BRITISH STANDARD

BS 5499-2: 1986

Fire safety signs, notices and graphic symbols —

Part 2: Specification for self-luminous fire safety signs

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Fire Standards Committee (FSM/-) to Technical Committee FSM/11, upon which the following bodies were represented:

Association of British Theatre Technicians
Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)
British Bingo Association
British Entertainment and Dancing Association
British Sign Association
Chartered Institution of Building Services' Engineers
Chartered Insurance Institute
Chemical Industries' Association
Chief and Assistant Chief Fire Officers' Association
Defence Manufacturers' Association
Department of Health and Social Security
Department of the Environment (Property Services Agency)
Department of the Environment (Building Research Establishment, Fire Research Station)
Fire Extinguishing Trades' Association
Fire Fighting Vehicle Manufacturers' Association
Fire Protection Association
Guild of Architectural Ironmongers
Health and Safety Executive
Home Office
Institution of Fire Engineers
Lighting Industry Federation Ltd.
National Radiological Protection Board
Royal Institute of British Architects
Society of Industrial Artists and Designers

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Contents

Foreword

This Part of BS 5499 has been prepared under the direction of the Fire Standards Committee. It constitutes a revision of BS 4218:1978, which it supersedes and which is withdrawn. The re-numbering has been carried out in order to align this Part with other Parts of BS 5499 dealing with fire and emergency safety signs. A revision of BS 2560, dealing with internally illuminated signs is also being carried out, and this will form Part 3 of BS 5499.

This Part of BS 5499 specifies requirements for self-luminous signs that are independent of any external source of energy. It has been accepted for use in buildings where it is necessary or desirable that indicating signs be illuminated, e.g. bingo halls, ballrooms and other places of public entertainment. It should be noted that no effective illuminance is emitted from this sign.

This Part of BS 5499 differs from BS 4218:1978 in that it applies solely to the construction and performance of this type of sign. The previous edition dealt with graphics requirements, specifically those for the word "EXIT". All graphics requirements are now to be included in BS 5499-1. The changes will be given in an amendment to Part 1.

This Part of BS 5499 is generally in accordance with the principles and criteria contained in the Nuclear Energy Agency document for Radiation Protection Standards for Gaseous Tritium Light Devices[1)].

While properly constructed signs such as those specified in this Part of BS 5499 constitute no significant hazard or risk to personal safety, it has to be recognized that if any sign containing a radioactive gaseous isotope is substantially damaged, the release of the radioactive gas from the sign could give rise to a temporary exposure of personnel, particularly in a confined space, during the period of dispersal of the gas. Moreover, if such a release occurred, part, or all of the sign would no longer be self-energized and might no longer fulfil its purpose of indication. It is accordingly desirable that all radioactive signs should be manufactured in accordance with this Part of BS 5499, which adequately provides against all personal hazard if the sign is handled with reasonable care during transit and installation. The requirements specified herein are intended to ensure that, in a sign complying with this Part of BS 5499, tritium cannot be released from the gaseous tritium light source(s) [GTLS(s)] under the most severe conditions that are likely to be encountered in the normal handling of the sign.

IMPORTANT NOTE The use and disposal of fire safety signs containing tritium is covered by Exemption Order 1985 No. 1047 (The Radioactive Substances (Gaseous Tritium Light Devices) Exemption Order 1985). Under this order, conditional exemption from registration would be given for signs that comply with this Part of BS 5499, that are securely fixed or attached to premises, or if stored, that are stored for not more than 1 month, and if certain other conditions are met. The manufacturer of the sign should furnish the purchaser with the necessary details.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6, 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)] Published by the Organization for Economic Co-operation and Development, 1973.

1 Scope

This Part of BS 5499 specifies requirements for the construction and performance of a type of safety sign which is self-energized in respect of luminosity, and which requires no external source of power, and is rigidly fixed in position.

It is not intended to apply to smaller signs that may be used in aircraft.

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 5499, the following definitions apply.

2.1
gaseous tritium light source (GTLS)

a sealed glass container filled with gaseous tritium and coated internally with a phosphor

2.2
gaseous tritium light device (GTLD)

an instrument, piece of equipment, article or subassembly containing one or more GTLS(s)

2.3
sign

equipment including graphics (see **2.4**) which are luminously self-energized either by GTLD(s) protected within an outer assembly, or by a GTLD alone

2.4
graphics

pictures, symbols, letters, figures or a combination of any of these

NOTE The requirements for graphics will be given in an amendment to BS 5499-1.

3 General design and construction

3.1 Construction of a GTLD

3.1.1 A GTLD shall be so constructed that it cannot be dismantled without the destruction of its enclosure.

3.1.2 The GTLD shall be vented to the atmosphere through two holes of between 2 mm and 3 mm diameter. These holes shall be on the sides which are closest to the vertical, and placed such that no GTLS is touched by the rod when tested in accordance with **A.2** a).

3.1.3 No individual GTLS shall contain more than 80 GBq (2.16 C_i) of tritium.

3.2 Construction of a sign

3.2.1 Where the GTLD is protected by an outer assembly, the GTLD(s) shall not be accessible or removable from the sign after mounting without the use of special tools and procedures. These tools and procedures shall be declared by the manufacturer.

3.2.2 The sign shall be vented to the atmosphere through holes of between 2 mm and 3 mm diameter, placed such that no GTLS is touched by the rod when tested in accordance with **A.2** a).

3.2.3 The front surface of the sign facing the observer shall have a matt or semi-matt surface.

3.2.4 The total activity of tritium in the sign shall not exceed 1 TBq (27 C_i).

4 Performance

4.1 Physical characteristics

When tested in accordance with **A.1** and **A.2**, the sign shall show no visual structural failure affecting the mechanical strength or integrity of the sign, or visually apparent loss of light output.

4.2 Luminance

When tested in accordance with **A.1** and **A.3**, within 1 month of manufacture, the full stencil outline of each graphic shall be illuminated, and the luminance at the surface of a sign at any local area of illumination shall be not less than 0.51 cd/m^2. For lettered graphics, the variation in luminance between one local area and another shall not exceed a ratio of three to two. For all other graphics, the variation in luminance between local areas shall not exceed a ratio of five to two. The legibility requirements of the sign, over the lifetime indicated in **6.3**, shall be in accordance with BS 5499-1.

4.3 Dose rate

The radiation dose rate at the surface of the assembled sign shall not exceed 2.5 μGy/h (0.25 mrad/h) in air, when measured in accordance with **A.1** and **A.4**.

4.4 Tritium leakage

The tritium activity of the water shall not exceed 10 kBq (270 nCi), when measured in accordance with **A.1** and **A.5**.

4.5 Water-soluble tritium content

The manufacturer shall declare the total tritium content of each GTLS. The amount of water-soluble tritium measured for each GTLS in **A.6** shall not exceed 2 % of the total activity of that source.

4.6 Flammability

When tested in accordance with appendix B, the external enclosure of the sign shall not exhibit any after-flame for a period in excess of 30 s after removal of the glow-wire.

5 Mounting

The sign shall incorporate means for secure and rigid fixing of such a type that a special tool(s) and procedure is required for the removal of the sign. The special tool(s) and procedure shall be declared by the manufacturer.

6 Identification and labelling

6.1 Manufacturer's declaration

The manufacturer shall provide written authenticated declarations of the following:

a) that the energizing source is tritium gas;

b) that no individual GTLS contains more than the amount of tritium specified in **3.1.3**, at the date of supply;

c) that the total activity of the tritium in the sign does not exceed the amount specified in **3.2.4** at the date of supply.

6.2 Marking

Each sign shall be indelibly marked, so that the marking can be seen from the front, with the basic radiation symbol given in BS 3510, and adjacent to this symbol in letters and figures not less than 3 mm high, the following:

"Replace by: (month and year)"

The marks shall be in such a position that no part of them is obscured.

NOTE The presence of the radiation symbol does not imply that the sign constitutes a radiation hazard under normal conditions of use. Its purpose is to call attention to the fact that the sign contains radioactive material.

6.3 Labelling

The back of each sign shall bear a label on which is given in permanent lettering the following.

a) The word "RADIOACTIVE".

b) The basic radiation symbol (see **6.2**).

c) The word "TRITIUM" and activity in gigabecquerels at date of supply.

d) A serial number.

e) The date of supply.

f) The number and date of this British Standard, i.e. BS 5499-2:1986[2)].

g) The following wording:

"Do not open.

When this sign is to be discarded, it has to be despatched to or removed by a manufacturer of such signs, or a person who is authorized under Section 6(3) of the Radioactive Substances Act (1960) to dispose of such radioactive waste".

h) The manufacturer's name and address.

The difference between the dates referred to in **6.3** e) and **6.2** shall be 15 years.

[2)] Marking BS 5499-2:1986 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification should be addressed to the appropriate certification body.

Appendix A Methods of test for performance

A.1 General

The methods of test described in **A.2** to **A.5** shall be carried out in the order given and on the same sign.

NOTE The number of signs to be tested should be agreed between the parties concerned in testing.

A.2 Physical characteristics test

Carry out the procedures described in a) to e). After each test, inspect the sign for visual structural failure affecting the mechanical strength or integrity of the sign and for visually apparent loss of light output.

a) *Ventilation holes.* Insert a rod into the ventilation holes with a force of 10 N until an obstruction is met or to a maximum depth of 15 mm if no obstruction is evident.

Repeat this procedure a total of 30 times at different angles in each vent hole.

b) *Impact test.* Drop the sign on its face, then on its back and then on one side from a height of 1 m onto a smooth, hard, rigid surface.

c) *Temperature test.* Heat the sign in air to a temperature of + 80 °C within 5 min. Keep the sign at this temperature, then cool to – 20 °C in less than 45 min. Keep the sign at this temperature for 1 h.

d) *Vibration test.* Subject the sign to three complete cycles in the range 25 Hz to 500 Hz at $5g_n$. Conduct this test by sweeping through all the frequencies in the range at a uniform rate from the minimum to the maximum frequency, and then return to the minimum frequency for 10 min or longer. Test each axis of the sign, and dwell for 30 min at each resonant frequency found.

e) *External pressure test.* Expose the sign in air to pressures of 25 kPa absolute and 200 kPa absolute for four periods of 15 min each. Return the pressure to atmospheric between each period.

A.3 Luminance test

Take readings using a photometer in a darkened room and measure over a 9 mm diameter. Make the measurements with in a period of 1 month from the date of manufacture of the sign.

A.4 Dose rate measurement

Measure the radiation dose rate at the surface of the assembled sign using an appropriate method.

NOTE Advice on appropriate methods for the tests in **A.4**, **A.5** and **A.6** can be obtained from the National Radiological Protection Board.

A.5 Tritium leakage test

Totally immerse the sign in water at 20 ± 2 °C for 24 h. Remove the sign and measure the activity of the water.

A.6 Water-soluble tritium content

Make measurements using an appropriate method (see **A.4**) of the water-soluble tritium content of three GTLSs from the sign under test or from the same production batch and of the same type as those in the sign.

Appendix B Flammability test

NOTE This method is closely based on that given in BS 6220.

B.1 Apparatus

B.1.1 *Glow-wire,* consisting of a loop of 80/20/Ni/Cr wire, as shown in Figure 1. When the loop is being formed, care shall be taken to avoid fine cracking at the tip. The glow-wire shall be electrically heated; the current necessary for heating the tip to a temperature of 960 °C shall be between 120 A and 150 A.

B.1.2 *Sheathed fine wire thermocouple,* having an outside diameter of 0.5 mm, the wires consisting of nickel-chromium and nickel-aluminium. The sheath shall consist of a refractory metal resistant to a temperature of at least 960 °C. The thermocouple shall be arranged in a 0.6 mm diameter pocket hole drilled in the tip of the glow-wire as shown in section A-A of Figure 1.

The thermo-voltages shall be in accordance with the international thermocouple tables given in BS 4937-4. The cold connections shall be kept in melting ice or in a compensation box.

NOTE The characteristics of the thermocouple should approach as closely to linearity as possible.

B.1.3 *Voltmeter,* for measuring the thermo-voltage, having an accuracy of class 0.5 as specified in BS 89.

B.1.4 *Timing device,* capable of timing to an accuracy of ± 1 s.

B.1.5 *Other apparatus.* The test apparatus shall be so designed that the glow-wire is kept horizontal and that a force of 1 N is maintained on the specimen when either the glow-wire or the specimen is moved horizontally towards the other over a distance of at least 7 mm.

NOTE An example of the test apparatus is shown in Figure 2.

B.1.6 *Chip of silver foil,* 99.8 % pure silver, 0.06 mm thick and of size 2 mm × 2 mm.

B.1.7 *Piece of white pine-board,* approximately 10 mm thick and covered with a single layer of wrapping tissue.

NOTE Wrapping tissue paper, as defined in 6.86 of BS 3203:1979 may be used, i.e. a soft strong light-weight wrapping paper of grammage (basis weight) generally between 12 g/m^2 and 30 g/m^2. It is primarily intended for protective wrapping of delicate articles and for gift wrapping.

B.2 Test specimen

The test specimen shall be either a complete sign or, if the test cannot be made on a complete sign, a suitable part of one cut out for the purpose of the test.

The test specimen shall be conditioned for 24 h at a temperature in the range 15 °C to 35 °C and at a relative humidity in the range 45 % to 75 %.

The test shall be made on one specimen and, in case of doubt, shall be repeated on two further specimens.

B.3 Procedure

Before starting the test, calibrate the thermocouple (**B.1.2**) at a temperature of 960 °C, placing it by melting the chip of silver foil (**B.1.6**) on the upper surface of the tip of the heated glow-wire (**B.1.1**).

NOTE 1 The temperature of 960 °C is reached when the foil lying flat on the surface just melts.

Check the calibration of the thermocouple as often as is necessary to ensure its continuing accuracy.

Make allowance for the fact that the thermocouple is able to compensate by an axial movement for thermal elongation of the glow-wire.

Place the test apparatus (**B.1.5**) in a draught-free room in subdued light so that any flame is visible.

Position the specimen (**B.2**) during the test with the surface to be tested in a vertical position. Apply the tip of the glow-wire to this surface.

Position the piece of white pine-board (**B.1.7**), approximately 200 mm directly beneath the glow-wire where it is applied to the specimen.

Heat the glow-wire electrically to a test temperature of 650 °C, which is measured with the calibrated thermocouple. Take care that this temperature and the heating current are constant for 60 s before starting the test and that no heat radiation influences the specimen during this period.

Bring the tip of the glow-wire into contact with the specimen and apply it for 30 ± 1 s; maintain the heating current during this period.

Limit the movement of the tip of the glow-wire through the test sample to which it is pressed to 7 mm.

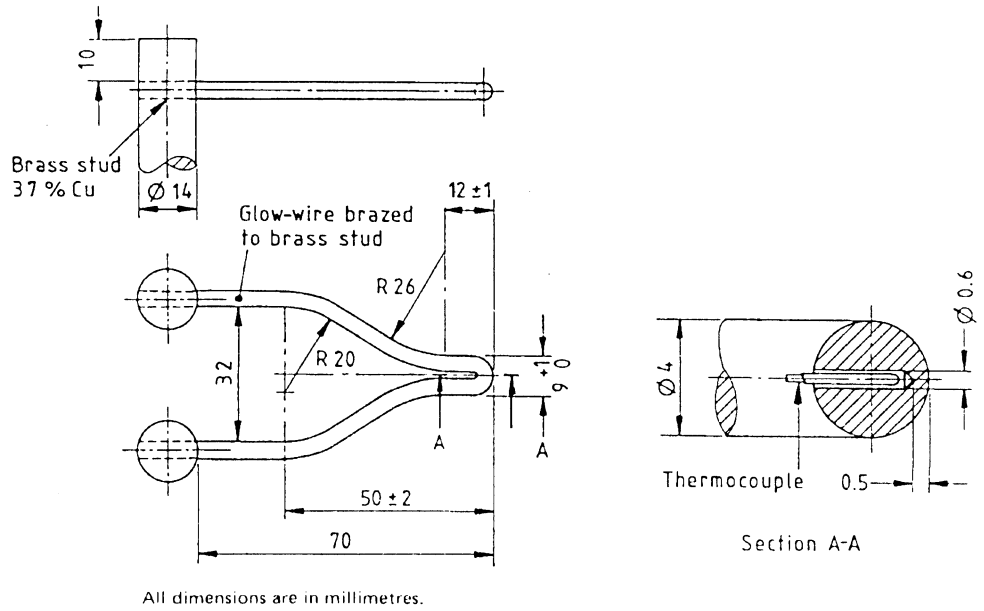
If possible, apply the tip of the glow-wire to flat surfaces and not to grooves, knock-outs, narrow recesses or sharp edges. Apply the tip of the glow-wire where the section is the thinnest, but not less than 15 mm from the upper edge of the specimen.

After 30 ± 1 s, remove the glow-wire from the specimen, avoiding any movement of air that may affect the results of the test and any further heating of the specimen.

NOTE 2 It is necessary to remove from the tip any residue of insulating material after each test, e.g. by means of a brush.

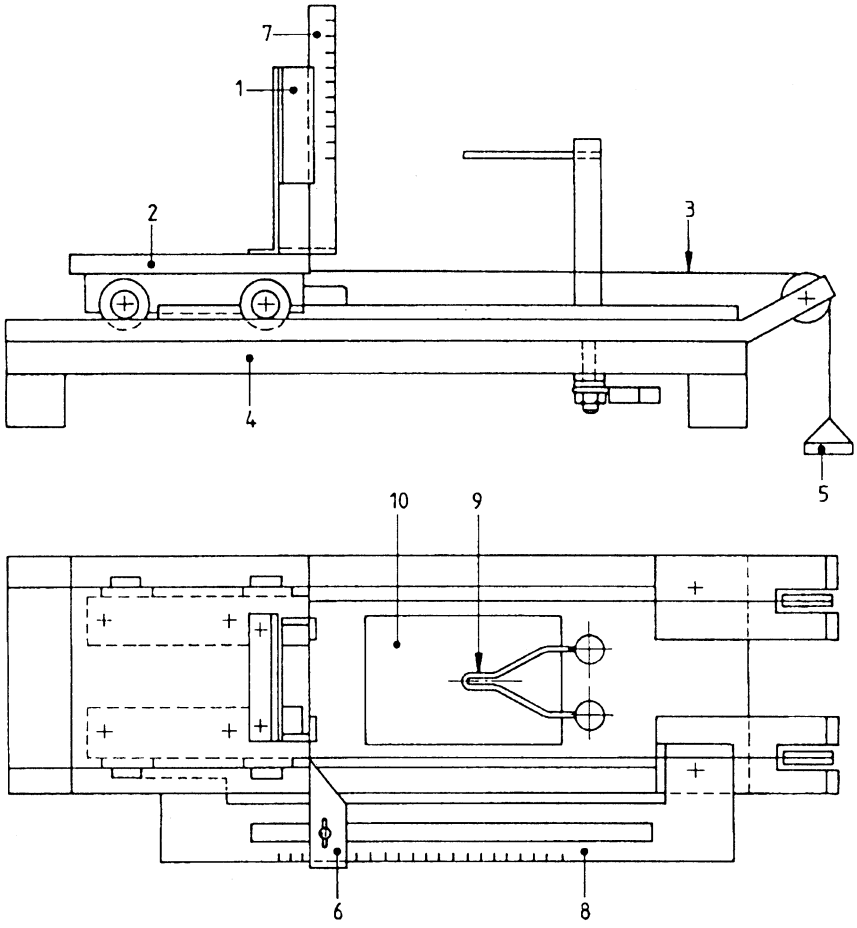
Apply the glow-wire to external parts made of plastics at a test temperature of 650 ± 10 °C.

During the application time of the glow-wire and during a period of 30 s from the end of the application time, observe the specimen and the surrounding parts, including the layer under the specimen. Measure and record the time when any ignition of the specimen occurs and/or the time when flames extinguish during or after the application time.



All dimensions are in millimetres.

Figure 1 — Glow-wire with thermocouple



Key
1 Support for sample
2 Carriage
3 Pulling string
4 Base plate
5 Weight
6 Adjustable stop
7 Scale for flame height
8 Scale for depth of penetration
9 Glow-wire with thermocouple
10 Opening base plate to pass molten or glowing particles

Figure 2 — Example of a suitable glow-wire test apparatus

Publications referred to

BS 89, *Specification for direct acting indicating electrical measuring instruments and their accessories.*

BS 2560, *Specification for exit signs (internally illuminated)*[3].

BS 3203, *Glossary of paper, board, pulp and related terms.*

BS 3510, *A basic symbol to denote the actual or potential presence of ionizing radiation.*

BS 4937, *International thermocouple reference Tables.*

BS 4937-4, *Nickel-chromium/nickel-aluminium thermocouples (Type K).*

BS 5499, *Fire safety signs, notices and graphic symbols.*

BS 5499-1, *Specification for fire safety signs.*

BS 5499-3, *Specification for fire safety signs (internally illuminated)*[4].

BS 6220, *Specification for junction boxes for use in electrical installations with rated voltages not exceeding 250 V.*

Nuclear Energy Agency, Radiation Protection Standards for Gaseous Tritium Light Devices[5]

[3] Referred to in the foreword only. To be revised. It is intended that the new edition will be published as BS 5499-3.

[4] In course of preparation. Referred to in the foreword only.

[5] Referred to in the foreword only. Published by the Organization for Economic Co-operation and Development, 1973.

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