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BRITISH STANDARD

BS 5433:1976

Incorporating Amendment Nos. 1 and 2

CONFIRMED
DECEMBER 2007

Specification for

Underground stopvalves for water services

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British Bath Manufacturers' Association*
British Plastics Federation*
Council of British Ceramic Sanitaryware Manufacturers*
Department of the Environment*
Environmental Health Officers' Association
Greater London Council*
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Association of Manufacturers of Domestic Electrical Appliances
British Gas Corporation
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British Valve Manufacturers' Association
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Institution of Water Engineers and Scientists
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Society of British Gas Industries
South London Consortium
Thames Water Authority — Metropolitan Water Division
Individual experts

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Foreword

This British Standard has been prepared under the authority of the Sanitary Appliances Standards Committee. The original idea for a British Standard for special stopvalves arose from a proposal by the then British Waterworks Association (now National Water Council) who had carried out an investigation among their members into the use and behaviour of valves based on BS 1010:1959 when used underground. Experience of the exacting conditions and lack of accessibility in situations where they were installed led to the recommendation for a stronger valve with special design features to match the operating conditions.

The dimensions given are those considered necessary to ensure the production of valves of nominal size ½ to 2 suitable for underground water services.

It is recommended that the body of the valve and the metal components be based on gunmetals and bronzes for strength and that attention be given to resistance against dezincification.

There is provision for alternative methods of operation by means of either a crutch-type handle or a square top. Provision is made for minimum opening torque so as to prevent the possibility of the head screwing out of the body when the stopvalve is being opened or turned with a key.

BS 1010:1959 has been retained and retitled "Part 1: *Imperial units*". Above-ground stopvalves are now included in the metric version BS 1010-2:1973.

In this standard, dimensions are expressed in metric terms except that pipe thread designations accord with BS 2779.

Requirements for methods of testing suitability of materials for use in contact with water for domestic purposes will form the subject of a separate standard to be prepared under the direction of the Environment and Pollution Standards Committee (EPC/-).

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 to iv, pages 1 to 18, 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.

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Section 1. General

1 Scope

This British Standard applies to copper alloy screwdown stopvalves of nominal sizes from ½ to 2 for installation on underground water service pipes. The nominal size is that corresponding to the pipe size of the thread at the end connection. It includes stopvalves with ends screwed internally or externally or arranged in accordance with clause **25**, and fitted with a crutch or with a square head.

2 References

The titles of the publications referred to in this standard are listed on the inside back cover.

3 Definition

For the purpose of this British Standard the following definition applies, together with any which are relevant in BS 2591-1.

screwdown stopvalves

any valve in which a disc carrying a renewable non-metallic washer is lifted from and lowered onto the body seat by a spindle whose axis is perpendicular to the face of the body seat and having suitable means of connection for insertion in a pipeline. The use of the word valve or stopvalve herein shall be taken to mean an underground stopvalve

4 Illustrations

Illustrations of typical stopvalves showing the component parts are given in Figure 1 to Figure 6. These illustrations are not intended to indicate design.

5 Nominal size

Stopvalves shall be designated by their nominal sizes; their dimensions shall be as specified in Table 3 to Table 12.

6 Marking

Stopvalves shall be legibly and permanently marked with the following information.

On the headwork and body:

a) manufacturer's name or mark;

b) the number of this British Standard, i.e. BS 5433.

On the body:

c) nominal size;

d) direction of flow.

Section 2. Dimensions, testing and materials

7 Dimensions

Dimensions for screw threads shall comply with those specified in Table 6 to Table 11. Other dimensions for valve bodies and components shall be as specified in Table 3, Table 4 and Table 5. Dimensions for parallel spigot and cone end tail pipes shall be as specified in Table 12.

8 Testing

Every stopvalve shall be tested in the assembled condition both in the fully closed position (seat test) and in the fully open position (body test).

In both cases the test shall consist of either a hydraulic test at not less than 21 bar[1)] or a pneumatic test at not less than 5 bar while the stopvalve is completely immersed in water. Alternatively, the body test may be carried out with the valve reversed and in the closed position. The valve being tested shall neither leak nor sweat during tests.

9 Materials

9.1 Composition. The preferred metallic materials for the component parts of underground stopvalves are those listed in Table 1.

9.2 Alternative materials. Other metallic materials may be used provided that they are not less suitable than those listed in Table 1, not more susceptible to corrosion, completely immune to dezincification and are not of lower mechanical strength.

9.3 Materials in contact with supply water. The materials which are in contact with supply water, including "O"-rings, gland packings, seat washers and lubricants used in the construction, shall not constitute a toxic hazard and shall not foster microbiological growth or give rise to taste, odour, cloudiness or discoloration of the water. Attention is drawn to National Water Council requirements in this respect.

[1)] 1 bar = 10^5 N/m^2 = 100 kPa.

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Table 1 — Materials

1	2		3	4	5	6	7	8	9
2	**Basic material form**		**Sand castings**				**Non-forging stock**		**Forging stock**
3	**Stopvalve component parts**		**Material specification**						
			BS 1452 grade 12 Cast iron	**BS 1400 LG1 Gunmetal**	**BS 1400 LG2 Gunmetal**	**BS 1400 LG4 Gunmetal**	**BS 1400 LG2 Continuous cast gunmetal**	**BS 2874 PB 102 Phosphor bronze**	**BS 2872 CA 104 Aluminium bronze**
4	Body			X	X	X			
5	Head			X	X	X	X	X	X
6	Gland	nominal size ½ and ¾ only					X	X	X
7		nominal size 1 and over		X	X	X	X	X	X
8	Spindle	nominal size ½ and ¾ only				X	X	X	X
9		nominal size 1 and over			X	X	X	X	X
10	Crutch				X	X	X	X	X
11	Washer plate			X	X	X	X	X	X
12	Nut						X	X	X
13	Square head		X	X	X	X	X	X	X
14	Union nuts, compression nuts and tail pipes			X	X	X	X	X	X
15	Seating washer			Vulcanized synthetic rubber complying with the requirements of clause **6** of BS 3457:1973					
16	Head seal "O"-ring			Rubber complying with the requirements of BS 2494					
17	Gland packing			See clause **24**					
18	Pinning wire for square head			BS 2874, CZ 121 or CZ 122					

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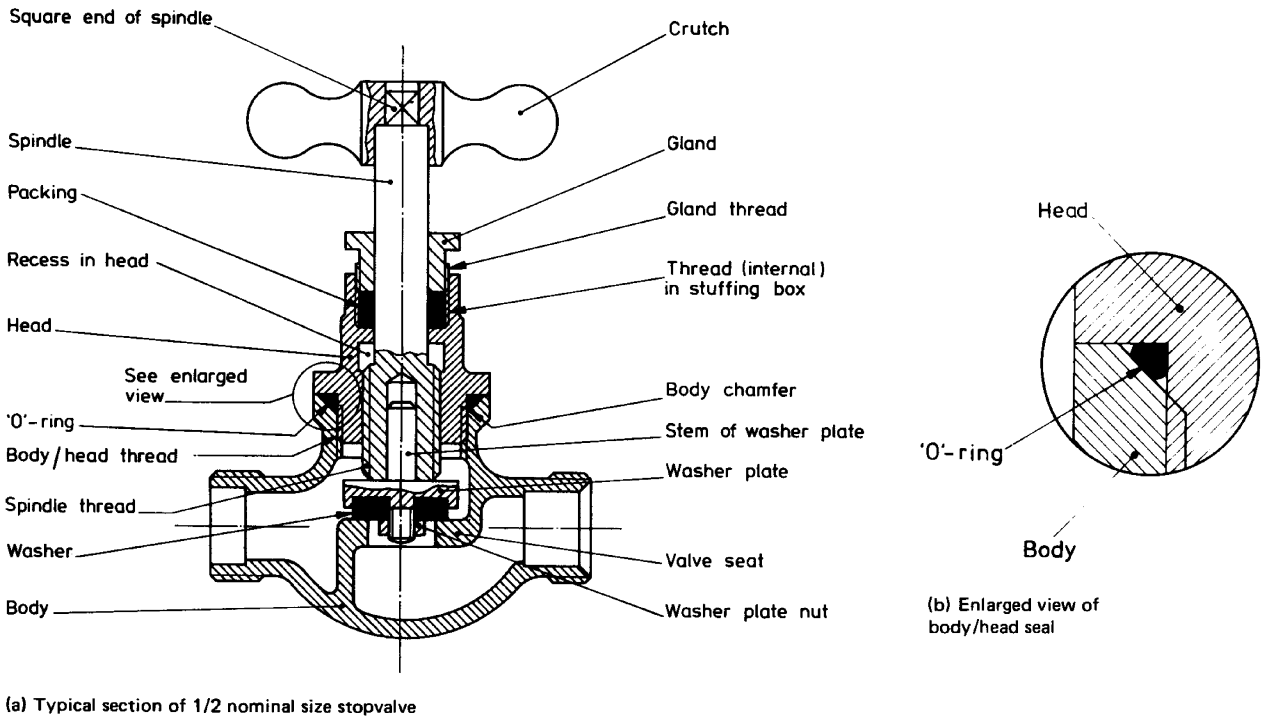

Figure 1 — Underground stopvalve

Section 3. Workmanship

10 Castings

Castings shall be in all respects sound and good, free from laps, blow holes and pitting, and both the external and internal surfaces shall be clean, smooth and free from sand.

They shall be neatly dressed and no casting shall be burned, plugged, stopped or patched.

11 Forgings

All forged components shall be sound, solid without laminations, smooth and well finished and shall comply with the requirements of BS 3885.

12 Machining

The bodies, heads, spindles and other parts shall be truly machined so that, when assembled, the parts are axial and parallel with surfaces smoothly finished with the limits of the size given in the tables applicable to the various components.

13 Thickness of parts

Except where there are definite dimensions given which provide for a lesser thickness, no part of any component of a valve shall be of less thickness than that shown in Table 3, line 4. Minimum thicknesses for unions are given in Table 12; see also clause **25**.

Section 4. Design and construction

14 Waterway

Except where otherwise stated, the area of waterway throughout the body of a valve shall be not less than the area of a circle of diameter equal to the bore of the seating.

The dimensions of the waterway through the unions of a valve shall be not less than those stated in Table 12 for the purposes specified in the table, or alternatively if the union ends are for copper tube the dimensions shall be not less than is specified for the appropriate size of union in BS 864-2.

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15 Seat

The seat of a valve shall be flat and solid with the body and shall fully support the washer. The bore of the seat shall be rounded to a radius of not less than 0.5 mm and not more than 0.8 mm.

The minimum thickness of metal supporting the seat shall be as given in Table 3, line 3.

16 Screw threads

16.1 General. Unless otherwise specified, all threads shall be of Whitworth or metric form and right-handed.

The external thread on spindles and the corresponding internal thread in heads shall be as detailed in Table 6 and Table 7.

All special threads on component parts shall be made to the diameters and pitches specified in Table 6 to Table 11 of this standard and shall comply with the requirements of BS 84 so far as it is applicable.

16.2 Inlet and outlet. Except where otherwise specified in this standard, inlets and outlets of valves shall:

a) for a pipe thread of the same nominal size as the valve, *either*:

1) comply with the requirements of class B of Table 3M or Table 3 of BS 2779:1973, for external threads; *or*

2) comply with the requirements of Table 4M or Table 4 of BS 2779:1973, for internal threads;

or

b) for union ends, comply with the dimensions specified in Table 12;

or

c) *either:*

1) be tapped or screwed (taper pipe thread) to comply with the requirements of BS 21; *or*

2) be tapped or screwed to comply with the requirements of BS 61; *or*

3) comply with the requirements of clause **25**.

16.3 Spindle thread. The length of the spindle thread shall be such that, when the washer plate is resting on the seating without any washer, a length of the thread equal to not less than 70 % of the external diameter of the threaded portion of the spindle shall be in full engagement with the internal thread of the head.

16.4 Head thread. The spindle thread in the head (internal) shall be so formed that when the spindle is screwed into the head to its fully open position, the end of the spindle projects beyond the face of the head at least 0.8 mm in nominal sizes up to 1 and at least 1.6 mm in larger sizes so that the top of the washer plate shall be clear of the bottom of the head when the valve is fully open. A recess shall be formed at the top of the thread equal in depth to the depth of thread and in length not greater than the dimensions given in Table 4, line 5.

17 Head seal

The head seal shall be as shown in Figure 1, i.e. using toroidal sealing rings and chamfer-type seal, and shall comply with the following requirements.

a) The housing dimensions and "O"-rings shall comply with the requirements of BS 4518 or BS 1806 and the "O"-ring sections diameters shall be as specified in Table 2. The "O"-ring shall be a slight stretch fit on the head in order that it will not fall off during assembly of the head in the body. The rubber shall comply with the requirements of BS 2494. The minimum width of metal to metal contact between body and head flanges shall be as specified in Table 3, line 7.

NOTE Table 2 contains reference number of suitable standard rings.

b) The head seal shall withstand a minimum breaking torque applied to the head as indicated in Table 2 without relative movement between head and body.

c) A plain portion of the head shall be formed at the back of the body attachment thread below the flange, the length of which shall be not less than the depth of the "O"-ring seal chamfer in the body, neither shall it prevent the body flange and head flange engagement complying with the requirements of b).

18 Washer plate

The washer plate with its stem shall be made in one piece, true all over, especially on the face on which the washer will be seated. If the washer plate is a casting it shall be machined all over.

The washer plate shall be free to rotate and so secured as to lift with the spindle.

Washer plates shall have a stud for the attachment of the washer. The stud shall be screwed and provided with a nut complying with the requirements of BS 57 or of BS 1083. The length of the screwing on the stud shall ensure that the washout beyond the thread is always shorter than the minimum thickness of the washer Q (see Table 5 and Figure 5).

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Table 2 — Head seal features

Valve size, nominal	"O"-ring and housing references				Minimum breaking torque after assembly
	BS 4518 (metric)		BS 1806 (imperial)		
	Section diameter	"O"-ring ref. no.	Section diameter[a]	"O"-ring ref. no.	
	mm		in		Nm
½	2.4	—	0.103	119	40
¾	2.4	—	0.103	123	40
1	2.4	0396-24	0.103	129	40
1¼	3.0	—	0.139	225	55
1½	3.0	0545-30	0.139	227	55
2	3.0	0695-30	0.139	—	55

[a] 0.103 in ≈ 2.62 mm. 0.139 in ≈ 3.53 mm.

An undercut used for securing the washer plate (to lift with the spindle) shall have a diameter of not less than 80 % of the minimum diameter of the washer plate stem given in Table 5, line 12.

19 Bodies and heads

19.1 Minimum thickness of wall. The minimum thickness of wall left after threading for any screwed parts of a valve not otherwise specified shall be not less than the thicknesses given in Table 3, line 4.

19.2 Thickness of screwed ends. Except where the dimensions specified provide otherwise, the thickness of metal between the minor diameter of the thread and the bore of externally screwed ends shall be within the limits given in Table 3, line 9, and the thickness of metal on hexagon ends between the major diameter of the internal thread and the faces of the hexagon shall be not less than those given in Table 3, line 4.

20 Method of attaching crutch or square head

Normally, a crutch or square head shall be fitted on a square spindle; the area of the inscribed square for any diameter of spindle is the smallest area permissible for insertion in the crutch or square head. The crutch or square head may be fitted by the use of any other not less suitable device provided that the minimum area of spindle allowed and the necessary mechanical strength are preserved in the design. All crutches and square heads shall be a close fit on the spindle without shake.

Crutches shall be fixed to the spindle by riveting, a screw or other equally efficient device.

Square heads shall be fixed by a pin or screw (see Figure 4, type 1) fastening onto or through the round portion of the spindle, but not the square, or may be fixed by riveting, a screw or equally efficient device (see Figure 4, type 2).

No crutch or square head shall be screwed onto the spindle.

The external dimensions of the square head shall be as shown in Table 5, lines 21, 22 and 23.

21 Clearance between crutch and stuffing box

When the valve is closed, there shall be sufficient distance between the top of the stuffing box and the underside of the crutch or square head in order that the valve can be repacked without removing either the crutch or square head.

22 Joint washers

Joint washers for use on parallel spigot tail pipes shall be made of materials complying with the requirements of clauses **6** or **7** and Appendix A of BS 3457:1973.

23 Seat washers

All seat washers shall be of vulcanized synthetic rubber complying with the requirements of clause **6** of BS 3457:1973.

24 Glands and gland packings

Glands are illustrated in Figure 3 and shall be as detailed in Table 4. The packing shall be of lubricated graphited asbestos or other equally efficient material. If the packing is not in grommet form, a suitable non-metallic washer shall be fitted in the bottom of the gland or stuffing box.

25 Union connections

Any tail pipe and coupling nut fitted to a valve shall be as detailed in Table 12, and shall be in accordance with the dimensions and tolerances set out in Table 12 for parallel spigot and cone end unions respectively.

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Unions of the cone type shall have the cone end machined or ground to a watertight fit without the use of grommets, washers, plastics material or other jointing.

When the end of a valve is required to be suitable for connecting to copper tube, that part of the end which forms the copper tube connection shall comply with the requirements of BS 864-2, type B. No departures from the requirements of this standard shall be made other than those essential to ensure compliance with the requirements BS 864-2, type B or capillary union only.

When the end of a stopvalve is required for connecting to polyethylene pipe complying with the requirements of BS 1972 and BS 3284, the minimum thicknesses as specified in BS 864-3 shall be adhered to.

26 Hexagonal shoulders

An hexagonal shoulder or other equally effective configuration shall be provided on at least one end of each stopvalve screwed with a pipe thread unless required for union or compression joints.

Hexagonal shoulders or other equally effective configuration shall be provided on the heads of all stopvalves.

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Table 3 — Dimensions of underground stopvalve bodies (see Figure 2)

All dimensions are in millimetres unless otherwise stated.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Line no.	**Ref. on figure**	**Dimension**	**Nominal size of stopvalve**											
			½		¾		1		1¼		1½		2	
			max.	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**
1	*A*	Bore of seating	13.0	12.5	19.3	18.9	25.8	25.2	32.3	31.5	38.6	37.8	51.3	50.4
2	*B*	Diameter of seat spot face		21.9		28.6		37.6		44.4		51.9		68.6
3	*C*	Thickness of metal supporting seat		3.6		3.6		4.8		5.9		5.9		7.1
4	*D*	Thickness of walls not threaded, etc.		2.4		2.4		3.2		4.0		4.0		4.8
5	*E*	Major diameter of body thread (in inches)		0.9531		1.2187		1.5937		1.8594		2.1562		2.8125
6	*F*	Length of internal thread and chamfer on body		12.5		13.5		16.5		18.5		20.5		23.5
7	*G*	Width of metal contact between body and head		2.4		2.4		3.2		4.0		4.0		4.8
8	*P*	Body flange thickness		4.0		4.0		5.0		5.0		5.0		6.0
9	*H*	Thickness of wall ends (minor diameter to bore)	3.4	2.6	3.6	2.6	3.8	3.1	4.8	3.9	4.8	3.9	5.6	4.7
10	*J*	Length of external thread (parallel)		12.0		15.0		19.0		22.0		22.0		25.0
11	*K*	Length of internal thread (parallel)		15.0		19.0		22.0		25.0		25.0		28.0
12	*L*	End flange thickness		3.2		3.6		4.0		4.0		4.7		4.7
13	*M*	Axial length of hexagon		9.0		10.0		11.0		12.0		14.0		16.0
14	*N*	Diameter of end flange		29.0		36.0		46.0		57.0		65.0		82.0

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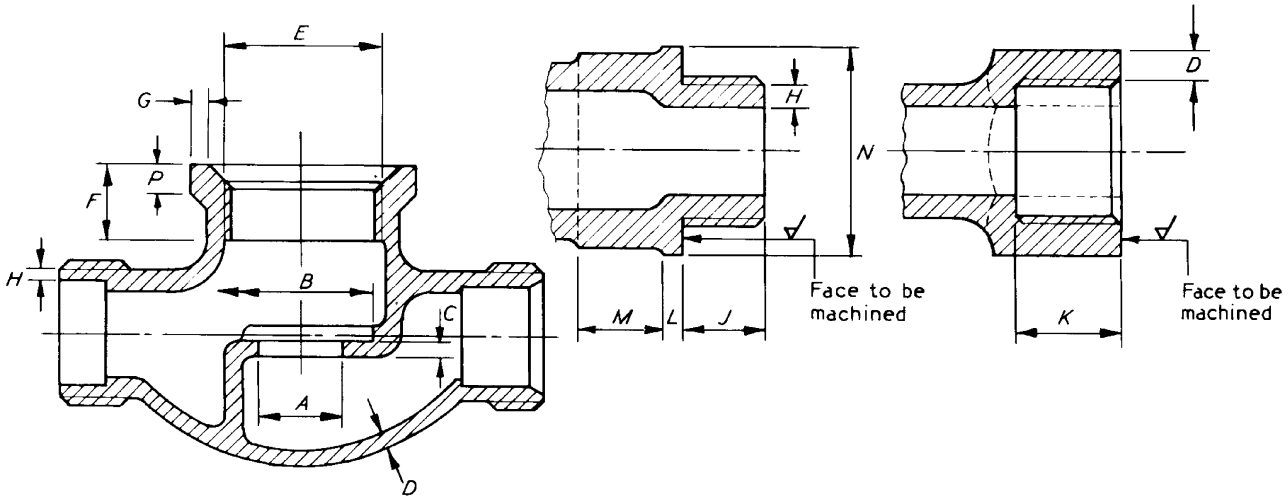

Figure 2 — Dimensions of underground stopvalve bodies (see Table 3)

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Table 4 — Dimensions of heads and glands (see Figure 3)

All dimensions are in millimetres unless otherwise stated.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Line no.	Ref. on figure	Dimension	Nominal size of stopvalve											
			½		¾		1		1¼		1½		2	
			max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
1	*A*	Major diameter of external thread on head (in inches)	0.9531		1.2187		1.5937		1.8594		2.1562		2.8125	
2	*B*	Length of external thread, including plain portion for head seal		11.0		12.0		15.0		17.0		19.0		22.0
3	*C*	Major diameter of internal thread for spindle (in inches)		0.625		0.75		0.875		1.00		1.125		1.25
4	*D*	Length of internal thread for spindle		21.0		26.0		31.0		35.0		42.0		44.0
5	*E*	Axial length of recess	7.0		7.0		8.0		10.0		12.0		15.0	
6	*F*	Major diameter of internal thread for stuffing box (in inches)		0.6875		0.750		1.0625		1.250		1.4375		1.625
7	*G*	Axial length of stuffing box (minimum length of thread = *P*)		11.0		12.0		15.0		17.0		20.0		23.0
8	*H*	Diameter of hole for spindle	11.51	11.22	13.11	12.82	16.36	16.02	17.98	17.63	21.21	20.8	24.46	24.0
9	*J*	Axial length of collar		2.3		2.7		3.1		4.0		4.0		4.7
10	*K*	Thickness of head flange		4.0		4.0		5.0		5.0		5.0		6.0
11	*L*	Axial length of hexagon		9.0		11.0		11.0		13.0		15.0		19.0
12	*M*	Size of hexagon across flats		22.2		28.0		33.3		39.6		44.4		53.9
13	*N*	Major diameter of external thread on gland (in inches)	0.6875		0.750		1.0625		1.250		1.4375		1.645	
14	*O*	Thickness of gland flange		3.0		3.0		4.0		4.0		5.0		5.0
15	*P*	Length of external thread on gland and internal thread in stuffing box		9.0		10.0		13.0		14.0		17.0		19.0

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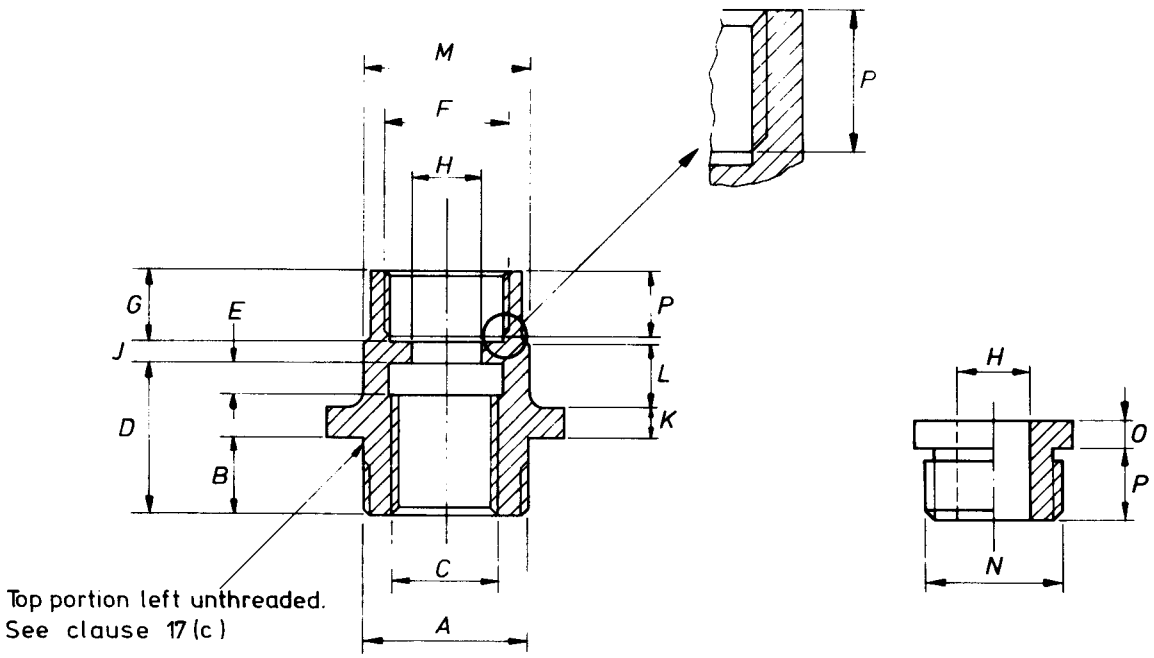

Figure 3 — Dimensions of heads and glands [see Table 4 and clause **17** c)]

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Table 5 — Dimensions of square heads, crutches, spindles, washers and washer plates (see Figure 4 and Figure 5)

All dimensions are in millimetres unless otherwise marked.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Line no.	**Ref. on figure**	**Dimension**	**Nominal size of stopvalve**											
			½		¾		1		1¼		1½		2	
			max.	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**
1	*A*	Length of crutch		60.0		66.0		82.0		95.0		114.0		127.0
2	*B*	Bar stock size for crutches[a]		16.0		18.0		22.0		25.0		29.0		32.0
3	*C*	Size across flats square end of spindle		7.9		8.7		11.1		12.3		14.6		16.6
4	*D*	Length of square end of spindle		6.3		6.3		7.9		9.5		11.1		12.7
5	*E*	Length under crutch of spindle		40.0		46.0		59.0		64.0		75.0		85.0
6	*F*	Distance when closed, underside crutch to top of head		22.0		25.0		31.0		33.0		38.0		44.0
7	*G*	Length of extended thread on spindle		22.0		27.0		33.0		36.0		44.0		46.0
8	*H*	Depth of washer plate stem hole in spindle	18.8	17.2	20.4	18.8	24.4	22.8	29.5	27.1	33.0	30.5	40.7	38.1
9	*J*	Diameter of washer plate stem hole in spindle	5.94	5.74	6.73	6.53	7.55	7.34	8.69	8.18	9.48	8.96	13.97	13.21
10	*K*	Diameter of plain portion of spindle	11.1	10.95	12.7	12.55	15.88	15.7	17.45	17.27	20.62	20.44	23.80	23.60
11	*L*	Major diameter spindle thread (in inches)	0.6233		0.7482		0.8750		1.00		1.125		1.250	
12	*M*	Diameter of washer plate stem[b]	5.69	5.51	6.48	6.30	7.29	7.08	7.93	7.67	8.71	8.46	12.7	12.44
13	*N*	Outside diameter of washer	18.7[c]	18.3	25.4	25.0	33.4	33.0	40.5	40.0	47.6	47.0	63.6	63.0
14	*O*	Length of washer plate stem	17.0	15.0	18.0	16.0	22.0	20.0	27.0	24.0	30.0	27.0	38.0	35.0
15	*P*	Thickness of washer plate		4.0		5.0		5.0		6.0		6.0		7.0
16	*Q*	Thickness of washer (when new)	4.4	4.0	4.4	4.0	5.4	5.0	5.4	5.0	6.4	6.0	6.4	6.0
17	*R*	Size of stud and nut	2 BA		O BA		O BA		$^{5}/_{16}$ in. BSF		$^{5}/_{16}$ in. BSF		$^{3}/_{6}$ in. BSF	

[a] The dimensions given in this line are boss sizes, which may be reduced by up to 0.4 mm in polishing and finishing.

[b] See also clause **18**.

[c] It is permissible to use **9.2** until December 1985.

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Table 5 — Dimensions of square heads, crutches, spindles, washers and washer plates (see Figure 4 and Figure 5)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Line no.	**Ref. on figure**	**Dimension**	**Nominal size of stopvalve**											
			½		¾		1		1¼		1½		2	
			max.	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**
18	*S*	Depth of counter bore	2.2	2.0	2.2	2.0	2.7	2.5	2.7	2.5	3.2	3.0	3.2	3.0
19	*T*	Inside diameter of washer plate	19.1	18.8	25.8	25.5	33.8	33.5	41.0	40.6	48.3	47.8	64.3	63.8
20	*U*	Outside diameter of washer plate	21.2	20.9	28.3	28.0	36.4	36.1	43.6	43.3	51.5	51.0	67.8	67.3
21	*V*	Length of taper of iron square head		19.0		19.0		19.0		32.0		32.0		32.0
22	*W*	Size across flats of iron square head (top)	15.8		15.8		15.8		25.4		25.4		25.4	
23	*X*	Size across flats of iron square head (bottom)	19.0		19.0		19.0		28.6		28.6		28.6	
24	*Y*	Diameter of hole in washer	5.0	4.7	6.4	6.0	6.4	6.0	8.5	8.0	8.5	8.0	10.0	9.5

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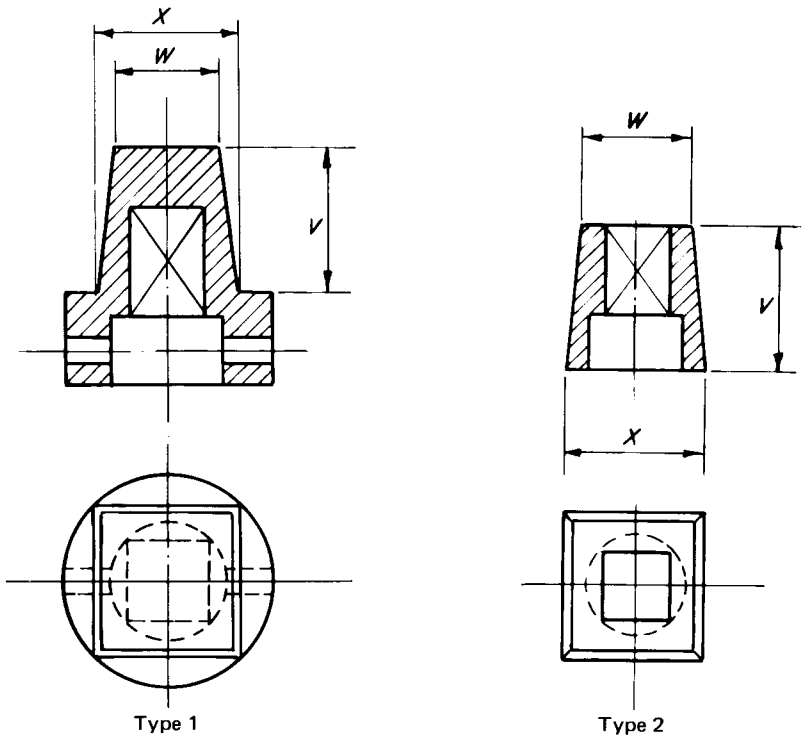

Figure 4 — Square heads (see Table 5)

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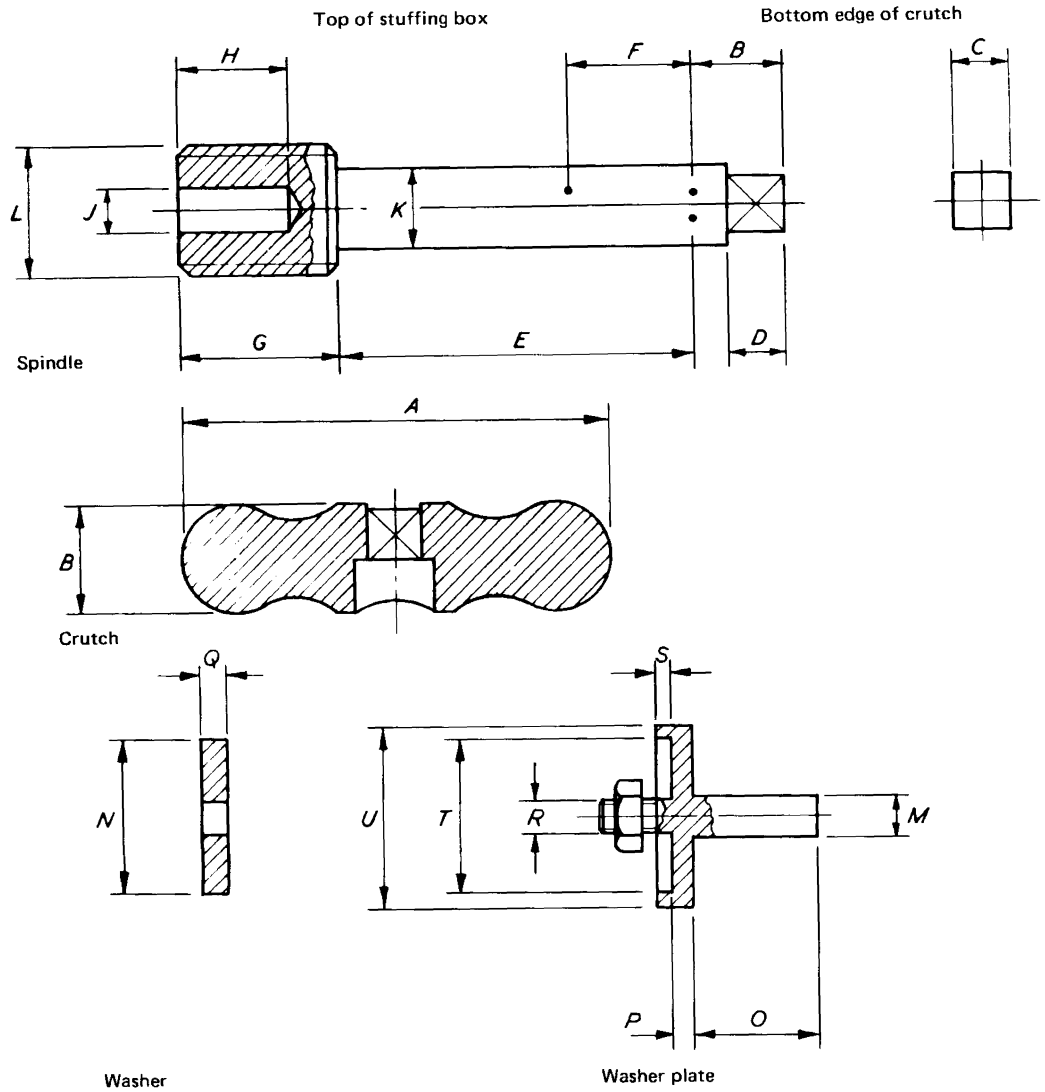

Figure 5 — Dimensions of crutches, spindles, washers and washer plates (see Table 5)

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Table 6 — BS Whitworth threads (external) on spindles for engagement with head threads (internal)

Limits and tolerances: free class

1	2	3	4	5	6	7	8	9	10	11	12
Line no.	Nominal size of valve	Number of threads per inch	Major diameter			Effective diameter			Minor diameter		
			max.	tolerance	min.	max.	tolerance	min.	max.	tolerance	min.
			in.	in.	in.	in.	in.	in.	in.	in.	in
1	½	11	0.6233	0.0114	0.6119	0.5651	0.0084	0.5567	0.5069	0.0144	0.4925
2	¾	10	0.7482	0.0122	0.7360	0.6842	0.0090	0.6752	0.6202	0.0153	0.6049
3	1	9	0.8750	0.0129	0.8621	0.8039	0.0096	0.7943	0.7328	0.0163	0.7165
4	1¼	8	1.0000	0.0137	0.9863	0.9200	0.0102	0.9098	0.8400	0.0173	0.8227
5	1½	7	1.1250	0.0145	1.1105	1.0335	0.0107	1.0228	0.9420	0.0183	0.9237
6	2	7	1.2500	0.0149	1.2351	1.1585	0.0111	1.1474	1.0670	0.0187	1.0483

NOTE The sizes given above are BS Whitworth "bolt" sizes (see Table 1 of BS 84:1956); the limits and tolerances for the various sizes correspond to those given in Table 6 of BS 84:1956.

Table 7 — BS Whitworth threads (internal) on heads for engagement with spindle threads (external)

Limits and tolerances: normal class

1	2	3	4	5	6	7	8	9	10
Line no.	Nominal size of valve	Number of threads per inch	Major diameter (min.)	Effective diameter			Minor diameter		
				max.	tolerance	min.	max.	tolerance	min.
			in.	in.	in.	in.	in.	in.	in.
1	½	11	0.6250	0.5752	0.0084	0.5668	0.5338	0.0252	0.5086
2	¾	10	0.7500	0.6950	0.0090	0.6860	0.6490	0.0270	0.6220
3	1	9	0.8750	0.8135	0.0096	0.8039	0.7620	0.0292	0.7328
4	1¼	8	1.0000	0.9302	0.0102	0.9200	0.8720	0.0320	0.8400
5	1½	7	1.1250	1.0442	0.0107	1.0335	0.9776	0.0356	0.9420
6	2	7	1.2500	1.1696	0.0111	1.1585	1.1026	0.0356	1.0670

NOTE The sizes given above are BS Whitworth "nut" sizes, (see Table 1 of BS 84:1956); the limits and tolerances for the various sizes correspond to those given in Table 5 of BS 84:1956.

Table 8 — BS Whitworth form screw threads (external) on heads for engagement with body threads (internal)

Limits and tolerances: medium class

1	2	3	4	5	6	7	8	9	10	11	12
Line no.	Nominal size of valve	Number of threads per inch	Major diameter			Effective diameter			Minor diameter		
			max.	tolerance	min.	max.	tolerance	min.	max.	tolerance	min.
			in.	in.	in.	in.	in.	in.	in.	in.	in.
1	½	18	0.9531	0.0081	0.9450	0.9175	0.0056	0.9119	0.8819	0.0106	0.8713
2	¾	18	1.2187	0.0081	1.2106	1.1831	0.0056	1.1775	1.1475	0.0106	1.1369
3	1	14	1.5937	0.0095	1.5842	1.5480	0.0066	1.5414	1.5023	0.0124	1.4899
4	1¼	14	1.8594	0.0095	1.8499	1.8137	0.0066	1.8071	1.7680	0.0124	1.7556
5	1½	14	2.1562	0.0099	2.1463	2.1105	0.0070	2.1035	2.0648	0.0128	2.0520
6	2	14	2.8125	0.0099	2.8026	2.7668	0.0070	2.7598	2.7211	0.0128	2.7083

NOTE The tolerances given above are based on values given in BS 84:1956.

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Table 9 — BS Whitworth form screw threads (internal) on bodies for engagement with head threads (external)

Limits and tolerances: medium class

1	2	3	4	5	6	7	8	9	10
Line no.	Nominal size of valve	Number of threads per inch	Major diameter (min.)	Effective diameter			Minor diameter		
				max.	tolerance	min.	max.	tolerance	min.
1	½	18	in. 0.9531	in. 0.9231	in. 0.0056	in. 0.9175	in. 0.9014	in. 0.0195	in. 0.8819
2	¾	18	1.2187	1.1887	0.0056	1.1831	1.1670	0.0195	1.1475
3	1	14	1.5937	1.5546	0.0066	1.5480	1.5260	0.0237	1.5023
4	1½	14	1.8594	1.8203	0.0066	1.8137	1.7917	0.0237	1.7680
5	1½	14	2.1562	2.1175	0.0070	2.1105	2.0885	0.0237	2.0648
6	2	14	2.8125	2.7738	0.0070	2.7668	2.7448	0.0237	2.7211
NOTE The tolerances given above are based on values given in BS 84:1956.									

Table 10 — BS Whitworth form screw threads (external) on glands for engagement with stuffing box threads (internal)

Limits and tolerances: medium class

1	2	3	4	5	6	7	8	9	10	11	12
Line no.	Nominal size of valve	Number of threads per inch	Major diameter			Effective diameter			Minor diameter		
			max.	tolerance	min.	max.	tolerance	min.	max.	tolerance	min.
1	½	18	in. 0.6875	in. 0.0078	in. 0.6797	in. 0.6519	in. 0.0053	in. 0.6466	in. 0.6163	in. 0.0103	in. 0.606
2	¾	18	0.7500	0.0078	0.7422	0.7144	0.0053	0.7091	0.6788	0.0103	0.668
3	1	18	1.0625	0.0081	1.0544	1.0269	0.0056	1.0213	0.9913	0.0106	0.980
4	1¼	14	1.2500	0.0091	1.2409	1.2043	0.0062	1.1981	1.1586	0.0120	1.146
5	1½	14	1.4375	0.0095	1.4280	1.3918	0.0066	1.3852	1.3461	0.0124	1.333
6	2	14	1.6250	0.0095	1.6155	1.5793	0.0066	1.5727	1.5336	0.0124	1.521
NOTE The tolerances given above are based on values given in BS 84:1956.											

Table 11 — Whitworth form screw threads (internal) in stuffing box for engagement with gland threads (external)

Limits and tolerances: medium class

1	2	3	4	5	6	7	8	9	10
Line no.	Nominal size of valve	Number of threads per inch	Major diameter (min.)	Effective diameter			Minor diameter		
				max.	tolerance	min.	max.	tolerance	min.
1	½	18	in. 0.6875	in. 0.6572	in. 0.0053	in. 0.6519	in. 0.6358	in. 0.0195	in. 0.6163
2	¾	18	0.7500	0.7197	0.0053	0.7144	0.6983	0.0195	0.6788
3	1	18	1.0625	0.0325	0.0056	1.0269	1.0108	0.0195	0.9913
4	1¼	14	1.2500	1.2105	0.0062	1.2043	1.1823	0.0237	1.1586
5	1½	14	1.4375	1.3984	0.0066	1.3918	1.3698	0.0237	1.3461
6	2	14	1.6250	1.5859	0.0066	1.5793	1.5573	0.0237	1.5336
NOTE The tolerances given above are based on values given in BS 84:1956.									

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Table 12 — Parallel spigot and cone end tail pipes for underground stopvalves (see Figure 6)

All dimensions are in millimetres unless otherwise stated.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Size of screwing for body and nut, pipe thread to BS 2779		G ¾		G 1		G 1¼		G 1½		G 2		G 2½	
	Nominal size of underground stopvalve		½		¾		1		1¼		1½		2	
Line no.	**Ref.**	**Dimension**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**
		Parallel spigot tail pipes[a]												
1	A_a[b]	Parallel spigot diameter	17.50		22.20		29.40		37.30		44.50		54.00	
2	A_b	Parallel bore for spigot in end of valve, diameter	17.90	17.60	22.60	22.30	30.00	29.50	37.90	37.40	45.00	44.50	54.60	54.10
3	A_c	Parallel spigot axial length	6.40	4.70	6.40	4.70	8.00	6.30	9.60	7.90	9.60	7.90	9.60	7.90
4	A_d	Parallel bore in end of valve, axial length	7.20	6.40	7.20	6.40	8.80	8.00	10.40	9.60	10.40	9.60	10.40	9.60
5	B_a	Collar diameter	24.00	23.50	30.10	29.30	38.80	37.80	44.70	43.50	56.50	55.30	72.00	70.80
6	B_b	Collar axial length		2.40		3.00		3.30		3.80		4.0		4.30
7	C_a[c]	Outside diameter of pipe and shoulder	20.40	17.50	25.90	23.90	33.50	31.80	40.20	39.70	50.20	46.10	65.30	60.40
8	C_b	Length of optional shoulder		3.90		3.90		4.70		5.50		5.50		5.80
9	D_a	Pipe bore		12.70		19.10		25.40		31.70		38.10		50.80
10	D_b	Pipe length from under collar to end		53.00		57.00		60.00		63.00		69.00		73.00
11	E_a	Thickness of wall		2.40		2.40		3.20		4.00		4.00		4.80
		Cone end tail pipes 9° taper 18° included angle												
12	F_a	Cone large end diameter	20.40		25.90		33.50		40.20		50.20		65.30	
13	F_b	Cone axial length		7.90		7.90		9.50		9.50		12.70		12.70
14	F_c	Cone (cap) face of collar to face of internal end	3.20		3.20		4.00		4.00		4.80		4.80	
15	F_d	Conical bore diameter of mouth in end of valve		19.30		24.80		32.20		38.90		48.70		63.80
		Coupling nuts												
16	G_a	Coupling nut, bore	21.00	20.70	26.80	26.40	34.70	34.20	41.40	40.90	51.60	51.10	66.80	66.30
17	G_b	Coupling nut, flange thickness		3.10		3.40		3.90		4.70		4.70		5.00
18	G_c	Coupling nut axial length		16.60		17.40		22.20		23.80		23.80		25.40
19	G_d	Coupling nut, size of flats on hexagon		30.50		37.30		47.00		53.80		66.70		82.20
20	H_a	Length of thread on end of valve		9.50		9.50		12.70		12.70		12.70		12.70
21		Variation on thickness of pipe due to eccentricity	0.25		0.30		0.40		0.50		0.50		0.50	

[a] For materials for parallel spigot tail pipe joint washers see clause **22**.

[b] When so desired, in order to provide a wider joint washer, the minimum wall thickness of the spigot may be 1.50 mm.

[c] The large tolerance on the outside diameter of the pipe may be used to form a shoulder if preferred.

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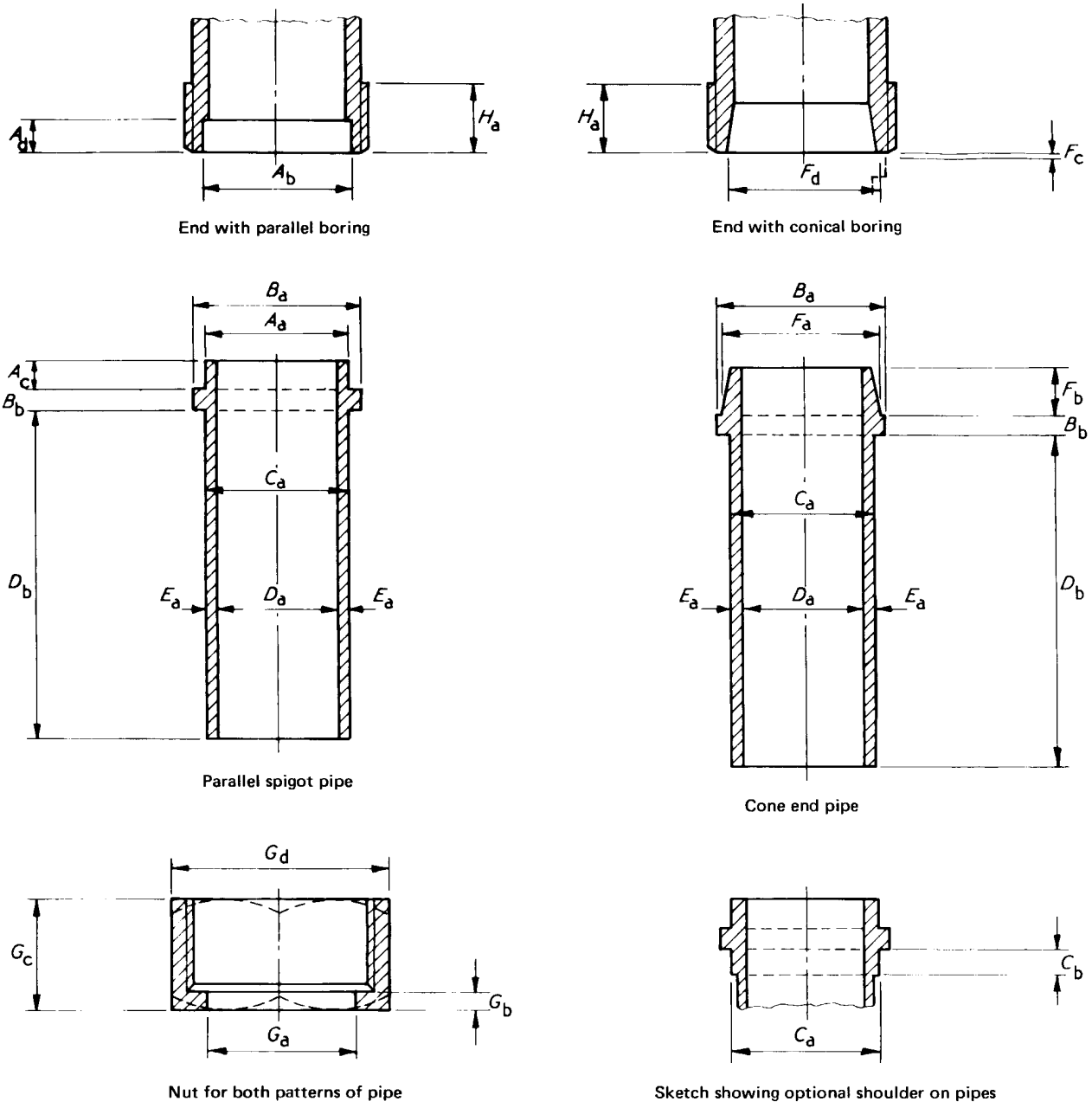

Figure 6 — Dimensions of ends, tail pipes and nuts (see Table 12)

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Publications referred to

BS 21, *Pipe threads for tubes and fittings where pressure-tight joints are made on the threads.*
BS 57, *B.A. screws, bolts and nuts.*
BS 61, *Threads for light gauge copper tubes and fittings.*
BS 84, *Parallel screw threads of Whitworth form.*
BS 864, *Capillary and compression tube fittings of copper and copper alloy.*
BS 864-2, *Metric units.*
BS 864-3, *Compression fittings for polyethylene pipes.*
BS 1010, *Draw-off taps and stopvalves for water services (screwdown pattern).*
BS 1010-1, *Imperial units.*
BS 1010-2, *Draw-off taps and above-ground stopvalves.*
BS 1083, *Precision hexagon bolts, screws and nuts (B.S.W. and B.S.F. threads).*
BS 1400, *Copper alloy ingots and copper and copper alloy castings.*
BS 1452, *Grey iron castings.*
BS 1806, *Dimensions of toroidal sealing rings ("O" seals and their housings).*
BS 1972, *Polythene pipe (Type 32) for cold water services.*
BS 2494, *Materials for elastomeric joint rings for pipework and pipelines.*
BS 2494-1, *Rubber joint rings for gas mains and water mains.*
BS 2591, *Glossary for valves and valve parts (for fluids).*
BS 2591-1, *Screw-down stop, check and gate valves.*
BS 2779, *Pipe threads where pressure-tight joints are not made on the threads.*
BS 2872, *Copper and copper alloys. Forging stock and forgings.*
BS 2874, *Copper and copper alloys. Rods and sections (other than forging stock).*
BS 3284, *Polythene pipe (Type 50) for cold water services.*
BS 3457, *Materials for water tap and stopvalve seat washers.*
BS 3885, *Tolerances for hot brass stampings.*
BS 4518, *Metric dimensions of toroidal sealing rings ("O"-rings and their housings).*

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