BS 750:2006

Incorporating
Amendment No. 1

BRITISH STANDARD

Specification for underground fire hydrants and surface box frames and covers

ICS 13.220.10

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 25 and a back cover.

Foreword

This British Standard was published by BSI and came into effect on 29 September 2006. It was prepared by Subcommittee FSH/17/1, *Hydrants, hydrant systems, couplings and indicator plates*, under the authority of Technical Committee FSH/17, *Fire brigade equipment*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 750:1984, which is withdrawn.

Information about this document

This British Standard has been revised as a result of the publication of BS EN 14339 and BS EN 1074-6 and includes specific national requirements that are not specified in BS EN 14339 and BS EN 1074-6.

Additionally, as a result of a number of safety events involving hydrants with outlets manufactured from nylon/plastics that were introduced in the 1984 version, such materials have been removed from this standard until such time as appropriate tests may be developed that reflect the in-service performance of these materials.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people, for whose guidance it has been prepared.

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.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags ▮A1⟩ ⟨A1▮. Minor editorial changes are not tagged.

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.

Section 1: General

1 Scope

This British Standard specifies the national operational and health and safety requirements for underground fire hydrants conforming to BS EN 14339 and BS EN 1074-6. It also includes specific national requirements not included in BS EN 14339 and BS EN 1074-6.

This British Standard is applicable to underground fire hydrants:

a) to be installed in a water distribution system;

b) in size DN 80;

c) suitable for a maximum allowable operating pressure (PFA) of 1.6 MPa or 2.5 MPa (16 bar or 25 bar);

d) with valves of the wedge-gate type or the screw-down type; and

e) with one outlet.

It also specifies requirements for their surface box frames and covers.

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 336:1989, *Specification for fire hose couplings and ancillary equipment*

BS 1610, *Methods for the load verification of testing machine*

BS 3416, *Specification for bitumen-based coatings for cold application, suitable for use in contact with potable water*

BS 4147, *Specification for bitumen-based hot-applied coating materials for protecting iron and steel, including suitable primers where required*

BS 4164, *Specification for coal-tar-based hot-applied coating materials for protecting iron and steel, including a suitable primer*

BS 5163-1, *Valves for waterworks purposes – Part 1: Predominantly key-operated cast iron gate valves – Code of practice*

BS 5163-2, *Valves for waterworks purposes – Part 2: Stem caps for use on isolating valves and associated water control apparatus – Specification*

BS 6001 (all parts), *Sampling procedures for inspection by attributes*

BS 6920-1, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water – Part 1: Specification*

BS EN 1074-1, *Valves for water supply – Fitness for purpose requirements and appropriate verification tests – Part 1: General requirements*

BS EN 1074-2, *Valves for water supply – Fitness for purpose requirements and appropriate verification tests – Part 2: Isolating valves*

BS EN 1074-6:2004, *Valves for water supply – Fitness for purpose requirements and appropriate verification tests – Part 6: Hydrants*

BS EN 1092-2, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 2: Cast iron flanges*

BS EN 1092-3, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 3: Copper alloy flanges*

BS EN 1561, *Founding – Grey cast irons*

BS EN 1563, *Founding – Spheroidal graphite cast iron*

BS EN 1982, *Copper and copper alloys – Ingots and castings*

BS EN 10088-1, *Stainless steels – Part 1: List of stainless steels*

BS EN 12163, *Copper and copper alloys – Rod for general purposes*

BS EN 12164, *Copper and copper alloys – Rod for free machining purposes*

BS EN 12165, *Copper and copper alloys – Wrought and unwrought forging stock*

BS EN 12167, *Copper and copper alloys – Profiles and rectangular bar for general purposes*

BS EN 12168, *Copper and copper alloys – Hollow rod for free machining purposes*

BS EN 14339:2005, *Underground fire hydrants*

WIS 04-52-01, *Specification for polymeric anti-corrosion (barrier) coatings* (as amended) (ISBN 0267-0305)[1)]

WIS 04-52-02, *The use of polymeric anti-corrosion (barrier) coatings* (ISBN 0267-0305)[1)]

WIS 04-52-03, *Specification for anti-corrosion coatings on threaded fasteners* (as amended)[1)]

1) WRc plc, Swindon. http://www.webookshop.com/

Section 2: Fire hydrants

3 General requirements

3.1 As a minimum, hydrants conforming to this British Standard shall conform to BS EN 14339.

3.2 Hydrants shall have a design life of a minimum of 50 years. This shall be determined by reference to:

a) the materials used in the construction and their properties;

b) the engineering design of the hydrant;

c) the normal situation of installation; and

d) the conditions of use.

3.3 Where materials have time-dependent properties, these shall be selected with reference to the manufacturer's data on such properties to determine their suitability for the function and life span.

3.4 Where elements of the hydrant are designed to be serviceable, this shall not be regarded as reason to design for a shorter operating life.

3.5 Serviceable components shall include those having potential for accidental damage and wear from abnormal use.

3.6 The manufacturer shall ensure that parts that are considered to be subject to wear shall be available for the lifetime of the valve.

3.7 Hydrants shall be one of the following two types:

a) a) type 1 wedge-gate (see Clause **4** and Figure 1);

b) b) type 2 screw-down (see Clause **5** and Figure 2).

4 Wedge-gate (type 1)

4.1 Hydrants of the wedge-gate type shall conform to the dimensions shown in Figure 1.

4.2 The wedge-gate valve shall conform to the recommendations and requirements of BS EN 1074-1, BS EN 1074-2, BS 5163-1 and BS 5163-2 for PN 16 or PN 25 valves.

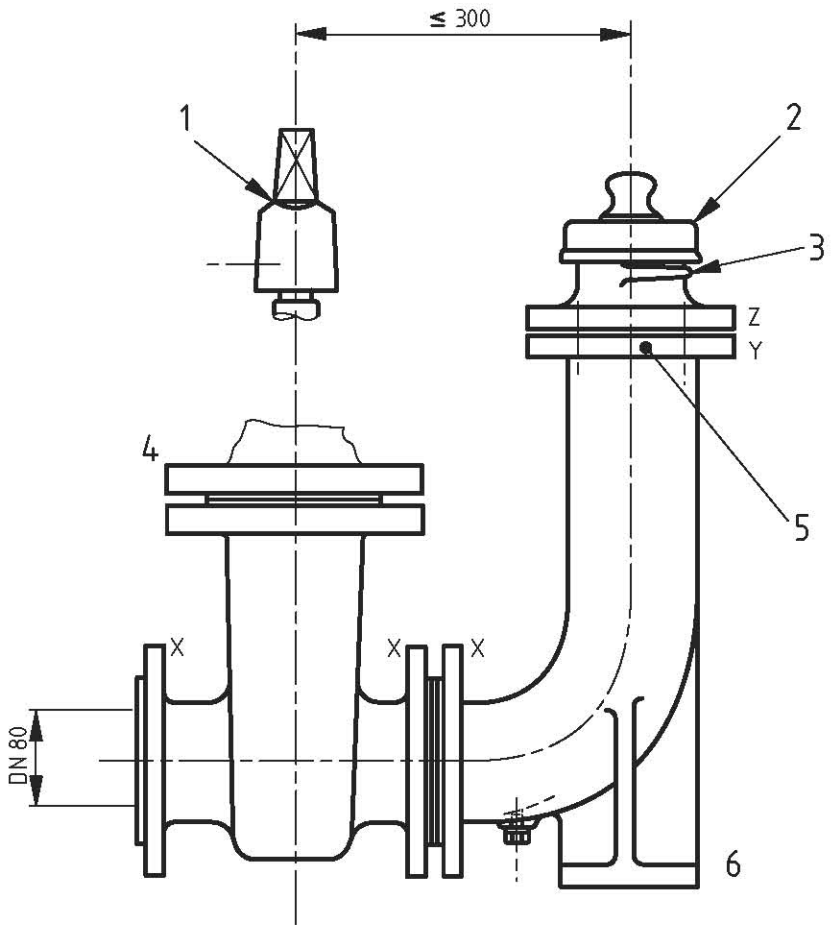
4.3 Materials for duck-foot bends shall conform to BS EN 1561 or BS EN 1563.

4.4 Y and Z flanges DN 50, PN 16 or PN 25 shall be compatible with the mating dimensions given in BS EN 1092-2 and BS EN 1092-3 as appropriate, and use the bolts, studs or set screws specified. They need not be circular and are not required to have raised faces.

NOTE Y or Z flanges may have a groove in the face to accommodate an "O" ring. The bolt holes may be slotted and the slots may extend to the periphery of the flange.

Figure 1 **Example of wedge-gate (type 1) fire hydrant showing required dimensions**

All dimensions are in millimetres



Key

1 Stem cap
2 Outlet cap
3 Outlet (for details see Figure 3)
4 Wedge-gate valve
5 65 nominal bore
6 Duck-foot bend
X, Y, Z flange

5 Screw-down (type 2)

5.1 Classification

Screw-down hydrants of type 2 shall conform to one of the following patterns.

a) Type 2a: The bonnets and/or outlets of this pattern shall be secured in such a manner that they cannot be removed when installed in a pipeline. With the exception of stem sealings, it shall be made clear in the manufacturer's literature that the hydrant cannot be maintained whilst in situ.

b) Type 2b: Designed to facilitate maintenance of obturator, stem, outlet and their seals, in situ, whilst mounted in a chamber having a surface box frame and cover conforming to Section 3. They shall have:

   i) Y and Z flanges DN 50, PN 16 or PN 25, compatible with the mating dimensions given in BS EN 1092-2 and BS EN 1092-3 as appropriate, and using bolts, studs or set screws specified. They need not be circular and are not required to have raised faces.

      NOTE Y or Z flanges may have a groove in the face to accommodate an "O" ring. The bolt holes may be slotted and the slots may extend to the periphery of the flange.

   ii) A bolted connection at the body/bonnet joint with a minimum of three bolts.

c) Type 2c: Designed to facilitate maintenance as type 2b. They shall have bolted connections between both the outlet and body and the bonnet and body. These connections shall each have a minimum of three bolts.

d) Type 2d: Designed to facilitate maintenance as type 2b, but having means of connection of the outlet and/or bonnet to the hydrant body other than type 2c (see **6.3**, **6.4**, and **5.5**).

Type 2b, type 2c and type 2d hydrants shall be capable of being dismantled in situ using standard, readily available tools.

5.2 Dimensions

5.2.1 Hydrants of the screw-down type shall conform to the dimensions shown in Figure 2.

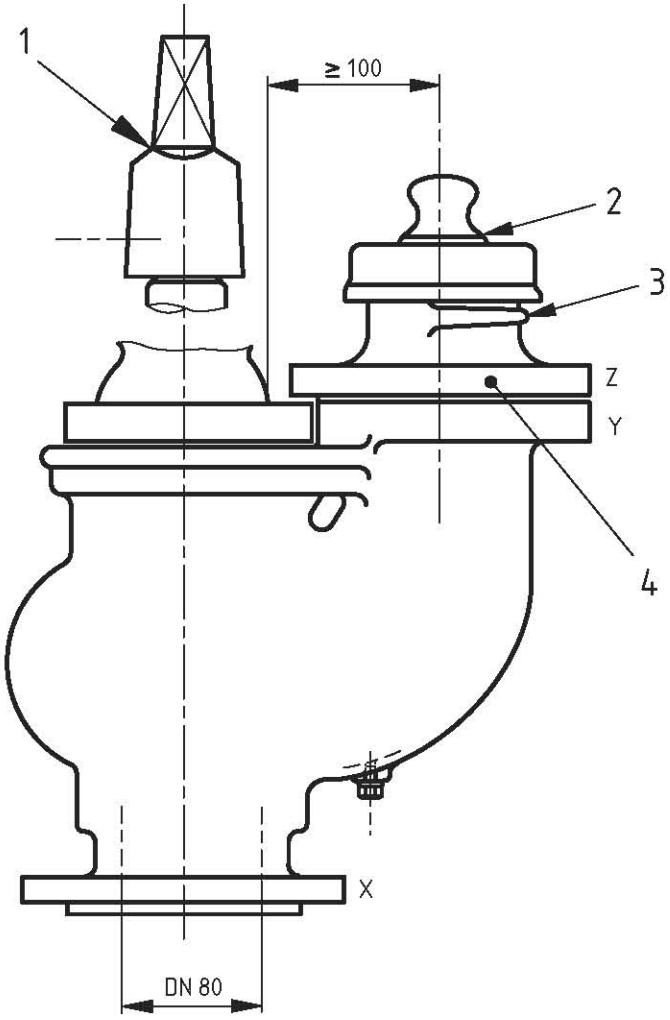
5.2.2 The clearance between the back of flange X (where used) and the body shall be not less than 17 mm at the position of any bolt hole.

5.2.3 The mating dimensions of flange X (where used) shown in Figure 2 shall be in accordance with BS EN 1092-2, DN 80 and PN 16 or PN 25.

NOTE It need not be circular or full form and may be provided with additional holes, which may be slotted, to suit other flange designs.

Figure 2 **Example of screw-down (type 2) fire hydrant showing required dimensions**

All dimensions are in millimetres



Key

1 Stem cap
2 Outlet cap
3 Outlet (for details see Figure 3)
4 65 nominal bore
X, Y, Z flange

5.3 Materials

5.3.1 All copper alloy materials used in the construction of hydrants shall conform to BS EN 1982, BS EN 12163, BS EN 12164, BS EN 12165, BS EN 12167 or BS EN 12168.

5.3.2 The threaded part of the valve which engages with the stem shall be a copper alloy.

5.3.3 Stems of screw-down type hydrants shall be manufactured from stainless steel conforming to BS EN 10088-1 with a minimum chromium content of 13% or copper alloy (see **5.3.1**).

[A1] **5.3.4** Stainless steel outlets shall be manufactured from grades conforming to BS EN 10088-1, with a minimum chromium content of 13%. [A1]

5.4 Sealings

5.4.1 Stem sealings shall be of one of the following two types:

a) toroidal sealing ring ("O" ring) type;

b) other pressure actuated types of seal.

5.4.2 Stem seals of screw-down hydrants shall be capable of being replaced with the valve closed and under operating pressure.

5.4.3 Where stem sealing is of the toroidal sealing ring ("O" ring) type, then two such seals shall be used.

5.4.4 A wiper ring shall be positioned above the seals to prevent the ingress of foreign matter.

5.5 Bonnets

5.5.1 Bonnets connected by means other than that described for type 2b and type 2c shall be secured by two independent and functionally different means. These different means shall each be capable of preventing the bonnet becoming unintentionally detached in the absence of the other.

Components involved in the attachment/retention of hydrant bonnets shall not be made from plastics.

5.5.2 Bonnets connected by means other than that described for type 2b and type 2c shall conform to the type requirements in Clause **11** with:

a) both security systems in place;

b) only one of the security systems in place;

c) only the other security system in place.

6 Outlets

6.1 The outlets shall be manufactured from copper alloy [A1] or stainless steel [A1] materials conforming to **5.3** and shall conform to **11.3** and **11.4**. The outlet shall conform to the dimensions shown in Figure 3.

Components involved in the attachment/retention of hydrant outlets shall not be made from plastics.

6.2 The design of hydrant and outlet shall permit full engagement onto the outlet of a standpipe conforming to BS 336:1989, Figure 12.

6.3 Outlets connected by means other than that described for type 2b and type 2c shall be secured by two independent and functionally different means. These different means shall each be capable of preventing the outlet becoming unintentionally detached in the absence of the other.

6.4 Outlets connected by means other than that described for type 2b and type 2c shall conform to the type requirements in Clause **11** with:

a) both security systems in place;

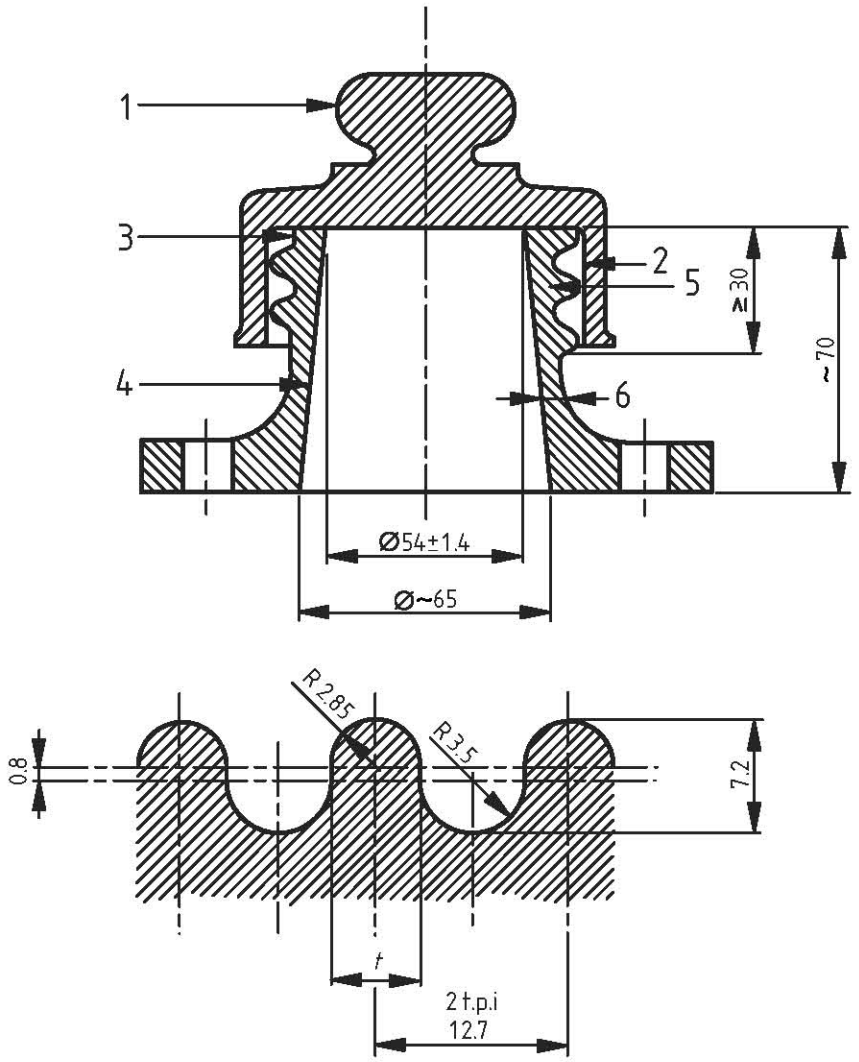
b) only one of the security systems in place;

c) only the other security system in place.

6.5 The screwed outlet shall be provided with a cap to cover the outlet (see Figure 3). It shall be securely attached to the hydrant by a chain or other flexible device.

Figure 3 **Screwed outlet (round thread) and outlet cap showing required dimensions**

All dimensions are in millimetres



Key

1 Outlet cap
2 Cap not to be threaded
3 Feather edge to be removed
4 Taper (see Note 2)
5 Outlet to be screwed with round thread, two threads per 25.4 mm crest diameter $82.2^{+0.6}_{-0.6}$ mm, root diameter ⩽ 68 mm
6 Wall thickness ⩾ 3.3 mm (i.e. minimum of 3.3 mm) of cylindrical section
t Thickness of thread $5.7^{\ 0}_{-0.6}$ mm

NOTE 1 The details of female round threads for stand-pipes are given in BS 336

NOTE 2 Deviations from a uniform taper are permitted.

7 Stem drive

7.1 Dimensional and performance requirements

The stem shall be provided with a cast iron cap conforming to BS 5163-2.

7.2 Closing direction

The hydrant shall be closed by turning the stem in a clockwise direction when viewed from above (as required in BS EN 14339).

8 Draining system

8.1 Each screw-down type hydrant and each duck-foot bend on a wedge-gate type hydrant shall be provided with a drain boss on the outlet side. It shall be located at the lowest practicable point that will permit the fitting of a blank plug, drilled drip plug or self operating frost valve.

NOTE The requirements of the draining system are taken from BS EN 14339.

8.2 Where fitted to the hydrant, the draining system shall perform in accordance with BS EN 1074-6:2004, 5.6. In addition, the manufacturer shall declare the volume of retained water and the time for draining.

9 Coating

9.1 All ferrous components liable to corrosion shall be prepared and coated in accordance with WIS 4-52-01 and WIS 4-52-02 or other equivalent standard.

NOTE Where an equivalent standard is chosen, its equivalence should be demonstrated.

9.2 Fasteners involved in the construction of a hydrant shall either be of an appropriate grade of stainless steel having a minimum chromium content of 13% or be coated in accordance with WIS 4-52-03 or equivalent standard for a barrier and galvanic coating system.

NOTE Where an equivalent standard is chosen, its equivalence should be demonstrated.

9.3 Details of coating process or standard used shall be declared in the manufacturer's literature.

10 Maintenance of water purity (potable water systems only)

All non-metallic parts of the hydrant, including materials, lubricants and coatings, which may be in contact with water intended for human consumption shall be in accordance with BS 6920-1.

11 Type requirements

11.1 General

A single set of tests only is required to ascertain that the hydrant design meets the stated requirements of the relevant part of this standard and BS EN 1074-1, BS EN 1074-2, BS EN 1074-6 and BS EN 14339.

11.2 Hydraulic characteristics

When fitted with a standard round thread outlet as shown in Figure 3, the hydrant shall have a K_v value of not less than 92.

NOTE K_v *is defined in BS EN 14339. The* K_v *value of 92 is equivalent to 2 000 l/min at 170 kPa (1.7 bar).*

11.3 Load/deflection requirements of screwed outlets

11.3.1 Ten sample outlets shall be subjected to the test method of **A.1**.

11.3.2 Five of these samples when subjected to the procedure of **A.1.3.1** shall have exhibited a maximum angular deflection of not greater than 7.5° and shall have a residual angle of deflection of not greater than 2°, both measured from the unloaded datum position.

11.3.3 The samples, in addition, shall exhibit no fractures and shall not have suffered damage so as to prevent subsequent reconnection of the standpipe.

11.3.4 The remaining five samples when subjected to the test method of **A.1.3.2** shall exhibit no leakage during the test.

11.4 Strength and leak-tightness requirements of type 2a and type 2d screwed outlets: Resistance of screwed outlets to rotational force

Outlets shall be tested in accordance with **A.2**. The following shall apply.

a) There shall be no visually detectable movement of the outlet occurring during the application of the initial (50 ± 2.5) Nm torque in either direction.

b) Outlets shall withstand a torque of (300 ± 15) Nm applied in both clockwise and anticlockwise directions for a minimum of 30 s whilst subjected to the pressures specified with no visible signs of leakage at the outlet/body joint for the duration of the test.

c) There shall be no damage that would impair subsequent performance of the hydrant or connection of a standpipe.

d) The total rotational movement (from fully clockwise to fully anticlockwise) during the application of the (300 ± 15) Nm torque shall not exceed 10°.

Leakage at the outlet/body joint, when testing with only one of the security systems, shall not be deemed a failure.

11.5 Resistance of hydrants to operating forces

11.5.1 This test shall be carried out prior to the tests described in **11.6** and **11.7**.

11.5.2 Hydrants, whilst subjected to a minimum hydraulic pressure of (PFA + 0.4) MPa (PFA + 4.0 bar), shall withstand in the fully open and in the fully closed positions a torque of (210 ± 10) Nm applied simultaneously with a lateral force giving a bending moment of (500 ± 25) Nm at the top of the stem and there shall be no visible signs of leakage over a period not less than 1 min.

NOTE The outlet should be capped when testing is carried out in the fully open position.

11.6 Strength and leak-tightness requirements of type 2a and type 2d bonnets – Resistance of bonnets to rotational force

Bonnets shall be tested in accordance with **A.3**. The following shall apply.

a) There shall be no visually detectable rotational movement of the bonnet occurring during the application of the initial (50 ± 2.5) Nm torque in either direction.

b) The connection between the hydrant body and bonnet of type 2a and type 2d pattern hydrants shall withstand a torque of (300 ± 15) Nm applied to the bonnet in both clockwise and anticlockwise directions for a minimum of 30 s.

c) The total rotational movement (from fully clockwise to fully anticlockwise) during the application of the (300 ± 15) Nm torque shall not exceed 10°.

d) There shall be no visible signs of leakage during the test and there shall be no dislodgement or damage to either body or bonnet or the method of securing the bonnet to the body that would impair subsequent performance of the hydrant.

Leakage at the bonnet/body joint, when testing with only one of the security systems, shall not be deemed a failure.

11.7 Endurance of the outlet requirement

The outlet shall be tested in accordance with Annex B. There shall be no signs of leakage from the outlet.

12 Hydrant assembly – Resistance to internal pressure of the shell and of all pressure containing components and resistance of the obturator to differential pressure

Each hydrant assembly, including the outlet, shall be tested in accordance with and conform to BS EN 1074-6.

13 Hydrostatic test certificate

Where requested, a certificate shall be made available which certifies that the hydrant assembly conforms to Clause **12**.

14 Marking and additional data

14.1 Each hydrant assembly shall be clearly marked in accordance with BS EN 1074-6 and BS EN 14339 and with the following:

a) the number and date of this British Standard, i.e. BS 750:2006[2)];

b) the type designation, i.e. 1, 2a, 2b, 2c or 2d.

14.2 Additional hydrant data shall be provided in accordance with BS EN 14339:2005, 6.2.

[2)] Marking BS 750:2006 on or in relation to a product is a claim by the manufacturer that the product has been manufactured in accordance with 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 to support such claims should be addressed to the Director, Quality Assurance Division, British Standards Institution, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ in the case of certification marks administered by BSI or to the appropriate authority for other certification marks.

Section 3: Surface box frames and covers

15 Grading

Surface box frames and covers shall be graded as follows:

Grade A — Capable of being used in carriageways and other areas carrying fast moving normal commercial vehicles with wheel loads[3] up to 5 tonnes and slow-moving specially authorized[4] vehicles with wheel loads up to 11.5 tonnes.

Grade B — Capable of bearing wheel loads[3] up to 5 tonnes for use in areas to which vehicles would have only occasional access, including areas such as footpaths and verges[4].

16 Materials

Materials for the manufacture of surface box frames and covers shall be chosen from those given in BS EN 1561 for grey cast iron or BS EN 1563 for spheroidal graphite cast iron.

17 Manufacture, workmanship and coating

17.1 Manufacture and workmanship

All cast units shall be cleanly cast and shall be free from air holes, sand holes, cold shuts and chill. They shall be neatly dressed and carefully fettled. All castings shall be free from voids, whether due to shrinkage, gas inclusions or other causes.

17.2 Coatings

All units shall be supplied as follows:

a) uncoated; or

b) units shall be thoroughly cleaned and dried before being given a short-term coating of one of the following:

1) hot applied coal tar coating material conforming to BS 4164, type 1 or type 2 materials; or

2) cold applied black bitumen solution conforming to BS 3416, type 1 or type 2 material, except that other solvents to accelerate the drying properties of the coating may be substituted; or

3) hot applied bitumen based coating material conforming to and applied in accordance with BS 4147 for type 1, grade C material.

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[3] **The magnitude of the stated wheel load is as exerted by a stationary vehicle.**

[4] As authorized by Statutory Instrument Sl.1101 of 1973 of the Motor Vehicles (Authorisation of Special Types) General Order 1973.

The choice of material and method of coating in respect of 1), 2) and 3) above, shall be at the option of the manufacturer.

NOTE Units are normally supplied in the coated state unless otherwise specified by the purchaser.

18 Design features

18.1 Clear opening

The minimum clear opening in surface box frames shall be as follows:

a) for wedge-gate (type 1) hydrant: 215 mm × 495 mm;

b) for screw-down (type 2) hydrant: 230 mm × 380 mm.

Projections at corners, required for manufacturing purpose, shall not give a resultant reduction of minimum clear opening area in excess of 1 600 mm^2 at each of the corners.

18.2 Frame depth and width

The depth of the frame shall be not less than 100 mm for Grade A and 75 mm for Grade B. The minimum bedding width of the frame shall be 50 mm (see Figure 4).

18.3 Fit of frames and covers

Surface box frames and covers shall be designed so that the top of the cover is flush with the top of the frame. Grade A covers and frames shall incorporate a permanent non-rock design feature.

18.4 Registers

Where the directional installation of the cover relative to the frame is an essential feature of a non-rock design, a register shall be provided.

18.5 Drainage and skid resistance

Covers of solid-top type shall be self-draining and have a raised pattern, such as chequers, so as to provide a skid-resisting surface.

18.6 Clearance

The maximum clearance, when the cover section is in any position relative to the frame, shall not exceed 6 mm.

18.7 Surface box cover lifting arrangement

18.7.1 General

18.7.1.1 To ensure that the dynamic effects or momentum do not mask a potential for the fire hydrant cover to fall through the frame, the cover shall be one-piece.

18.7.1.2 Direct removal from the frame shall require the use of a single prising bar to free and subsequently lift the cover without jamming or obstruction over a period of 3 seconds from a closed position to where the cover is at 90° to the upper edge of the frame.

18.7.1.3 Frames or covers shall be provided with prising bar recesses. Each recess shall have a nominal length of 33 mm and nominal width of 10 mm.

18.7.1.4 Covers shall be formed with a lip not more than 15 mm from the top, not less than 5 mm deep and running the full length of the recess. Two keyholes shall be provided.

18.7.1.5 Frames and covers excluded from the requirement of **18.4** shall be provided with prising bar recesses at lips at the midpoint of both short edges.

*NOTE Attention is drawn to the Manual Handling Operations Regulations [1]. Fire hydrants are frequently operated in emergency situations by a single firefighter. This necessitates that one person should be able to readily lift the cover with a prising bar and then clear with ease the minimum clear opening dimensions as given in **18.1**. During the removal of a cover the design of the surface box should present minimal opportunity for the cover to drop into the chamber.*

18.7.2 Keyholes

Keyholes shall conform to the dimensions shown in Figure 5a).

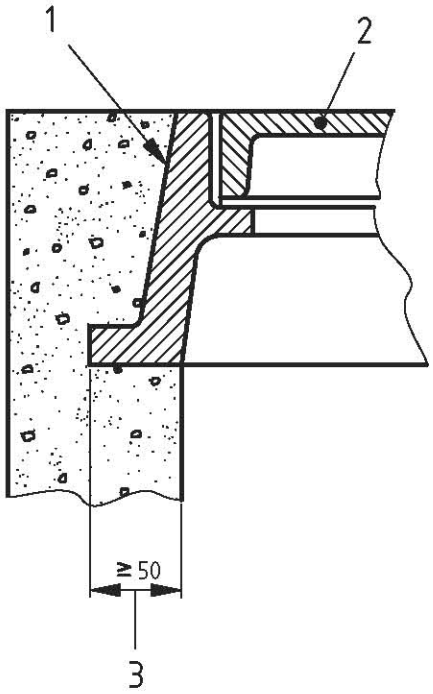
18.7.3 Additional requirements

Lifting keys, if provided, shall conform to the dimensions shown in Figure 5b).

NOTE Annex C, item c) 3).

Figure 4 **Minimum bedding width of surface box frame showing required dimensions**

All dimensions are in millimetres



Key

1 Surface box frame

2 Surface box cover

3 Bedding width

19 Marking

19.1 Surface box covers shall be clearly marked by having the words "FIRE HYDRANT" in letters not less than 30 mm high, or the initials "F.H." in letters not less than 75 mm high, cast into the cover.

19.2 The cover and frame shall have clearly cast thereon the number and date of this British Standard and the appropriate grade as given in Clause **15**, e.g. "BS 750:2006, Grade A".

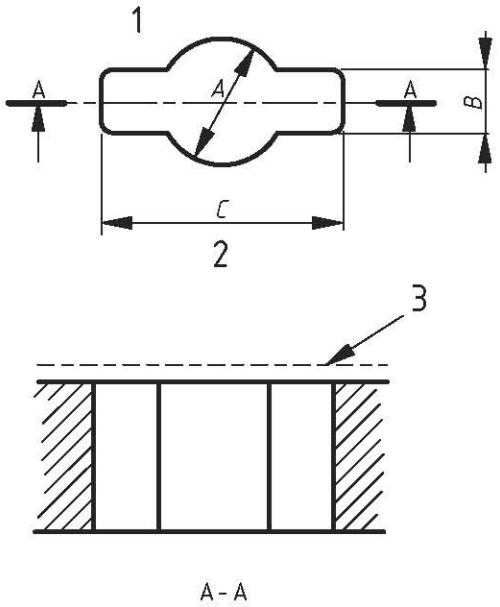
20 Type requirements

Surface box frames and covers, whether made of grey cast iron or spheroidal graphite cast iron, shall be capable of supporting without fracture the design loads of 300 kN for Grade A and 125 kN for Grade B when tested in accordance with Annex D.

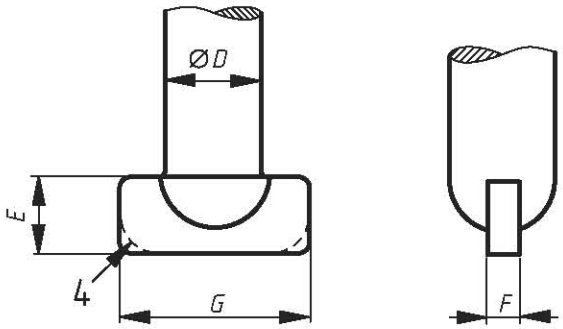
Figure 5 **Detail of keyhole and key**

All dimensions are in millimetres

a) Keyhole



b) Key



Key

1 Open
2 Plan
3 Line of raised pattern
4 Alternative shape

	Minimum	Maximum
A	22	25
B	9	13
C	44	–

D	20 ± 1
E	15 ± 1
F	6 ± 1
G	40 ± 1

21 Production requirements

Samples from lots of surface box frames and covers, when tested in accordance with Annex D, shall be capable of supporting the design loads shown in Table 1 and shall conform to the acceptance criteria in the same table.

Table 1 **Production test load requirements and acceptance criteria**

Material	**Grade of frame and cover**	**Production test load** kN	**Acceptance criteria**
Grey cast iron (CI)	A B	300 125	No fracture
Spheroidal graphite cast iron (SG)	A B	200 85	No fracture or any permanent set[A] greater than 0.2% of the distance between selected seatings

[A] Measured at the mid-point between any two selected supporting seatings after removal of the test load.

Acceptance of lots of frames and covers shall be in accordance with BS 6001, QL 2.5% inspection level II (Normal Inspection). The acceptance of a lot of frames and covers by the purchaser shall not prejudice the purchaser's right to reject the lot if it is subsequently found not to meet the requirements of this clause.

22 Test certificate

Provision shall be made for a certificate to be made available which certifies that samples from each production lot from which the delivery is made up conform to the requirements of Clause **21**.

Annex A (normative) Type tests for strength, security and endurance

A.1 Load/deflection test

A.1.1 Apparatus

A specimen hydrant (complete with outlet) or alternatively, in the case of type 2b and type 2c, a specimen outlet, is mounted to a rigid plate having a facility to enable an internal water pressure of $(PFA + 0.4)^{+0.1}_{0}$ MPa ($PFA + 4^{+1}_{0}$ bar) to be applied. Either a standpipe of sufficient length or a blanking cap modified to have a suitable loading bar is connected to the test outlet. The standpipe or loading bar shall be of sufficient length that the specified bending moment can be generated by a force applied at a minimum distance of 900 mm from the mounting point of the outlet under test. The test arrangement is shown in Figure A.1. The force (F) is applied in a vertical plane in either an upward or downward direction. The force is such as to produce a minimum bending moment of [A1⟩ 1 500 ⟨A1] Nm for the test procedure described in **A.1.3.1** and for the test procedure of **A.1.3.2** a minimum bending moment of [A1⟩ 750 ⟨A1] Nm together with a hydrostatic pressure of $(PFA + 0.4)^{+0.1}_{0}$ MPa ($PFa + 4^{+1.0}_{0}$ bar).

A.1.2 Test specimens

Ten specimen outlets or, in the case of type 2a and type 2d, 10 specimen hydrants, in the condition that they are supplied to the user are randomly selected. Five samples shall be used for the first part of the procedure (see **A.1.3.1**) and five for the second (see **A.1.3.2**).

A.1.3 Procedure

A.1.3.1 Apply a minimum bending moment of [A1⟩ 1 500 ⟨A1] Nm, as described in **A.1.1**, for a period of 10 s. Note the angular deflection at this point. Remove the applied force and after 2 min measure the residual angular deflection.

A.1.3.2 With a hydrostatic pressure of $(PFA + 0.4)^{+0.1}_{0}$ MPa ($PFA + 4.0^{+1.0}_{0}$ bar) applied within the outlet apply a minimum bending moment of [A1⟩ 750 ⟨A1] Nm, as described in **A.1.1**, for a period of 1 min during which time check for leaks. At the end of this period remove the applied force and hydrostatic pressure.

A.1.3.3 Repeat the test procedure **A.1.3.1** and **A.1.3.2**, on the same sample, three times with the force applied at approximately (a) 45°, (b) 90° and (c) 180° from the position of the first test.

A.1.3.4 Repeat the test procedure **A.1.3.3**, on the same sample, in the most potentially vulnerable orientation of the outlet to the force, unless this position has already been covered by the tests in **A.1.3.2** and **A.1.3.3**.

A.2 Test for rotational resistance of outlet

A.2.1 Apparatus

A suitable test rig capable of withstanding test forces shall be provided to mount the hydrant.

A.2.2 Test specimens

One randomly selected hydrant, in the delivery condition (including any proprietary joints) shall be tested.

A.2.3 Procedure

A.2.3.1 Mount and secure the hydrant by its inlet connection to the test rig. Fit a blanking cap to the outlet and if necessary provide a means of rigidly securing it to the threaded portion of the outlet to prevent the cap being removed during the anticlockwise test.

A.2.3.2 Apply a torque of (50 ± 2.5) Nm directly to the outlet in a clockwise direction and hold for minimum 30 s and observe for any visual movement. Repeat the test in an anticlockwise direction and observe for any visual movement.

A.2.3.3 Repeat **A.2.3.2** with a torque of (300 ± 15) Nm and measure the total rotational movement (from fully clockwise to fully anticlockwise) of the outlet.

A.2.3.4 Repeat **A.2.3.3** with an internal hydrostatic pressure of $(PFA + 0.4)^{+0.1}_{0}$ MPa ($PFA + 4.0^{+1.0}_{0}$ bar). Examine the outlet/body joint during the test for visible signs of leakage.

A.3 Test for rotational resistance of bonnets

A.3.1 Apparatus

A suitable test rig capable of withstanding test forces shall be provided to mount the hydrant.

A.3.2 Test specimens

One randomly selected hydrant, in its delivery condition (including any proprietary joints), shall be tested.

A.3.3 Procedure

A.3.3.1 Mount the hydrant on the test rig and fit a blanking cap to the outlet. Provide a means of applying a torque either directly to the bonnet or by means of any suitable device, which shall not add to the strength of the body/bonnet connecting system.

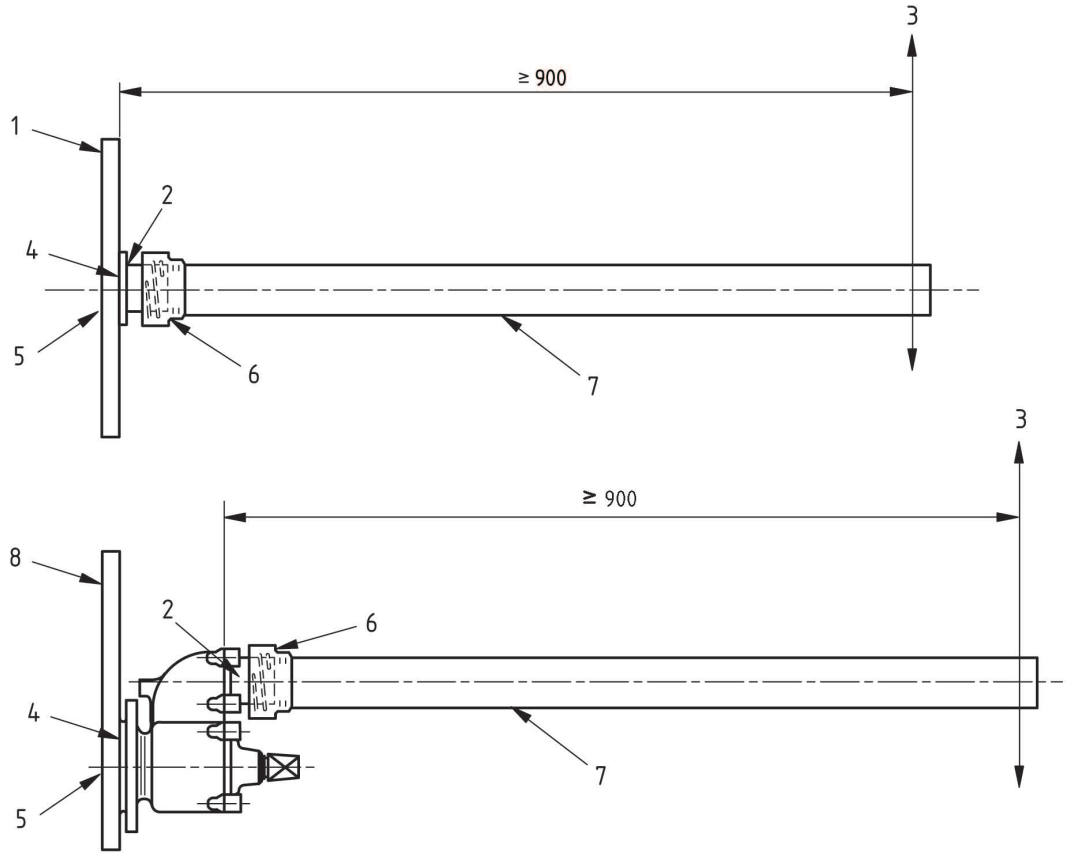
A.3.3.2 Apply a torque of (50 ± 2.5) Nm directly to the bonnet in a clockwise direction and hold for a minimum of 30 s and observe for any visual movement. Repeat the test in an anticlockwise direction and observe for any visual movement.

A.3.3.3 Repeat **A.3.3.2** with a torque of (300 ± 15) Nm and measure the total rotational movement (from fully clockwise to fully anticlockwise) of the bonnet.

A.3.3.4 Repeat **A.3.3.3** with an internal hydrostatic pressure of $(PFA + 0.4)^{+0.1}_{0}$ MPa ($PFA + 4.0^{+1.0}_{0}$ bar). Examine the bonnet/body joint during the test for visible signs of leakage.

Figure A.1 **Load/deflection test apparatus**

All dimensions are in millimetres



Key

1 Rigid support plate for outlet
2 Outlet
3 Force applied (see **11.3**)
4 Joint (or proprietary joint assembly)
5 Hole in plate to enable test pressure to be applied to outlet
6 Blanking cap and washer or standpipe
7 Loading bar or standpipe
8 Rigid support plate for hydrant

Annex B (normative) Type hydrostatic tests for screwed outlets

B.1 Apparatus

A suitable test rig capable of withstanding test forces shall be provided to mount the hydrant.

B.2 Test specimens

One randomly selected outlet, in its delivery condition, shall be tested.

B.3 Procedure

B.3.1 Mount the outlet to a hydrant. Fit a standpipe or blanking cap in accordance with BS 336 to the outlet with a torque of (150 ± 7.5) Nm and then remove it. Repeat this procedure 200 times.

B.3.2 Blank off the screwed outlet using a blanking cap and connect the other end to a pressurized water supply.

B.3.3 Subject the screwed outlet to a hydraulic pressure of not less than 1.5 times PFA for a period of not less than 1 min.

*NOTE The test may be carried out in conjunction with the tests on the hydrant (see Clause **11** and Clause **12**).*

Annex C (informative) Information to be supplied by the purchaser

The purchaser should supply the manufacturer with the following information.

a) Information on options which are detailed in this standard, common to both wedge-gate and screw-down type hydrants:
   1) whether a wedge-gate (type 1) or screw-down (type 2a, 2b, 2c or 2d) is required (see Clause **3**);
   2) form of stem sealing required (see Clause **5.4**);
   3) what form of draining system is required (see Clause **8**);
   4) if a certificate of test is required (see Clause **13**).

b) Suggested additional information common to both wedge-gate and screw-down type hydrants:
   1) whether valves are for use in or transport through the tropics;
   2) whether for sea water or other non-potable water use;
   3) special provisions for despatch;
   4) need for any special coatings;
   5) whether witnessing of tests is desired.

c) Information specific to surface box frames and covers:
   1) whether Grade A or Grade B design (see Clause **15**);
   2) whether for wedge-gate or screw-down type hydrant (see Clause **18**);
   3) whether lifting key(s) are required (see ⟦A1⟩ **18.7.3** ⟨A1⟧);
   4) whether valve opening direction is required to be marked; if so, the direction of opening;
   5) if a certificate of test is required (see Clause **22**).

Annex D (normative) Type and production loading tests for surface box frames and covers

D.1 Apparatus

D.1.1 *Standard frame* to be used as a supporting frame.

D.1.2 *Bearing block* of 300 mm × 200 mm, of hardwood faced with hard rubber or other resilient material, and sufficiently rigid to ensure that the load on the cover is evenly distributed over the full area of the block.

D.1.3 *Device, preferably a hydraulic testing machine, for applying the load.* The device shall be capable of applying a load at least 25% greater than 300 kN for Grade A and 125 kN for Grade B. If a testing machine is used it shall conform to the accuracy requirements for Grade A or Grade B testing machines given in BS 1610. If any other load-measuring device is used, it shall be accurate to within 2% of the indicated load.

D.1.4 *Measuring device*, accurate to 0.1 mm, suitable for indicating deflection measurements on spheroidal graphite cast iron units.

D.2 Type test (grey cast iron and spheroidal graphite cast iron frames and covers)

Support the cover in the frame (**D.1.1**) and position the bearing block (**D.1.2**) centrally on and wholly within the perimeter of the unit or section(s) being tested. Apply a test load of 300 kN for Grade A and 125 kN for Grade B without shock, and sustain it for a minimum of 30 s.

D.3 Production batch test

D.3.1 Grey cast iron frames and covers

Support the cover in the frame (**D.1.1**) and position the bearing block (**D.1.2**) centrally on and wholly within the perimeter of the unit being tested. Apply the appropriate test load indicated in Table 1, without shock, and sustain it for a minimum of 30 s.

D.3.2 Spheroidal graphite cast iron frames and covers

Support the cover in the frame (**D.1.1**) and position the bearing block (**D.1.2**) centrally on and wholly within the perimeter of the unit being tested. Before the load is applied take an initial reading with the measuring device (**D.1.4**) at a point midway between two selected supporting seatings to establish a datum point. Where it is not practicable to make this measurement exactly on the line drawn between the two supporting seatings it shall be taken on a line parallel to, and as near as possible to, this line.

Apply the appropriate test load indicated in Table 1, without shock, five times, sustaining alternating maximum and zero loads for minimum periods of 20 s; then take a second reading at the datum point. Record the difference between the two readings as the permanent set.

Bibliography

Standards publications

BS 9990, *Code of practice for non-automatic fire-fighting systems in buildings*

Other publications

[1] The Manual Handling Operations Regulations 1992, SI 1992 No. 2793. London: TSO.

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