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SPECIFICATION FOR
FLAMEPROOF ELECTRIC
LIGHTING FITTINGS

BRITISH STANDARDS INSTITUTION

SPECIFICATION FOR FLAMEPROOF ELECTRIC LIGHTING FITTINGS

B.S. 889 : 1965

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BRITISH STANDARDS INSTITUTION

Incorporated by Royal Charter

2 PARK STREET, LONDON W1A 2BS

Telex: 266933

Telephone: 01-629 9000



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THIS BRITISH STANDARD, having been approved by the Colliery Requisites Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 25th February, 1965.

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Second revision February, 1965.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- | | |
|---|--|
|  | <p>B.S. 7. Rubber-insulated cables and flexible cords for electric power and lighting (for working voltages up to and including 11 kV).</p> <hr/> <p>B.S. 98. Dimensions of screw lamp caps and lampholders (Edison type).</p> <p>B.S. 161. Tungsten filament general service electric lamps (200-250 V).</p> <p>B.S. 229. Flameproof enclosure of electrical apparatus.</p> |
|  | <p>B.S. 542. Cable glands and sealing boxes for association with apparatus for use at mines.</p> <hr/> <p>B.S. 738. Definitions for non-ignitable and self-extinguishing properties of solid electrical insulating materials (including classification and methods of test).</p> |
|  | <p>B.S. 1041. Code for temperature measurement.</p> <p>Part 4. Thermocouples.</p> |



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- B.S. 1270. Schedule for electric discharge lamps for general purposes.
- B.S. 1853. Tubular fluorescent lamps for general lighting service.
- B.S. 1875. Bi-pin lamp-caps and lamp-holders for tubular fluorescent lamps for use in circuits the declared voltage of which does not exceed 250 volts.
- B.S. 2004. PVC-insulated cables and flexible cords for electric power and lighting.
- B.S. 2818. Auxiliaries for operation of fluorescent lamps on a.c. 50 c/s supplies.
- B.S. 2899. Rubber insulation and sheath of electric cables.
- B.S. 3360. Copper conductors in insulated cables and cords.
- B.S. 3677. Schedule of fluorescent mercury discharge lamps.
- B.S. 4066. Tests on electric cables under fire conditions.
Part 1. Method of test on a single vertical-insulated wire or cable.
- B.S. 5042. Specification for lampholders and starter-holders.
Part 1. Bayonet lampholders.
- CP 1003. Installation and maintenance of flameproof and intrinsically-safe electrical equipment for industries other than coal mining.



British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. references relate to the work on this standard:
Committee reference MQE/13 Draft for comment D63/958

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CO-OPERATING ORGANIZATIONS

The Colliery Requisites Industry Standards Committee under whose supervision this British Standard was prepared, consists of representatives from the following Government department and scientific and industrial organizations:

- *Association of Mining Electrical and Mechanical Engineers
- *British Electrical and Allied Manufacturers' Association
 - British Iron & Steel Federation
 - Electric Cable Makers' Federation
 - Federation of Associations of Colliery Equipment Manufacturers
 - Institution of Electrical Engineers
 - Institution of Mechanical Engineers
 - Institution of Mining Engineers
 - Mechanical Handling Engineers' Association
- *Ministry of Power
- National Association of Colliery Managers
- *National Coal Board

The Government department 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 British Chemical Manufacturers
- Association of Steel Conduit Manufacturers
- British Plastics Federation
- Electricity Council, the Generating Board and the Area Boards in England and Wales
- Electric Lamp Industry Council
- Electric Light Fittings Association
- Electrical Research Association
- Glass Manufacturers' Federation
- Illuminating Engineering Society
- Independent Lamp Manufacturers' Export Group
- Ministry of Labour (H.M. Factory Inspectorate)
- Oil Companies Materials Association
- Society of Glass Technology
- Individual manufacturers of lighting fittings

BRITISH STANDARD SPECIFICATION FOR FLAMEPROOF ELECTRIC LIGHTING FITTINGS

FOREWORD

This revision of the 1947 edition of B.S. 889, issued with the authority of the Colliery Requisites Industry Standards Committee, is applicable to flameproof lighting fittings for use in situations where flammable gases or vapours may be present in the surrounding atmosphere. The specification is extended to include fittings for tubular fluorescent lamps, also handlamps; it prescribes the rating and performance required, also those features of design and construction which are considered essential to secure safety and reliability in service. In addition, details of marking are given.

Part 1 of this standard deals with fittings using well-glasses, and glasses of various designs other than glass tubes, and includes the floodlight type of fitting. The specification indicates requirements of material for the body and glass; constructional details; also dimensions and strength tests for the glasses. The requirements in Part 1 also include impact tests which can be withstood by toughened glasses but not, in general, by annealed glasses. The well-glasses described in Appendix A, which presents a standardized range to facilitate manufacture in bulk, were designed as being suitable for the toughening process.

The standard recognizes three types of glass for well-glasses and glasses of the bulkhead or flat type, namely Type A and Type C (acid-etched internally), which may be required by the customer to comply with all the tests described in B.S. 889, Part 1, because of exceptional risk of mechanical damage; and Type B, which is not required to comply with the impact tests and is therefore acceptable for less strenuous service conditions.

The specification in Part 1 of maximum surface temperature is based on three ranges, viz. ranges X, Y and Z. The temperature rises associated with these ranges are related to a maximum service ambient temperature of 35°C; in conformity with international practice, however, the tests are to be made in an ambient temperature of between 20°C and 30°C. The maximum values for ranges Y and Z are specified for fittings used only in the position of axial alignment for which they are designed (see Clause 17). If a significantly different position is found necessary, for fittings in either of these two ranges, the purchaser should consult the manufacturer (see Clause 18). Fittings to range X are tested in the operating position producing the highest surface temperature.

The temperature range categories applicable to the various gases and vapours listed in B.S. 229* are given in Appendix E. The various appendices give additional detailed information and recommendations.

* B.S. 229, 'Flameproof enclosure of electrical apparatus'.

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For applications where cellulose solutions are involved, fittings of the temperature range Z may be installed, subject to the terms of Note 5 to Clause 17. The portable handlamps described in Part 4 are not suitable for such applications.

Part 2 of this standard deals specifically with the particular requirements for fittings incorporating glass tubes designed to enclose tubular fluorescent lamps.

Part 3 of this standard deals with fittings incorporating tubes made from approved synthetic plastics. At present the only material which has been evaluated and approved is the acrylic plastics polymethyl-methacrylate.

This material is produced in the form of cast tube and moulding powder, the latter for injection or compression moulding, or for extrusion. Different moulding powders are available, including clear and coloured transparent grades, also opal grades of different opacities. Cast tube is considered only as in the clear transparent grade.

Part 4 of this standard details the special constructional and performance requirements governing the design and application of portable hand-lamps; it includes the specification of the particular type of screened flexible cable which has been approved by the Certifying Authority.

All fittings are required to comply with the relevant clauses of B.S. 229*.

For general guidance, and for information concerning the installation and maintenance of flameproof electrical equipment, it is recommended that reference be made to the British Standard Code of Practice CP 1003†.

It should be noted that if any additional features are added to the flameproof equipment for the purpose of preventing ingress of moisture, these features should in no way affect the flameproof design of the fitting.

A typical method of weatherproofing is depicted by Fig. 4.

Particulars of the flameproof mark, registered under the Trade Marks Acts, 1905-38, and of the procedure to obtain authority to use the mark, are given in Appendix H of the standard.

Most of the materials likely to be employed on these fittings are subject to independent British Standards.

NOTE. Certain of the metric conversions given are approximate. More accurate conversions should be based on the tables in B.S. 350, 'Conversion factors and tables'.

* B.S. 229, 'Flameproof enclosure of electrical apparatus'.

† CP 1003, 'Installation and maintenance of flameproof and intrinsically-safe electrical equipment'.

SPECIFICATION

GENERAL

SCOPE

1. This specification applies to all lighting fittings of flameproof construction intended for use in situations where explosive mixtures of air and flammable gases or vapours may occur.

Part 1 deals with fittings using well-glasses and various designs other than glass tubes, and includes the floodlight type of fitting.

Part 2 deals with fittings incorporating glass tubes to enclose tubular fluorescent lamps.

Part 3 deals with fittings incorporating clear or opal acrylic plastics tubes to enclose tubular fluorescent lamps (Group I only).

Part 4 deals with portable flameproof handlamps and the particular type of screened flexible cable approved for use therewith.

PART 1. FITTINGS USING WELL-GLASSES, BULKHEAD DISHED OR FLAT GLASSES

TYPES OF GLASSES

2. Three types of glasses are recognized as standard, as follows:

Type A glasses (toughened). Type A glasses for flameproof fittings shall comply in all respects with the requirements of Clauses 9 and 10 of this specification.

Type B glasses (annealed and heat resistant). Type B glasses for flameproof fittings shall comply with the requirements of Clauses 9 and 10, except that Subclauses 9f(i) and 10f(i) shall not apply, and the difference of temperature between the hot air oven and the water specified in Subclauses 9f(ii) and 10f(ii) shall be not less than 75 degC.

Type C glasses (toughened). Type C glasses for flameproof fittings are glasses which are etched, by the glass manufacturer, with acid on the inner surface in order to produce a silk finish, light-diffusing texture. Such glasses shall comply with the mechanical tests prescribed for Type A glasses.

NOTE. Only Types A and C glasses are permitted in the temperature range X (see Clause 17) or for Group I application (see B.S. 229*).

FLAMEPROOF ENCLOSURE

3. All fittings designed in accordance with this specification shall comply with the relevant clauses of B.S. 229*.

NOTE 1. B.S. 229 gives information concerning flammable gases and vapours and the relevant maximum permissible dimensions for gaps between joint surfaces.

NOTE 2. For the purposes of this specification a flameproof enclosure is as defined in B.S. 229.

* B.S. 229, 'Flameproof enclosure of electrical apparatus'.

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BODIES OF FITTINGS

4. The bodies of the fittings, and the retaining rings used for the glasses, shall be of suitable metal.

NOTE. Aluminium and certain alloys of aluminium or magnesium may not be acceptable for installation in some locations, particularly underground in coal mines.

LAMPS



5. Fittings shall be designed to accommodate tungsten filament lamps of the appropriate wattage complying with B.S. 161* mercury discharge and tubular fluorescent lamps in accordance with B.S. 1270†, B.S. 1853§ or B.S. 3677||, as appropriate; or 15-watt pigmy type lamps. Sodium lamps shall not be used.

NOTE. The use of other types of lamp, otherwise suitable, is not precluded provided that the recognized temperature rise (see Clause 17) is not exceeded.

LAMP HOLDERS



6. Lampholders shall comply where applicable with the appropriate parts of B.S. 5042 : Part 1¶, B.S. 98** or B.S. 1875††, or any other relevant British Standards, and be of such material as to withstand the service temperatures.

CONTROL GEAR AND INTERNAL WIRING

7. Discharge lamp auxiliary gear shall comply with B.S. 2818‡‡ or other relevant British Standards. All internal wiring shall comply with appropriate British Standards and be such as to withstand the service temperatures.

TERMINALS

8. The terminals to which the supply cables are attached, whether they form an addition to or are separate from the lampholder, shall be substantial and shall be either of the stud type and not less than 2BA size, provided with two suitable washers, or of the pinching type. Screws for the pinching screw terminals shall be such as not to damage the conductors during tightening, and shall be of a diameter not less than 80 per cent of the wiring hole diameter. The size of the hole shall be not less than $\frac{1}{8}$ in (3.2 mm) diameter. Where a screw type lampholder is used, the centre contact shall be connected to a terminal, which shall be clearly identified, for connection to the live conductor.

* B.S. 161, 'Tungsten filament general service electric lamps'.



† B.S. 1270, 'Schedule for electric discharge lamps for general purposes'.

§ B.S. 1853, 'Tubular fluorescent lamps for general lighting service'.

|| B.S. 3677, 'Schedule for fluorescent mercury discharge lamps'.



¶ B.S. 5042, 'Specification for lampholders and starterholders', Part 1, 'Bayonet lampholders'.

** B.S. 98, 'Dimensions of screw lamp caps and lampholders (Edison type)'.

†† B.S. 1875, 'Bi-pin lamp caps and lamp-holders for tubular fluorescent lamps for use in circuits the declared voltage of which does not exceed 250 volts'.

‡‡ B.S. 2818, 'Auxiliaries for operation of fluorescent lamps on a.c. 50 c/s supplies'.

Provision shall be made for connecting an earthing conductor and the earth terminal shall comply with the above requirements.

For fittings designed to accommodate lamps not exceeding 25 watts and using conductors not exceeding 0.002 in² (1.3 mm²) nominal cross sectional area, studs of a size not less than 4BA may be employed.

Creepage paths over insulants should take into account the effects of condensation of moisture and the degree of pollution by the atmosphere, where such fittings are likely to be employed. Adequate clearances are, therefore, necessary and a minimum distance of $\frac{1}{4}$ in (6.35 mm) shall apply.

NOTE. If moulded material is used for the insulation of any part, account should be taken of the maximum internal temperature of the fitting; also, the relevant British Standards should be regarded.

WELL-GLASSES

9. The requirements specified under Subclauses *a* to *d* of this Clause are applicable to all well-glasses. Recommended dimensions for well-glasses are given in Table 13 (Appendix A).

The test specified under Subclause *e* shall be carried out on all well-glasses individually. The tests described under Subclause *f* shall be applied only to type samples selected at random, but all batches of well-glasses shall be capable of withstanding the tests described under this Subclause, except that Subclause *f*(i) shall not apply to Type B glasses. All these tests specified under Subclauses *e* and *f* shall be carried out on unmounted well-glasses (see Fig. 1).

a. Composition of glass. Well-glasses may be made of glass of any composition, subject to their satisfying the requirements under Subclauses *b*, *e* and *f* of this Clause.

b. Light transmission. Well-glasses shall be made of glass having a light absorption not greater than 15 per cent per inch of thickness.

NOTE. This Subclause is not intended to apply to opal or coloured glasses.

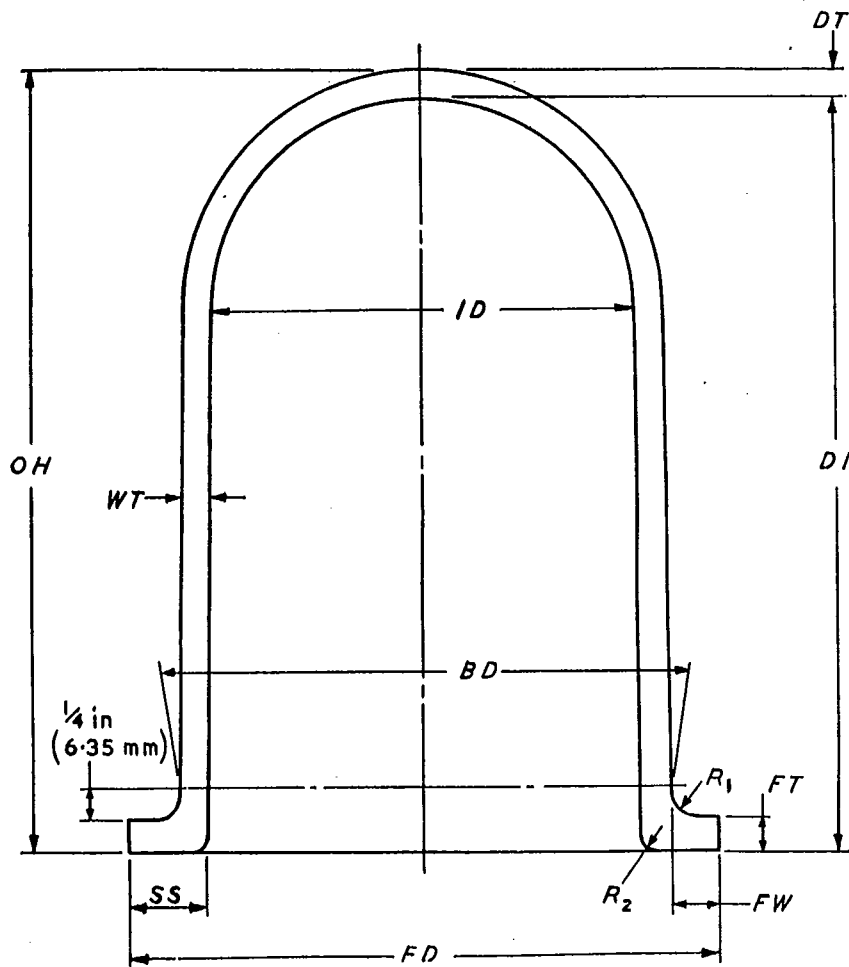
c. Finish of surface: Types A and B. These glasses (see Clause 2) shall not be subjected to any process such as grinding, etching or any method of roughening which may impair or destroy the fire-finish acquired during blowing or moulding, with the exception that the marking required by Subclause 20*b* shall be produced, by an appropriate method, in such a position that it will be visible after assembly in the fitting.

Type C. These glasses (see Clause 2) are etched with acid on the inner surface to produce a silk finish, light-diffusing texture.

d. Dimensions. (i) *Thickness of wall (WT)*.* The ratio of the thickest to the thinnest part of the wall of any well-glass shall not exceed 4 to 3. Where a prismatic pattern is carried, the measurement of thickness shall be taken at the root of the prism.

* See the code of dimensions given in Fig. 1 for interpretation of letter references.

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CODE OF DIMENSIONS

FD Flange diameter
BD Body diameter
ID Internal diameter
DT Dome thickness
WT Wall thickness
FT Flange thickness

FW Flange overhang width
SS Seating surface
DI Depth (internal)
OH Overall height
R₁ Outer radius
R₂ Inner radius

Fig. 1. Well-glass: terms and dimensional characteristics (diagrammatic only)

(ii) *Diameter of the body (BD)*. The nominal outside diameter of the body of a well-glass, measured $\frac{1}{4}$ in (6.35 mm) away from the flange, shall be as specified by the maker of the fitting and be within the tolerances stated in Table 1.

TABLE 1. TOLERANCES ON DIAMETER OF WELL-GLASS BODIES

Outside diameter of body				Tolerance	
Over	Up to and including	Over	Up to and including		
in	in	mm	mm	in	mm
—	5	—	127	$\pm \frac{3}{32}$	± 2.4
5	10	127	254	$\pm \frac{1}{8}$	± 3.2
10	12	254	305	$\pm \frac{9}{32}$	± 4.0
12	15	305	381	$\pm \frac{3}{16}$	± 4.8

(iii) *Thickness of domed end (DT)*. The thickness of the domed end (DT) shall be not less than the minimum wall thickness. The thickest part of the dome shall not exceed the average wall thickness by more than the relevant amount given in Table 2.

TABLE 2. PERMISSIBLE INCREASE IN THICKNESS OF DOME OF WELL-GLASSES

Outside diameter of body				Permissible increase from average wall thickness (per cent)
Over	Up to and including	Over	Up to and including	
in	in	mm	mm	
—	5	—	127	80
5	10	127	254	100
10	—	254	—	125

NOTE. Where a prismatic pattern is carried, the measurement of thickness shall be taken at the root of the prism.

(iv) *Diameter of flange (FD)*. The nominal outside diameter of the flange shall be as required by the maker of the fitting and be within the same tolerances as are specified in Subclause 9d(ii) for diameter of body. These tolerances are to cover all permissible variations of diameter, including ellipticity or ovality.

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(v) *Flange overhang width (FW)*. The flange overhang width (i.e. the distance to which the flange extends outwards, from the outside of the cylindrical portion of the body, at a point $\frac{1}{4}$ in (6.35 mm) from the flange) shall be within the limits shown in Table 3.

TABLE 3. FLANGE OVERHANG WIDTH OF WELL-GLASSES

Outside diameter of body				Flange overhang width (FW)							
				Types A and C				Type B			
Over	Up to and including	Over	Up to and including	min.		max.		min.		max.	
in	in	mm	mm	in	mm	in	mm	in	mm	in	mm
—	4	—	101.6	$\frac{5}{16}$	7.94	$\frac{3}{8}$	9.52	$\frac{1}{4}$	6.35	$\frac{3}{8}$	9.52
4	5	101.6	127	$\frac{3}{8}$	9.52	$\frac{1}{2}$	12.7	$\frac{1}{4}$	6.35	$\frac{7}{16}$	11.1
5	7	127	178	$\frac{7}{16}$	11.1	$\frac{5}{16}$	14.3	$\frac{5}{16}$	7.94	$\frac{1}{2}$	12.7
7	10	178	254	$\frac{1}{2}$	12.7	$\frac{5}{8}$	15.87	$\frac{3}{8}$	9.52	$\frac{9}{16}$	14.3
10	12	254	305	$\frac{5}{8}$	15.87	$\frac{3}{4}$	19.05	$\frac{7}{16}$	11.1	$1\frac{1}{16}$	17.46
12	15	305	381	$\frac{3}{4}$	19.05	$\frac{7}{8}$	22.2	$\frac{1}{2}$	12.7	$1\frac{3}{16}$	20.64

(vi) *Thickness of flange (FT)*. The thickness of the flange, measured parallel to the axis of the well-glass, shall comply with the dimensions given in Table 4.

TABLE 4. FLANGE THICKNESS OF WELL-GLASSES

Outside diameter of body				Thickness of flange			
				Types A and C		Type B	
Over	Up to and including	Over	Up to and including	nominal*		minimum	
in	in	mm	mm	in	mm	in	mm
—	4	—	101.6	$\frac{5}{16}$	7.94	$\frac{5}{16}$	7.94
4	5	101.6	127	$\frac{3}{8}$	9.52	$\frac{3}{8}$	9.52
5	7	127	178	$\frac{7}{16}$	11.1	$\frac{7}{16}$	11.1
7	10	178	254	$\frac{1}{2}$	12.7	$\frac{1}{2}$	12.7
10	12	254	305	$\frac{9}{16}$	14.29	$\frac{9}{16}$	14.29
12	15	305	381	$\frac{5}{8}$	15.87	$\frac{5}{8}$	15.87

* Tolerance $\pm \frac{1}{32}$ in (0.8 mm) on the nominal dimension adopted by the manufacturer.

(vii) *Flatness of 'seating' surface of flange.* The 'seating' surface (SS) of the flange shall be at right angles to the cylindrical axis of the well-glass, within 3 degrees, and shall be so nearly flat that when the well-glass is stood with its flange on a plane surface, it shall not be possible to insert between the plane surface and the flange a feeler gauge of the following appropriate thickness:

For sizes up to 7 in (177.8 mm) dia.: $\frac{7 \times \text{nominal dia. of body}}{1000}$

For sizes above 7 in (177.8 mm) dia.: $\frac{\text{nominal diameter of body}}{100}$

(viii) *Parallelism of flange surfaces.* The opposite parallel surfaces of the flange shall be parallel to within $\pm \frac{1}{16}$ in (1.6 mm).

The outer corner (R_1) of the flange shall be rounded to $\frac{1}{16}$ in (1.6 mm) radius. The inner corner (R_2) between the flange and outer surface of the wall shall be rounded to between $\frac{1}{8}$ in (3.17 mm) and $\frac{1}{16}$ in (1.6 mm) radius.

e. *Hydraulic test.* Each well-glass, held at its flange or seating surface only, shall be subjected to a hydraulic pressure, as stated in Table 5, applied internally for a period of not less than 15 seconds or more than 20 seconds. The pressure is to be brought up gradually to the prescribed value, the time taken being not more than 1 minute.

TABLE 5. HYDRAULIC TEST PRESSURE: WELL-GLASSES

Outside diameter of body				Internal pressure	
Over	Up to and including	Over	Up to and including		
in	in	mm	mm	lbf/in ²	kgf/cm ²
3	5	76	127	100	7.031
5	7	127	178	120	8.437
7	—	178	—	150	10.546

f. *Type tests.* The makers of the glasses shall guarantee that the glasses are made to withstand the tests described in (i) to (iii) of this Subclause, for Type A and Type C glasses, and in (ii) and (iii) of this Subclause for Type B glasses, with a risk of failure which is not greater than that resulting from the following procedure:

When a purchaser requires tests to be made on any particular consignment, the following shall apply:

For consignments of up to 500, a random selection of ten glasses shall be taken for each of the type tests; for consignments of above 500 a random

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selection of 2 per cent shall be taken. In each instance if no more than 10 per cent fail in any one test the consignment shall be deemed to be satisfactory.

If more than 20 per cent fail, the consignment shall be deemed not to comply with this standard.

If more than 10 per cent but not more than 20 per cent fail, a further sample, similar to the original, shall be selected at random and the test repeated. If no more than 10 per cent fail in the repeat test the consignment shall be deemed to be satisfactory. If more than 10 per cent fail, the whole consignment shall be deemed not to comply with the standard.

No well-glass shall be used for more than one test.

No well-glass which has been used for any of the type tests described shall be put into service, but shall be destroyed after the tests have been completed.

The purpose of the impact and thermal shock tests is to ensure correct physical qualities, rather than to give an indication of ultimate strength in service.

(i) *Impact test (Type A and Type C glasses only).* Well-glasses, when subjected to the test described in Appendix B, shall be capable of withstanding without breakage, or the formation of deep cracks, an impact normal to the general contour of the glass, at any point on the cylindrical portion and not less than 1 in (25.4 mm) from the flange, given by the spherical end of the 4 lb (1.8 kg) hammer, at the end of a swing equivalent to the vertical height of fall given in Table 6.

TABLE 6. IMPACT DATA: WELL-GLASSES

Outside diameter of body				Effective height of fall (4 lb (1.8 kg) hammer)	
Over	Up to and including	Over	Up to and including		
in	in	mm	mm	in	cm
3	4	76	102	6	15.2
4	5	102	127	9	22.9
5	7	127	178	15	38
7	—	178	—	24	61

(ii) *Thermal shock test.* Well-glasses shall be capable of withstanding the thermal shock given by heating them for 30 minutes in an air oven, then plunging them, domed end first, into water having a temperature between 15°C and 20°C; the difference between oven and water temperature being not less than 125 degC for Type A and Type C glasses, and not less than 75 degC for Type B glasses.

(iii) *Durability test.* Well-glasses shall be made of a type of glass which, when

tested in accordance with the method described in Appendix C, shall not show more than a faint tarnish or spotting.

GLASSES OF THE BULKHEAD TYPE, INCLUDING DISHED AND FLAT DESIGNS

10. The requirements specified under Subclauses *a* to *d* of this Clause are applicable to all glasses; the test specified under Subclause *e* shall be carried out on all glasses individually. The tests described under Subclause *f* shall be applied only to type samples selected at random, but all batches of glasses shall be capable of withstanding the tests described under this Subclause, except that Subclause *f*(i) shall not apply to Type B glasses. All the tests specified under Subclauses *e* and *f* shall be carried out on unmounted glasses.

a. Composition of glass. Glasses may be made of any composition, subject to their satisfying the requirements specified under Subclauses *b*, *e* and *f* of this Clause.

b. Light transmission. Glasses shall be made of glass having a light absorption not greater than 15 per cent per inch of thickness.

NOTE. This subclause is not intended to apply to opal or coloured glasses.

c. Finish of surface. Types A and B. These glasses (see Clause 2), except toughened flat glasses, shall not be subjected to any process such as grinding, etching or any method of roughening, which may impair or destroy the fire-finish acquired during blowing or moulding, with the exception that the marking required by Subclause 20*b* shall be produced, by an appropriate method, in such a position that it will be visible after assembly in the fitting.

The edges of toughened flat glasses may be ground prior to the toughening process.

Type C. These glasses (see Clause 2) are etched with acid on one side only (the inner surface when fitted) to produce a silk finish, light-diffusing texture.

d. Dimensions. (i) *Variation in thickness.* The variation permissible in thickness shall be $-0, +33\frac{1}{2}$ per cent of the thickness required by the maker of the fitting. Where the glass is of a prismatic type, the measurement of thickness shall be taken at the root of the prism.

(ii) *Tolerance on other dimensions.* Dimensions measured between any chosen points on the 'seating' flange, or edge of a glass, shall conform to the dimensions required by the maker of the fitting, within $+1$ per cent and -2 per cent of the maximum dimensions of the glass.

(iii) *Width of flange or seating.* A. Bulkhead type glasses. In glasses where a plane flange is provided for the purpose of fixing the glass into the fitting, the flange width (i.e. the distance to which the flange extends outwards from the outer surface of the curved or domed portion) shall be as given in Table 7.