BRITISH STANDARD

BS 5041-1: 1987

Incorporating Amendment No.1

Fire hydrant systems equipment —

Part 1: Specification for landing valves for wet risers

UDC 614.843.1 + 621.643.51

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Fire Standards Committee (FSM/-) to Technical Committee FSM/6, upon which the following bodies were represented:

Association of County Councils
Association of Metropolitan Authorities
British Coal
British Fire Services' Association
British Plastics Federation
British Valve Manufacturers' Association Ltd.
Chief and Assistant Chief Fire Officers' Association
Convention of Scottish Local Authorities
Copper Development Association
Department of the Environment (Property Services Agency)
Department of Transport (Marine Directorate)
Fire Extinguishing Trades Association
Fire Offices Committee
Fire Protection Association
Greater London Council
Home Office
Institution of Fire Engineers
Ministry of Defence
Royal Institute of British Architects

The following body was also represented in the drafting of the standard, through subcommittees and panels:

British Fire Protection Systems Association Ltd.

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Contents

Foreword

This revision of BS 5041-1 has been prepared under the direction of the Fire Standards Committee and supersedes BS 5041-1:1975, which is withdrawn. It specifies requirements for valves suitable for use on wet risers of either high or low pressure installations. BS 5041-1:1975 was restricted to copper alloy globe valves but in this revision requirements for diaphragm valves are included.

The subjects of the other Parts in the BS 5041 series of general specifications for fire hydrant systems equipment are as follows.

— *Part 2: Landing valves for dry risers;*

— *Part 3: Inlet breechings for dry riser inlets;*

— *Part 4: Boxes for landing valves for dry risers;*

— *Part 5: Boxes for foam inlets and dry riser inlets.*

These Parts give detailed requirements for most of the other special items required for wet and dry risers described in BS 5306-1.

In this standard metric values are given in SI units; for further information reference should be made to BS 3763. Some nominal bores and thread sizes are given in inches to accord with the standards referred to.

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 10, 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.

Section 1. General

1 Scope

This Part of BS 5041 specifies requirements for copper alloy globe valves generally complying with BS 5154 and diaphragm valves generally complying with BS 5156, both suitable for installation as landing valves on wet risers. The valves have screwed or flanged inlets and also delivery hose connections complying with BS 336. This standard covers valves of nominal pressure (PN) designations 15 bar and 20 bar and nominal inlet sizes DN 40 to DN 65 for flanged ends and 1½ and 2½ for screwed ends.

NOTE 1 Unless otherwise stated all pressures are gauge pressures expressed in bar: 1 bar = 10^5 N/m^2 = 100 kPa.
NOTE 2 Information which the purchaser is recommended to supply to the manufacturer is given in Appendix B and does not form part of the specification.
NOTE 3 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 5041, the following definitions apply.

2.1
wet riser (wet rising main)

a vertical pipe installed in a building for fire fighting purposes, permanently charged with water from a pressurized supply, and fitted with valves and outlet connections at specified points

2.2
landing valve

an assembly comprising a valve and outlet connection from a wet or dry riser

3 Valve types

Valves, whether globe or diaphragm, shall be of the horizontal, bib-nosed, oblique or right-angle type, the general forms being illustrated in Figure 1.

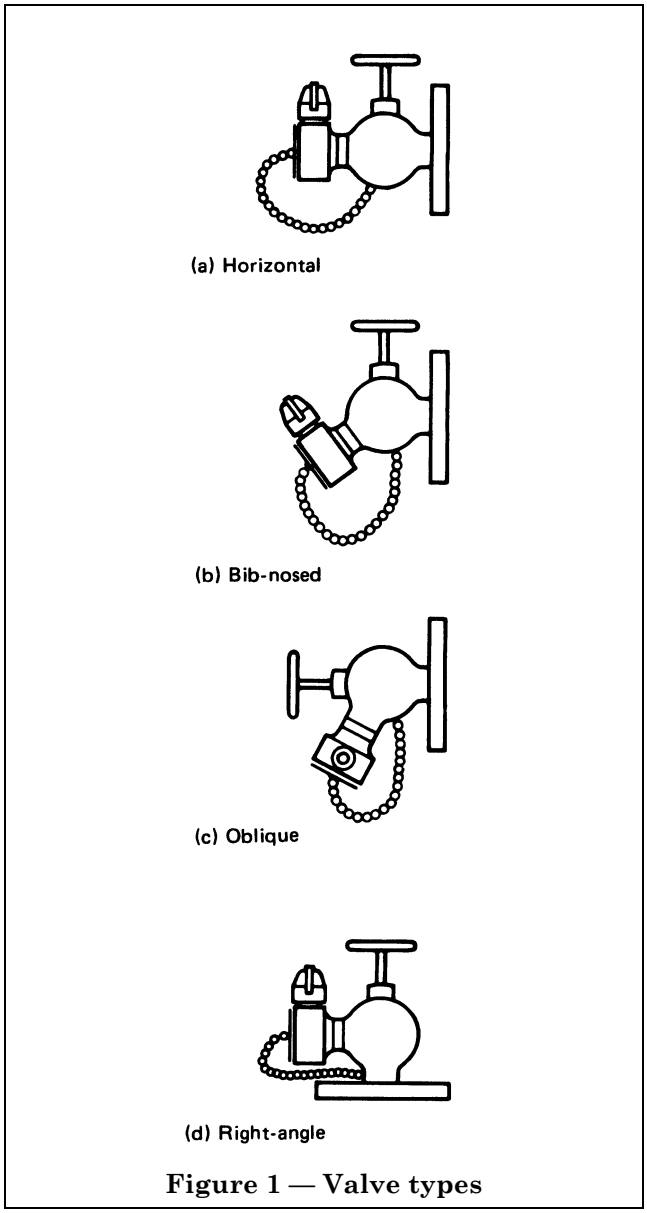

Figure 1 — Valve types

4 Classification by pressure rating

4.1 General

Valves shall be classified as low pressure or high pressure according to the nominal inlet working pressure for which they are suitable.

4.2 Low pressure valves

Low pressure valves shall be suitable for use at nominal inlet pressures up to 15 bar.

4.3 High pressure valves

High pressure valves shall be suitable for use at nominal inlet pressures up to 20 bar.

5 Nominal inlet sizes

5.1 Flanged end valves

The nominal inlet size (DN) shall be 40, 50 or 65.

5.2 Screwed end valves

The nominal inlet size (DN) shall be 1½, 2 or 2½.

6 Temperature rating

Both low pressure and high pressure valves shall be suitable for continuous use at their nominal pressure rating throughout the temperature range from 0 °C to 38 °C.

7 Marking

7.1 General

Each valve shall be marked with the following:

a) the letters "LP" (for low pressure valves) or "HP" (for high pressure valves) in a position which will be visible after the valve has been installed;

b) the nominal size;

c) the manufacturer's name or trademark;

d) the number of this standard, i.e. BS 5041/1[1)].

7.2 Diaphragm valves

The diaphragm shall be marked "FIRE HYDRANT", "FIRE HYD" or with the manufacturer's grade reference for the particular material. The marking shall be visible on the assembled valve.

[1)] Marking BS 5041/1 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.

Section 2. Design

8 Materials

Each component or part of the valve shall be made from one of the materials given in Table 1.

9 Valve bodies

9.1 Body wall thickness

The body wall thickness at any point shall be as follows.

a) *For low pressure valves:* not less than shown in Table 6 of BS 5154:1983 for PN 16 for the appropriate size of valve.

b) *For high pressure valves:* not less than shown in Table 6 of BS 5154:1983 for PN 20 for the appropriate size of valve.

9.2 Body seat

The body seat shall be either integral with the body or inserted in the form of a securely fitted but renewable ring. The shape of the seating surface shall be suited to the type of disk used (see clause **16**).

9.3 Seating face

The seating face shall be not less than 3 mm wide.

10 Valve inlets

10.1 General

Valve inlets shall be either flanged (see **10.2**) or screwed (see **10.3**).

10.2 Flanged ends

10.2.1 Inlet flanges shall be in accordance with the following tables in BS 4504-2:1974, with the possible exception of drilling (see **10.2.2**):

a) *for low pressure valves:* Table 16/21 for the appropriate size of valve;

b) *for high pressure valves:* Table 25/21 for the appropriate size of valve.

The casting surrounding the bolt holes on the flange shall be cast smooth and level or machined or spot faced to ensure satisfactory bolting.

Holes shall be equally spaced on the pitch circle diameter and shall be drilled "off centres".

If a flange is fitted with an "O" ring seal then the seal shall comply with BS 1806 or BS 4518.

10.2.2 If the purchaser does not specify drilling requirements for the flanges, they shall be drilled in accordance with Table 16/21 (low pressure valves) or Table 25/21 (high pressure valves) of BS 4504-2:1974.

10.3 Screwed ends

10.3.1 Body ends shall be hexagonal or of shape suitable for a hook or "C" spanner to facilitate tightening.

10.3.2 Screwed ends shall have male or female threads complying with BS 21.

10.3.3 The thickness of male ends shall be not less than 3 mm from the root diameter of the thread to the bore of the inlets.

11 Valve outlets

Outlet end connections shall be either integral or screwed on, and shall be of female instantaneous pattern complying with BS 336.

12 Bonnets

12.1 Diaphragm valves

The bonnet to body connection shall be bolted.

12.2 Globe valves

The bonnet to body connection shall be screwed or union or bolted. The surfaces forming the bonnet and body joint shall be machined. The joint may be metal to metal, or made with a gasket or "O" ring of non-shrinking material and complying with BS 1806 or BS 4518.

12.3 Bonnet wall thickness

The bonnet wall thickness at any point shall be as follows:

a) *for low pressure valves:* not less than shown in Table 6 of BS 5154:1983 for PN 16 for the appropriate size of valve;

b) *for high pressure valves:* not less than shown in Table 6 of BS 5154:1983 for PN 20 for the appropriate size of valve.

13 Stems

13.1 General

Valves shall be of the rising stem inside screw type, having the actuating thread within the bonnet or otherwise protected from damage and the external environment. They shall be formed in one piece, and shall be of sufficient length to ensure a minimum clearance of 40 mm between the handwheel and any part of the valve vertically below the periphery of the handwheel, and between the handwheel and the plunger release lug on the outlet.

Table 1 — Choice of materials for components and parts

Component	Material	British Standard number	Grade or designation
Low pressure and high pressure valves			
Body	Copper alloy	1400	LG2 or LG4
Bonnet	Copper alloy	1400 2872 2874	LG2 or LG4 CZ114 or CZ122
Stem	Copper alloy	2874	CZ112, CZ113, CZ114 or CZ121
Disk	Copper alloy	1400 2872 or 2874	LG2 or LG4 CZ114 or CZ122
Outlet	Copper alloy	1400	LG2 or LG4
Handwheel	Copper alloy Malleable cast iron Grey cast iron Spheroidal graphite cast iron Aluminium alloy[a]	1400 2872 6681 1452 2789 1490	LG2 or LG4 CZ114 or CZ122 — 150 or 180 — LM6 or LM25
Renewable disk facing	Rubber Chloroprene	1154 2752	70 IRHD minimum nominal hardness
Diaphragm	Rubber	—	Manufacturer's standard
Black cap	Copper alloy	1400 2872	LG2 or LG4 CZ114 or CZ122
	Aluminium alloy[a]	1490	LM5 condition M LM6 condition M LM16 condition TF LM25 condition TB or TF
Bolting: globe valves diaphragm valves	 Carbon steel[b], tensile strength not less than 390 N/mm^2 Aluminium bronze	 1506 2872	 162 CA104
Compressor	Grey cast iron Copper alloy	1452 1400	150 LG2 or LG4
High pressure valves only			
Relief valve seating	Rubber Chloroprene Nylon	1154 2752 —	85 IRHD minimum nominal hardness Hardness HV 5 to HV 12 when measured in accordance with BS 427-1
Relief valve spring	Copper alloy Stainless steel	— —	— —
Pressure regulating spring	Chrome vanadium steel	BS 970-5	735 A50

[a] The surface shall have an anodized finish of thickness not less than grade AA15 of BS 1615:1987, and the anodic oxidation coating shall be sealed (see clause **7** of that standard).

[b] Free cutting steels shall not be used.

13.2 Stem sizes

The diameter of the stem shall be not less than 16 mm where the stem is made from CZ114, or 19 mm where the stem is made from any other copper alloy (see Table 1).

The size of any square or drive on the stem shall be not less than 12 mm across flats. Where the handwheel is attached to the stem using a pin, the minimum cross-sectional dimension at that point shall be not less than 14.5 mm.

13.3 Threads on stems

The actuating thread shall be either Acme form or "V" form. The root diameter of the thread shall be not less than the following:

a) 16 mm for stems of CZ114;

b) 19 mm for stems of CZ112, CZ113 or CZ121.

13.4 Retention of stem

It shall not be possible for the spindle to pass completely through the gland nut.

14 Stem sealing on globe valves

Globe valves shall be provided with one of the following means of sealing the stems:

a) an "O" ring complying with BS 1806 or BS 4518; or

b) a rubber gland seal; or

c) a stuffing box gland.

It shall be possible to replace the seal or repack the gland when under pressure with the valve fully closed.

15 Glands on globe valves

Glands on globe valves shall be either screwed or bolted Screwed glands shall consist of a gland and gland nut when used as a stuffing box. Bolted glands shall be either a solid type or a two-piece self-aligning type.

16 Disks and disk facings

Disks shall be provided with resilient facings which may be renewable or bonded.

17 Handwheels and operation

The valve shall be closed by turning the handwheel in a clockwise direction when facing the handwheel. The number of complete turns of the handwheel to fully open a completely closed valve shall be not less than four nor more than 10.

Handwheels shall be marked with the SHUT direction.

Handwheels shall have a diameter of not less than 100 mm.

18 Bolting

Bolting shall be in accordance with one of the standards given in Table 2.

Table 2 — Bolting for valves

Metric	Inch
BS 3692	BS 1769
BS 4190	BS 2693-1
BS 4439	BS 4882
BS 4882	

19 Pressure retention

19.1 Body test

A valve shall show no sign of leakage or distortion of the body when tested in accordance with **A.1.1** (see also **25.1**).

NOTE This requirement is for the integrity of the valve body, not the strength of the release mechanism of the valve outlet connection (see clause **11**). BS 336 requires connectors including the release mechanism to withstand a test pressure of 22.5 bar. The test method in **A.1.1** is such that the requirements of **19.1** and BS 336 are not contradictory.

19.2 Seat test

A valve shall show no sign of leakage or distortion of the body when tested in accordance with **A.1.2** (see also **25.2**).

20 Strap

The valve shall be provided with a means for attaching a strap, so that the handwheel can be secured to counter unauthorized use.

NOTE If specified by the purchaser the following should also be provided (see BS 5306-1):

a) a strap made of leather or reinforced plastics material not less than 12 mm wide or less than 2 mm thick, and with ends suitable for linking by a padlock;

b) a small non-ferrous padlock to secure the two ends of the strap.

The provision of a strap is not usually considered necessary where the valve is to be enclosed in a box.

21 Blank cap and chain

A blank cap complying with BS 336 shall be provided. The cap shall be provided with a pressure relief hole having a flow area of not less than 2 mm^2.

The blank cap shall be attached to the body by a suitable lug, "S" hook and chain.

22 Water flow rate and outlet pressure

NOTE Manufacturers customarily quote a flow coefficient for valves. The requirements in **22.1** will be met by low pressure valves with a flow coefficient C_v (as defined and measured by the method given in BS 5793-2.1) of not less than 42. The requirements in **22.2** will be met by high pressure valves which have a flow coefficient of not less than 27 when fully open and which limit the outlet pressure to not more than 4.5 ± 0.5 bar.

22.1 Low pressure valves

The water flow rate through the valve shall be not less than 8.5 L/s and the outlet pressure shall be not less than 4 bar when the inlet pressure is 4.7 bar, when measured in accordance with **A.2**.

22.2 High pressure valves

The water flow rate through the valve shall be not less than 8.5 L/s at an outlet pressure of 4.5 ± 0.5 bar and at inlet pressures from 5.7 bar up to and including 20 bar, when tested in accordance with **A.3**.

23 Outlet pressure at restricted flow (high pressure valves only)

23.1 High pressure valves shall be fitted with a device which, when the outlet is restricted, limits the outlet pressure to a value not exceeding 7 bar, when tested in accordance with **A.4.1** and **A.4.2**.

23.2 Where the means of pressure limitation is a pressure relief valve, it shall not open at an outlet pressure of less than 5 bar when tested in accordance with **A.4.1** and **A.4.3**.

23.3 Where the means of pressure limitation is a pressure regulating mechanism, any means of adjustment shall be fitted with a locking/clamping device to maintain the initial setting. The valve shall comply with all the operational requirements of this specification without alteration of the initial setting (see also clause **26**).

24 Resistance to high temperature (diaphragm valves only)

Diaphragm valves shall not leak at a rate exceeding 23 L/min when tested in accordance with **A.5**.

Section 3. Production testing requirements and test certificate

25 Hydrostatic tests

25.1 Body test

Each valve shall be tested in accordance with **A.1.1** and shall comply with **19.1**.

25.2 Seat test

Each valve shall be tested in accordance with **A.1.2** and shall comply with **10.2**.

26 Pressure control test (high pressure valves only)

Each high pressure valve shall be tested in accordance with **A.4** and shall comply with clause **23**.

27 Test certificate

If the purchaser has requested a test certificate, the manufacturer shall supply one to certify that the valves in question have been tested and have satisfactorily complied with clause **19** (applicable to the type of valve). It shall also state the medium used in each test.

Appendix A Test methods

NOTE Where the tests in **A.1**, **A.3** and **A.4** are carried out for type approval purposes, it may be sufficient to carry out each appropriate test once only.
WARNING NOTE. Where hydrostatic pressure testing is involved, safety precautions in accordance with the relevant parts of the Health and Safety Executive Guidance Note "General Series/4" should be taken.

A.1 Pressure retention test

(see clauses **19** and **25**)

A.1.1 *Body test*

Blank off the outlet of the valve. Render any pressure relief valve inoperative. With the valve in the open or partly open position, connect the inlet to a hydraulic pressure test rig. Vent any trapped air. Subject the valve body to the appropriate hydrostatic test pressure for the appropriate test duration in accordance with Table 3. Apply the test pressure without significant hydraulic shock. Use no external restraint on the valve body.

NOTE The test may be carried out before the connector is fitted to valves with screwed-on connectors. When testing high pressure valves with integral connectors, or with screwed-on connectors fitted, additional means of retaining the outlet blanking piece may be used to prevent distortion of the release mechanism. When testing low pressure valves with the connector fitted additional means may not be used to retain the outlet blank: only the release mechanism may be used.

Table 3 — Body test pressures and durations

Valve type	Minimum hydrostatic test pressure	Test duration
	bar	min
Low pressure	22.5	2
High pressure	30	2

A.1.2 *Seat test*

Render any pressure relief valve inoperative. Connect the inlet to a hydrostatic pressure test rig. Vent any trapped air. With the outlet open to the atmosphere and the valve in the closed position, subject the valve to the appropriate hydrostatic test pressure and appropriate test duration in accordance with Table 4. Apply the test pressure without significant hydraulic shock.

Table 4 — Seat test pressures and durations

Valve type	Minimum hydrostatic test pressure	Test duration
	bar	min
Low pressure	16.5	2
High pressure	22	2

A.2 Flow and pressure drop test (low pressure valves only)

(see **22.1**)

A.2.1 *Apparatus.* A test rig of pipework of a size appropriate for the landing valve under test and having the following features shall be used:

a) pressure measuring devices, accurate to ± 0.05 bar, fitted close to the inlet and outlet of the valve;

b) two control valves fitted upstream and downstream of the pressure measuring devices;

c) a means of supplying water at both a suitable pressure and 8.5 L/s;

d) a means of measuring the water flow rate through the rig, accurate to ± 0.5 L/s.

A.2.2 *Procedure*

Mount the landing valve in the test rig fully opened. With water flowing through the rig adjust the control valves to give a flow rate of 8.5 L/s and an inlet pressure at the landing valve of 4.7 bar. If necessary, successively adjust the two control valves: opening the upstream valve will increase pressure and flow while opening the downstream valve will decrease pressure and increase flow. Measure and record the outlet pressure.

A.3 Flow and pressure control (high pressure valves only)

(see **22.2**)

A.3.1 *Apparatus.* A test rig in accordance with **A.2.1** shall be used except that the water supply shall be at 20 bar and 8.5 L/s.

A.3.2 *Procedure*

Carry out the test as follows.

a) Mount the landing valve in the test rig fully opened.

b) With water flowing through the rig and at an inlet pressure of approximately 7.5 bar, adjust the control valves to give a flow rate of 8.5 ± 0.5 L/s. Measure and record the water flow rate and inlet and outlet pressures.

c) Open the upstream control valve to increase the inlet pressure to approximately 12.5 bar. Do not adjust the downstream control valve unless the outlet pressure is outside the limits of 4.5 ± 0.5 bar AND the flow rate is outside the limits 8.5 ± 0.5 L/s. In that case adjust only the downstream valve and by small increments only until the flow rate of pressure falls within the limits. Measure and record the flow rate and pressures.

d) Repeat c) at inlet pressures of approximately 17.5 bar and $20\ ^{+0}_{-0.1}$ bar.

e) Close the upstream control valve to give an inlet pressure of approximately 15 bar. Adjust the downstream control valve only if necessary, as above. Measure and record the flow rate and inlet pressures.

f) Repeat e) at an inlet pressure of 10 bar and at as low an inlet pressure as is possible without the outlet pressure dropping below 4.0 bar.

A.4 Pressure relief tests (high pressure valves only)

(see clauses **23** and **26**)

A.4.1 *Apparatus.* Apparatus in accordance with **A.2.1** with the means of measuring flow upstream from the landing valve shall be used.

Since valves with a pressure regulating device do not release water to relieve the pressure, a means of relieving excessive inlet pressure should be fitted when testing this type.

For testing high pressure valves fitted with a pressure relief valve, provision shall be made for disposal of the water which will be released through the relief valve.

A.4.2 ***Procedure for verification of compliance with 23.1***

Mount the landing valve in the test rig fully opened. With water flowing through the rig, adjust the control valves to give a flow rate of 8.5 L/s at an inlet pressure of 20 bar.

Close the downstream control valve slowly. Observe and record whether the outlet pressure remains below 7 bar until it is fully closed.

NOTE It may be necessary to adjust the upstream control valve to control any increase in the inlet pressure.

Repeat the test at inlet pressures of 10 bar and 15 bar.

A.4.3 ***Procedure for verification of compliance with 23.2 (pressure relief types only)***

Mount the landing valve in the test rig fully opened. With water flowing through the valve, adjust the control valves to give a water flow rate of 8.6 L/s, or the maximum possible if this rate cannot be attained, at an inlet pressure of 5 bar. Slowly close the downstream control valve. Observe and record the outlet pressure at which the pressure relief valve opens.

A.5 High temperature resistance test (diaphragm valves only)

(see clause **24**)

A.5.1 ***Apparatus***

A.5.1.1 *Oven or furnace* capable of maintaining an air temperature of 540 ± 10 °C during the test.

A.5.1.2 *Suitable pipework* for connection to the valve inlet, to provide a water supply at a pressure equal to the nominal inlet pressure of 15 bar (low pressure valves) or 20 bar (high pressure valves) and for connection to the outlet to dispose of water passing through the valve. This pipework shall be self-draining.

A.5.2 ***Procedure***

Remove any outlet hose connection and blank cap.

Fill the valve with water and close it. Adjust the water pressure to the value equal to the nominal inlet pressure of the valve under test. Heat the oven to 540 ± 10 °C, place the valve in the oven and maintain at this temperature for 20 min. Measure the rate of any water flow from the valve at the end of this time.

Appendix B Recommendations for the information to be supplied by the purchaser to the manufacturer

It is recommended that the purchaser provide the following information with his or her order:

a) the valve type (see clause **3**);

b) whether a high pressure or low pressure valve is required (see clause **4**);

c) the nominal size (see clause **5**);

d) whether a screwed or flanged valve inlet is required (see clause **10**);

e) if a flanged inlet is required, whether the flange is to be supplied undrilled (see **10.2.2**);

f) whether a strap and padlock is required (see clause **20**).

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Publications referred to

BS 21, *Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).*

BS 336, *Specification for fire hose couplings and ancillary equipment.*

BS 427, *Method for Vickers hardness test.*

BS 427-1, *Testing of metals.*

BS 970, *Wrought steels (blooms, billets, bars and forgings).*

BS 970-5, *Carbon and alloy spring steels for the manufacture of hot formed springs.*

BS 1154, *Specification for natural rubber compounds.*

BS 1400, *Specification for copper alloy ingots and copper alloy and high conductivity copper alloy castings.*

BS 1452, *Specification for grey iron castings.*

BS 1490, *Aluminium and aluminium alloy ingots and castings.*

BS 1506, *Specification for carbon, low alloy and stainless steel bars and billets for bolting material to be used in pressure retaining applications.*

BS 1615, *Method for specifying anodic oxidation coatings on aluminium and its alloys.*

BS 1769, *Unified black hexagon bolts, screws and nuts (UNC and UNF threads). Heavy series.*

BS 1806, *Dimensions of toroidal sealing rings ("O" seals and their housings).*

BS 2693, *Screwed studs.*

BS 2693-1, *General purpose studs (obsolescent).*

BS 2752, *Specification for chloroprene rubber compounds.*

BS 2789, *Specification for spheroidal graphite or nodular graphite cast iron.*

BS 2872, *Copper and copper alloys. Forging stock and forgings.*

BS 2874, *Specification for copper and copper alloy rods and sections (other than forging stock).*

BS 3692, *ISO metric precision hexagon bolts, screws and nuts. Metric units.*

BS 3763, *The International System of units (SI)*[2)].

BS 4190, *ISO metric black hexagon bolts, screws and nuts.*

BS 4439, *Screwed studs for general purposes. Metric series.*

BS 4504, *Flanges and bolting for pipes, valves and fittings. Metric series.*

BS 4504-2, *Copper alloy and composite flanges.*

BS 4518, *Specification for metric dimensions of toroidal sealing rings ("O" rings) and their housings.*

BS 4882, *Bolting for flanges and pressure containing purposes.*

BS 5041, *Fire hydrant systems equipment*[2)].

BS 5041-2, *Specification for landing valves for dry risers.*

BS 5041-3, *Inlet breechings for dry riser inlets.*

BS 5041-4, *Boxes for landing valves for dry risers.*

BS 5041-5, *Boxes for foam inlets and dry riser inlets.*

BS 5154, *Specification for copper alloy globe, globe stop and check, check and gate valves.*

BS 5156, *Specification for diaphragm valves.*

BS 5306, *Code of practice for fire extinguishing installations and equipment on premises.*

BS 5306-1, *Hydrant systems, hose reels and foam inlets.*

BS 5793, *Industrial-process control valves.*

BS 5793-2, *Flow capacity.*

BS 5793-2.1, *Sizing equations for incompressible fluid flow under installed conditions.*

BS 6681, *Specification for malleable cast iron.*

Health and Safety Executive Guidance Note "General Series/4"[3)].

[2)] Referred to in the foreword only.

[3)] Available from HMSO, 49 High Holborn, London WC1 for personal callers, or by post from HSMO, PO Box 276, London SW8 5DT.

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