordance with BS EN 60529:1992; or
- b) be housed in an enclosure in accordance with 6.3.2 and protected against moisture, e.g. all live parts shall be protected by conformity coating.

7.2.2 LED modules shall be installed in accordance with the supplier's instructions.

*NOTE 1 These instructions generally include:*

- a) *details of the power supply to which modules can be connected indicating voltage and power rating;*
- b) *wiring details indicating the maximum number of LEDs needed per circuit to ensure consistent luminance across all modules;*
- c) *the module spacing required, dependent on the depth of the sign, to ensure consistent luminance on the sign face or background substrate for halo illumination.*

*NOTE 2 LED module spacing is subject to test and evaluation by the manufacturer and the resulting quality of the illumination should be agreed with the purchaser.*

7.2.3 LED power supplies and drivers used shall be marked with the voltage and power rating.

7.2.4 The cable size shall be chosen in accordance with the cable manufacturer's instructions to minimize voltage drop from the LED power supply to the LED modules.

7.2.5 The output of the LED power supply shall contain protection with due consideration to the maximum current capacity of the circuit.

## 7.3 Self-contained signs

7.3.1 Self-contained fixed signs operating at low voltage shall conform to BS 4533-102.1.

7.3.2 Self-contained portable signs operating at low voltage shall conform to BS EN 60598-2-4.

7.3.3 Self-contained signs operating at a voltage exceeding low voltage, but which include parts of the sign illumination or wiring operating at low voltage, shall conform to BS EN 50107-1; BS 4533-102.1; or BS EN 60598-2-4, as appropriate.

## 7.4 Signs or luminous discharge-tube installations

7.4.1 Signs or luminous discharge-tube installations operating at a voltage exceeding low voltage shall conform to BS EN 50107-1.

7.4.2 Signs or luminous discharge-tube installations operating at a voltage not exceeding low voltage shall conform to BS 7671.

## 7.5 Floodlighting luminaires

Floodlighting luminaires shall conform to BS EN 60598-2-5

## 8 Marking and literature

### 8.1 Marking (illuminated signs)

**8.1.1** Marking of signs operating at a voltage exceeding low voltage shall conform to BS EN 50107-1.

**8.1.2** Marking of signs operating at a voltage not exceeding low voltage shall conform to BS 7671.

**8.1.3** Marking of self-contained illuminated signs operating at low voltage shall conform to BS EN 60598-1.

**8.1.4** Marking of self-contained illuminated signs operating at a voltage exceeding low voltage, but which include parts of the sign illumination or wiring operating at low voltage, shall conform to BS EN 50107-1 and BS EN 60598-1.

### 8.2 Literature (all signs)

Within any literature given to the purchaser, the designer shall state whether or not they provide a recovery and disposal service.

*NOTE 1 Design consideration should be given to the dismantling of the sign and segregation and recycling of dissimilar materials at the end of its service life. Metals, many plastics, hot and cold cathode lighting tubes and timber products can be recycled.*

*NOTE 2 Attention is drawn to the Waste Electrical and Electronic Equipment (WEEE) Regulations 2006 [6] and Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Regulations 2008 [7].*

*NOTE 3 Various materials have inherent dangers upon recovery, e.g. lead, asbestos clad installations and cold cathode tubing. Electrical hazards and the instability of some structures should also be taken into account.*

**Annex A (informative) Guidance on working with vinyl films****A.1 General**

Following the correct procedures for storing, handling, maintaining and removing vinyl films maximizes the life of the finished graphic. It also helps ensure that manufacturers' warranties are not invalidated in the event of graphics failure if the recommended procedures are not followed.

**A.2 Storage**

Unapplied vinyl graphics should be stored in a clean, dry area away from direct sunlight, excessive atmospheric moisture or humidity, at an ambient temperature of less than 38 °C and a relative humidity of less than 80%.

**A.3 Handling**

Applied vinyl graphics should be handled carefully during shipment and installation to prevent damage to the face of the graphic. If it is necessary to temporarily cover installed graphics (sometimes referred to as "bagging"), special care should be taken to follow manufacturers' recommendations.

Generally, the use of any premask tape should be avoided, as it can quickly and permanently bond to the graphic, paper or plastic covers as a result of plasticizer migration. Fastening methods which might abrade the graphic should not be used.

**A.4 Removal**

The terms "removable" and "permanent" indicate the degree of ease or difficulty with which a film can be removed and how much adhesive remains on the substrate.

For the best results, removable films should be removed within the time specified in the film product's instruction bulletin. These films can be removed with little or no heat and could have less than 30% adhesive residue.

Although not designed for removal, permanent films can, if necessary, be removed by the use of heat and/or chemical aids, but could leave significantly more than 50% adhesive residue.

The type of substrate/surface to which a particular film or sheeting is applied can affect both the initial and the ultimate adhesion and thus the ease or difficulty with which the applied film can be removed. Generally, vinyl graphics applied to a flat surface are easiest to remove, while those applied to surfaces with rivets are more difficult and those applied to surfaces with corrugations even more so.

It is particularly important to check manufacturers' warranties, as removal from substrates that have coatings (or anti-reflection and scratch-resistance functions) might not be covered and film removal in such situations might damage the substrate.

## A.5 Substrate selection, preparation and cleaning

To obtain a high-quality and long-lasting graphic, it is important to use the correct preparation and application techniques for each type of substrate. Vinyl film can be applied to most substrates that are:

- clean;

*NOTE 1 All substrates should be considered contaminated and be cleaned right up to the last cleaning process immediately before vinyl application.*

- dry;

*NOTE 2 Any moisture trapped beneath the graphic will cause the graphic to fail prematurely due to loss of adhesion or freezing in cold environments.*

- non-porous;

*NOTE 3 Porous materials absorb moisture which affects the ability of the film or sheeting to adhere to the substrate.*

- smooth.

*NOTE 4 It is more difficult for the adhesive to make good contact with textured surfaces if the roughness is greater than that of 150 grit sandpaper.*

There are three basic cleaning methods (general, solvent and isopropyl alcohol – IPA) and the type of substrate determines which method to use. Care should be taken to avoid the use of improper cleaning methods and techniques because manufacturers' warranties could be invalidated.

General cleaning involves the use of a recommended detergent diluted in water. Preparations that contain waxes, oils or lotions should be avoided, while chemicals used in some automated vehicle washing systems might interfere with adhesion. If using solvent cleaning, it is important to consult local air quality regulations as these might prohibit the use of surface preparations and cleaning materials based on solvent (volatile organic compounds – VOC) content. Because it evaporates quickly, IPA is not an appropriate cleaner if the substrate is warm or the conditions windy. A more general cleaning method should, in these circumstances, be adopted.

## A.6 Application

Graphics should be applied when the air, film and substrate temperatures are within the specified range outlined in the vinyl manufacturer's data sheets. Each manufacturer's film will have different operating and application temperatures. Applying the graphic at the incorrect temperature might prevent the graphic from performing to manufacturer's described life expectancy.

## A.7 Conditions that might affect application

**A.7.1** Graphics applied above maximum recommended application temperature might prematurely grab and adhere.

**A.7.2** Substrates should be above the dew point temperature to avoid moisture from condensing on the substrate surface.

**A.7.3** In very humid conditions it might be difficult to keep the substrate dry.

**A.7.4** Below the minimum recommended application temperature, graphics become stiff and brittle and the adhesive does not adequately bond with the substrate.

## **A.8 Cleaning**

For cleaning graphics with an over-laminate film, a chemical cleaner designed for high-quality painted surfaces should be used. The cleaner should be wet, non-abrasive, without strong solvents and possess a pH value between 3 and 11 (i.e. neither strongly acidic nor strongly alkaline). Power or pressure washing may be used but care should be taken to avoid aggressive washing, which can damage the graphic by either allowing water to penetrate beneath the graphic or causing water to reduce graphic adhesion, leading to lifting or curling of the graphic.

Some contaminants (typically tar, oil, diesel smut, bituminous material, pollen, fungus and various forms of graffiti) might remain following normal cleaning procedures. However, these can be removed by a choice of recommended methods and preferably on a customer "test and approve" basis.

## Bibliography

### Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 5499 (all parts), *Graphical symbols and signs – Safety signs, including fire safety signs*

BS 5589, *Code of practice for preservation of timber*

BS 8110-1, *Structural use of concrete – Part 1: Code of practice for design and construction*<sup>3)</sup>

BS 8442, *Miscellaneous road traffic signs and devices – Requirements and test methods*

BS EN 12899 (all parts), *Fixed vertical road traffic signs*

BS EN 62031:2008, *LED modules for general lighting – Safety specifications*

IEC 60050-845:1987, *International Electrotechnical Vocabulary – Chapter 845: Lighting*

### Other publications

- [1] Association of Petroleum and Explosives Administration (APEA) and The Energy Institute (EI). *Guidance for design, construction, modification, maintenance and decommissioning of filling stations*. APEA/EI, 2005.
- [2] GREAT BRITAIN. Building Regulations 2000 and subsequent amendments. London: The Stationery Office.
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- [5] Institute of Lighting Engineers (ILE). *Technical Report No. 5, Brightness of Illuminated Advertisements*. ILE, 2001.
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<sup>3)</sup> It is anticipated that BS 8110-1 will be withdrawn in due course due to the publication of BS EN 1992-1-1. Up to date information can be obtained from BSI Customer Services.





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