BRITISH STANDARD

BS 1414: 1975

Incorporating Amendment Nos. 1 and 2

Specification for

Steel wedge gate valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries

UDC 621.646.5:669.14:[622.313 + 662.753 + 665.6]

Co-operating organizations

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

British Gas Corporation
British Mechanical Engineering Confederation
British Rubber Manufacturers' Association Ltd.
British Steel Industry*
Council of British Manufacturers of Petroleum Equipment*
Department of Energy (Oil)
Oil Companies Materials Association*
Process Plant Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Association of Hydraulic Equipment Manufacturers
British Chemical Engineering Contractors' Association
British Industrial Measuring and Control Apparatus Manufacturers' Association
British Plastics Federation
British Ship Research Association
British Valve Manufacturers' Association
Engineering Equipment Users' Association
Steel Castings Association

This British Standard, having been approved by the Petroleum Equipment Industry Standards Committee, was published under the authority of the Executive Board on 30 April 1975

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The following BSI references relate to the work on this standard:
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Amendments issued since publication

Amd. No.	Date of issue	Comments
5837	June 1988	
6562	August 1990	Indicated by a sideline in the margin

Contents

Foreword

This British Standard is one of a series for valves prepared under the authority of the Petroleum Industry Standards Committee. It was first published in 1949 when the materials referred to were described by reference to ASTM specifications. It is a metricated revision except that class designations and body to bonnet bolting sizes have not been converted into metric units. Imperial units are also given for some dimensions in order to comply with established international petroleum practice. The previous sections dealing with face-to-face and end-to-end dimensions, inspection and tests have now been omitted as these subjects have their own separate standards:

BS 2080 "*Face-to-face, centre-to-face, end-to-end and centre-to-end dimensions of flanged and butt-welding end steel valves for the petroleum, petrochemical and allied industries*".

BS 6755 *"Testing of valves"* Part 1 *"Specification for production pressure testing requirements.*

NOTE Requirements for final inspection and supplementary inspection at all stages of manufacture, previously specified in BS 5416-1:1974 (now withdrawn) should be stated by the purchaser in his enquiry or order.

The end flanges for valves of 600 mm (24 in) size and below are required to be in accordance with BS 1560 *"Steel pipe flanges and flanged fittings (nominal sizes $\frac{1}{2}$ in to 24 in) for the petroleum industry"* — Part 2 *"Metric dimensions"* (corresponding to ANSI B 16.5) and butt-welding ends are generally in accordance with ANSI B 16.25. For valves larger than 600 mm (24 in) size, end flanges are required to be in accordance with BS 3293 "*Carbon steel pipe flanges (over 24 in nominal size) for the petroleum industry*" or API Standard 605.

NOTE User requirements for valves generally in accordance with this standard but suitable for use in piping systems with flanges in accordance with BS 4504 "*Flanges and bolting for pipes, valves and fittings. Metric series*" are dealt with in Appendix B.

It is intended that valves complying with the requirements of this standard should be interchangeable as units with those of similar type specified in API 600. The present revision of BS 1414 is generally in accordance with the seventh edition of API 600 (November 1973) except that it has been extended to cover carbon steel valves in sizes up to 1 050 mm (42 in) in Class 150 and Class 300.

Acknowledgment is made to the American Petroleum Institute and to the American National Standards Institute for data used.

The titles of the American standards referred to in this standard and the foreword are as follows:

ANSI	
B 16.5	*Steel pipe flanges and flanged fittings* (including supplements)
B 16.25	*Buttwelding ends*
API	
Std 5b	*Specification for threading, gaging, and thread inspection of casing, tubing and line pipe threads*
Std 600	*Steel gate valves* (flanged or butt-welding ends)
Std 605	*Large-diameter carbon steel flanges*
ASTM	
A 182	*Forged or rolled alloy-steel pipe flanges, forged fittings and valves and parts for high temperature service*
A 276	*Stainless and heat resisting steel bars and shapes*
A 351	*Ferritic and austenitic steel castings for high temperature service*
B 124	*Copper and copper alloy forging rod, bar and shapes*
B 138	*Manganese bronze rod, bar and shapes*
B 148	*Aluminium bronze sand castings*
B 150	*Aluminium bronze rod, bar and shapes*
B 584	*Copper alloy sand castings for general applications*

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 20, 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 British Standard specifies requirements for cast or forged carbon and alloy steel outside screw and yoke, solid wedge (plain or flexible) rising stem gate valves, with or without soft seals, with flanged or butt-welding ends, in nominal sizes within the range of 25 mm to 600 mm (1 in to 24 in) and Class 150 to Class 2 500. It also covers carbon steel valves in nominal sizes 650 mm to 1 050 mm (26 in to 42 in) in Class 150 and Class 300 only. This standard can also be used as a general guide where valves of material composition outside the scope of section three of this standard are required as, for example, for use in highly corrosive services or environments or for low temperatures (see clause **36**).

2 References

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

3 Nomenclature

For the purposes of this British Standard the nomenclature for valve parts shall be as shown in Figure 1 which is also illustrative of some acceptable designs.

4 Pressure classification

This standard applies to valves of the following pressure class designations:

Class 150, Class 300, Class 400, Class 600, Class 900, Class 1 500 and Class 2 500.

The numerals in these class designations represent the primary service pressure ratings of the valves in pounds-force per square inch.

5 Pressure/temperature ratings

The pressure/temperature ratings applicable to valves specified in this standard shall be in accordance with Tables PE-1 to PE-12 of Appendix A of BS 1560-2:1970 for the particular shell material specified. There is, however, a temperature restriction on soft seals and on certain trim materials (see **18.3** and **29.5**).

Where valves in accordance with this standard are to be used at service temperatures below − 30 °C, reference should be made to BS 3351. Service temperature refers to the temperature of the fluid in the line at the valve.

6 Nominal sizes

This standard covers valves of the following nominal sizes:

mm	(in)	mm	(in)	mm	(in)
25	(1)	150	(6)	500	(20)
32[a]	($1\frac{1}{4}$)[a]	200	(8)	600	(24)
40	($1\frac{1}{2}$)	250	(10)	650	(26)
50	(2)	300	(12)	700	(28)
65[a]	($2\frac{1}{2}$)[a]	350	(14)	750	(30)
80	(3)	400	(16)	900	(36)
100	(4)	450	(18)	1 050	(42)

[a] These sizes have been retained only for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 end flanges should be avoided.

For each valve class the applicable sizes are shown in Appendix A.

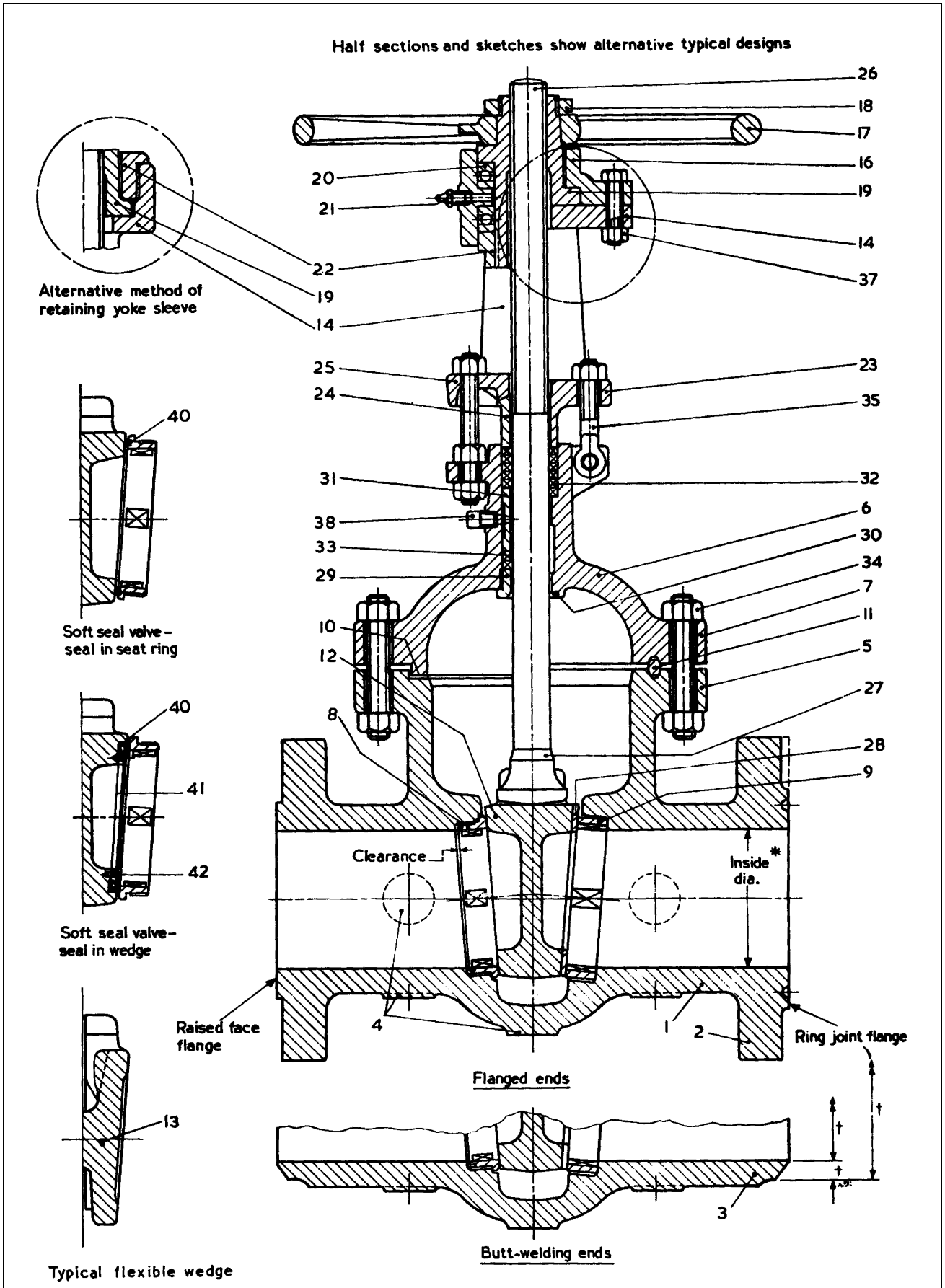
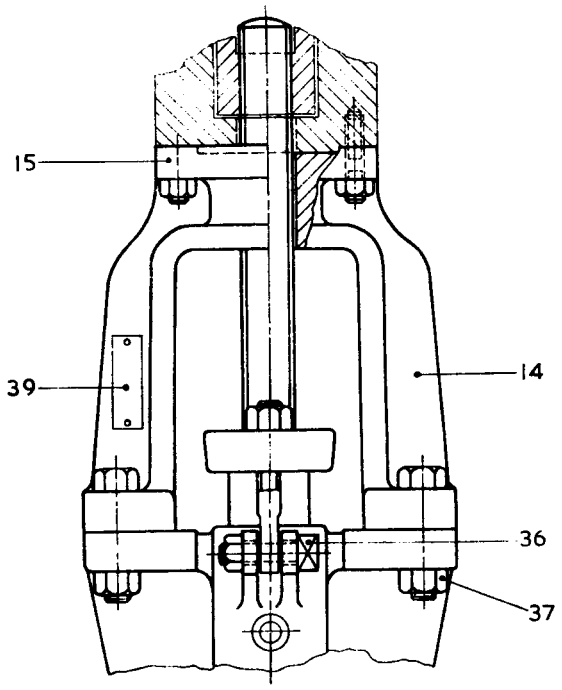


Figure 1 — Solid wedge gate valve, outside screw and yoke rising stem, cast or forged steel



View showing yoke with actuator mounting flange

Reference	Name of part	Material reference clause
1	Body	**19**
2	End flange	—
3	Butt-welding end	—
4	Body bosses	—
5	Body/bonnet flange	—
6	Bonnet	**19**
7	Bonnet flange	—
8	Shoulder seated ring	**20** and **29**
9	Bottom seated ring	**20** and **29**
10	Bonnet gasket	**21**
11	Ring joint	**21**
12	Plain wedge	**22** and **29**
13	Flexible wedge	**22** and **29**
14	Yoke	**23**
15	Actuator mounting flange	—
16	Yoke cap	—
17	Handwheel	**24**
18	Handwheel nut	**25**
19	Yoke sleeve	**26**
20	Yoke sleeve rolling bearing	—
21	Bearing lubricator fitting	—

Reference	Name of part	Material reference clause
22	Yoke sleeve retaining nut	**27**
23	One piece gland	**28**
24	Gland follower	**28**
25	Gland flange	**28**
26	Stem	**29**
27	Stem seat	—
28	Wedge facing ring	**29**
29	Back-seat bushing	**29**
30	Back seat	**29**
31	Lantern ring	**30**
32	Stem packing	**31**
33	Wiper rings	**31**
34	Bonnet stud-bolts and nuts	**32**
35	Gland bolt and nut	**32**
36	Gland lug bolt and nut	**32**
37	Yoke bolting	**32**
38	Stuffing box plug	**33**
39	Nameplate	**34**
40	Soft seal ring	**35**
41	Soft seal retaining ring	**35**
42	Soft seal retaining ring screws	**35**

NOTE These sketches are composite for the purpose of showing some typical variations in individual details and part names. A product utilising any combination of these details (except when such combination may be specifically prohibited in the text) or similar construction will be acceptable provided it complies with this standard in all other respects.

* See Appendix A.

† See Figure 2.

Figure 1 — Solid wedge gate valve, outside screw and yoke rising stem, cast or forged steel

7 Information to be supplied by the purchaser

Certain clauses of this standard permit alternatives and the purchaser may require features which depart from the requirements of this standard. The purchaser should state in the enquiry and order the following (the items marked with an asterisk are mandatory).

a) *Class and nominal size (see clauses **4** and **6** and **B.7**).

b) *If soft seals are required and, if so, whether these are required to be in the wedge seats or body seats (see clauses **5** and **18**).

c) *Whether flanged or butt-welding ends are required.

1) If flanged ends are required, whether welded-on flanges are acceptable (see **8.5**); the type of facing (see **8.6**); for sizes above 600 mm (24 in), whether flanges are to be in accordance with BS 3293 or API Std 605.

2) If butt-welding ends are required, the pipe schedule number or wall thickness and outside diameter [see **8.8** b)].

d) If allowance is to be made for the passage of a pipe scraper [see **8.8** c)].

e) If shell tappings are required and, if so, the location and the type of thread if other than API Std 5B (see **8.9** and **9.8**).

f) If a particular form of wedge is required (see **10.2**).

g) If the yoke is to be fitted with a flange for actuator or gearbox mounting (see clause **11**).

h) Details of type of operation required if other than direct-handwheel operated (see clauses **12** and **16**).

i) If a lantern ring is to be provided for Class 300 to Class 2 500 valves (see **14.4**).

j) If a bypass is required, give the full specification of the bypass valve, piping and connections (see clause **17**).

k) *The shell material (see clause **19**).

l) If a special bonnet gasket is required (see clause **21**).

m) *The nominal trim material symbol (see **29.2**).

n) If any special stem packing is required, or specify packing design temperature if above 400 °C (see clause **31**).

o) Material(s) for bonnet, gland, and yoke bolting if required for operation at process design temperatures below − 30 °C or above 480 °C, or for other special operating conditions (see clause **32**).

p) Material requirements for valves in highly corrosive services or environment, or for low temperature service (see clause **36**).

q) Test and inspection requirements in accordance with BS 5146.

r) Requirements for tropical or special packaging (see clause **46**).

Section 2. Design

8 Body

8.1 For the body the design criteria specified in **8.2** to **8.11** shall be observed.

8.2 The body shall be designed to minimize pressure loss as well as corrosive and erosive effects. The body end ports shall be circular.

8.3 The wall thickness of the body shall conform to the shell thickness given in Appendix A. Drilling of, or pinning to, the wall of a pressure-containing part, e.g. for nameplate fixing, is not permissible where it would reduce the effective thickness below the minimum permitted value.

8.4 Face-to-face dimensions for raised face flanged end valves and end-to-end dimensions for butt-welding end and ring joint flanged end valves shall conform to the dimensions specified in BS 2080.

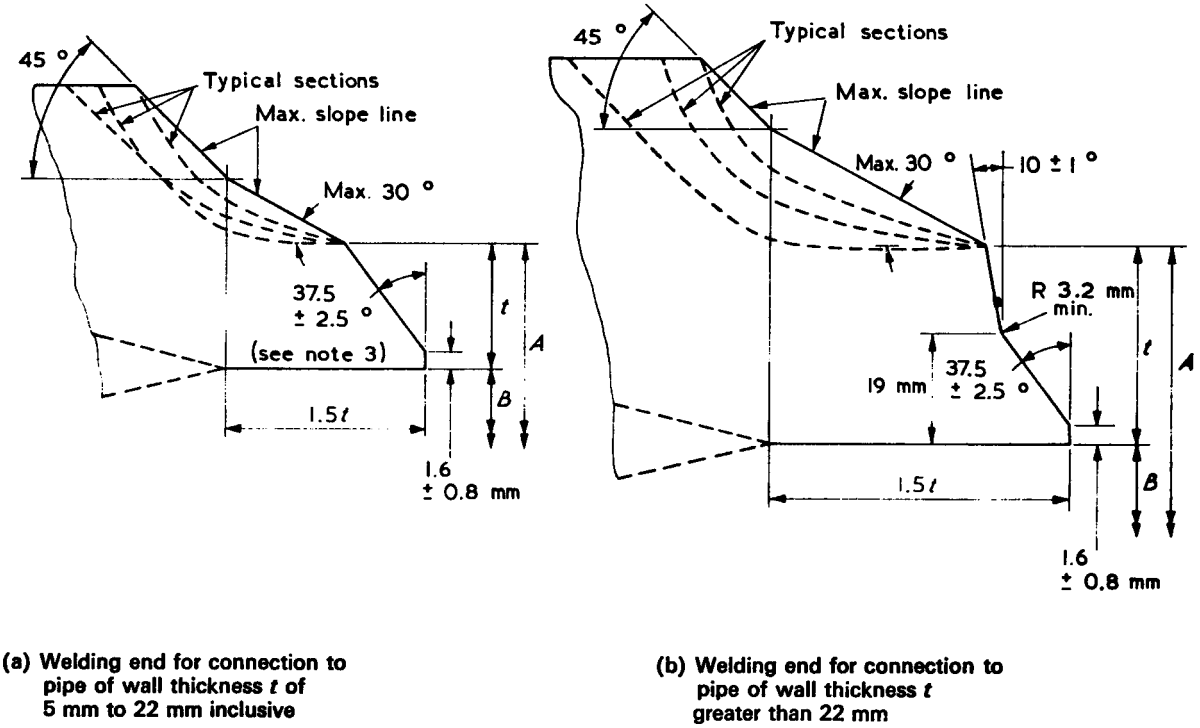
8.5 End flanges shall be cast or forged integral with the body except that flanges may be attached by welding if so specified in the order. The welds of end flanges attached by butt-welding shall comply with the requirements of BS 3351 and shall have any necessary heat treatment as required by BS 3351 to ensure that they are suitable for service temperatures down to − 30 °C. Flange attachment by other welding processes shall be the subject of agreement between the manufacturer and the purchaser.

8.6 End flanges shall comply with the requirements of BS 1560-2 for valves up to and including 600 mm (24 in) nominal size and BS 3293 or API Std 605 (as specified by the purchaser) for valves over 600 mm (24 in) nominal size. End flange facings shall be one of the types shown in Figures 1 and 2 of BS 2080. The purchaser shall specify the type of facing required.

Valves generally in accordance with this standard but suitable for use in piping systems with BS 4504 flanges shall comply with the requirements of Appendix B.

8.7 Butt-welding ends shall comply with the details shown in Figure 2.

NOTE When welding butt-welding end valves into piping systems the welds and any necessary heat treatment shall comply with the requirements of BS 3351.



(a) Welding end for connection to pipe of wall thickness *t* of 5 mm to 22 mm inclusive

(b) Welding end for connection to pipe of wall thickness *t* greater than 22 mm

A = **nominal outside diameter of welding end (see table below)**
B = **nominal inside diameter of pipe (for tolerance on *B*, see table below)**
t = **nominal wall thickness of pipe.**

NOTE 1 The inside and outside surfaces of valve welding ends shall be machine finished overall. Welding-end bores shall be machined parallel for a distance of 1.5*t* and then run out as shown in the figures without abrupt change of section. The outsides of welding ends may be run out in any manner indicated in the figures, provided that sharp angles and abrupt changes of slopes are avoided.

NOTE 2 For nominal outside diameters and wall thicknesses of standard steel pipes see BS 1600-2.

NOTE 3 For valves required to connect with pipe of less than 4.8 mm wall thickness the angle 37.5 ± 2.5° shall not apply and welding ends shall be finished to a slight chamfer or be square, at the option of the manufacturer.

NOTE 4 Regardless of tolerances specified for dimensions *A* and *B*, the thickness of the welding end shall never be less than 87.5 % of the nominal thickness of the pipe.

NOTE 5 For end-to-end dimensions of butt-welding end valves see BS 2080.

Value nominal size	mm	25	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	650	700	750	900	1 050
	(in)	(1)	(1¼)	(1½)	(2)	(2½)	(3)	(4)	(6)	(8)	(10)	(12)	(14)	(16)	(18)	(20)	(24)	(26)	(28)	(30)	(36)	(42)
A	(mm)	35	44	50	62	75[a]	91	117	172	223	278	329	362	413	464	516	619	670	722	774	928	1 083
Tolerance on *A*	(mm)	+0 −0.8																				
Tolerance on *B*	(mm)	± 0.8										± 1.6				+3.2 −1.6						

[a] *A* shall be 78 mm when used with BS 3600 steel pipe.

Figure 2 — Butt-welding ends

8.8 For flanged valves the minimum inside diameter of the body end port shall be as specified in Appendix A.

For butt-welding end valves the minimum inside diameter of the body end port shall comply with the details given in Figure 2. Pipe schedule number or pipe wall thickness and outside diameter of the pipe shall be specified by the purchaser.

If it is required to pass a pipe scraper through the valve, this shall be specified by the purchaser.

8.9 Valves of nominal sizes 80 mm (3 in) and above shall have provision for tappings at the seven positions A to G shown in Figure 3. When the metal thickness of the body is insufficient to provide the effective length of the thread for body tapping, or the body presents an uneven surface, bosses shall be provided.

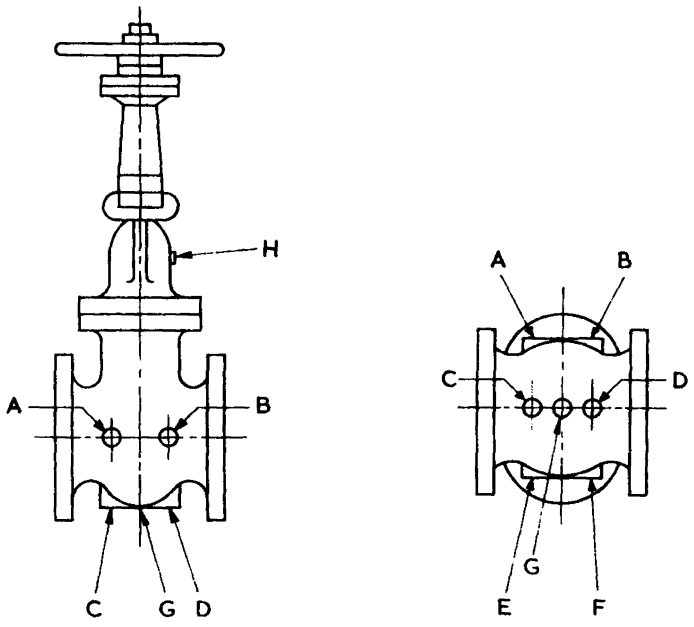
Provision should be made for the body tappings as follows:

Nominal size	Pipe tapping size	Minimum diameter of boss
mm	in	mm
50 to 100	$\frac{1}{2}$	38
150 and 200	$\frac{3}{4}$	44
250 and 300	1	54
350 and larger	$1\frac{1}{2}$	70

Holes shall not be drilled or tapped unless specified in the order, which should then state the thread required (if other than API Std 5B) and the location (see Figure 3). Tapped holes shall be provided with plugs.

On valves of nominal sizes below 80 mm (3 in), provision for tapping shall be as specified by the purchaser and shall comply with Figure 3 as regards location.

Where a bypass is to be provided see clause **17**.



Third angle projection.

NOTE For valves below 80 mm the bonnet tapping may be positioned to suit the manufacturer.

Figure 3 — Location of tappings

8.10 Separate seat rings in the body shall be employed except as indicated in a) and b) of this subclause.

a) Austenitic steel valves, in which case these may have integral seats.

b) Austenitic or hard-facing (body) seat materials which may be deposited directly on the valve body and the minimum finished thickness of the deposit shall then be 1.6 mm. Direct deposition of 13 % chromium seat material on to the body is not permissible.

Separate seat rings may have directly deposited seating material in accordance with any of the specifications indicated in Table 2, in which case the minimum thickness of the deposit shall be 1.6 mm.

Seat rings may be shoulder-seated or bottom-seated at the option of the manufacturer and may be screwed in, rolled in or welded in unless one particular method is specified by the purchaser. Threaded seat rings shall be provided with lugs or slots to facilitate removal. Shoulder-seated rings shall be designed so that any clearance between the back of the ring and the bottom of the ring recess shall be not greater than 1.6 mm for sizes 300 mm (12 in) and smaller, and 3.2 mm for sizes 350 mm (14 in) and larger (see Figure 1). Tack welding may be employed to prevent loosening (see BS 3351). The faces of the rings shall be smooth finished with the sharp corners at the inner and outer edges removed to prevent scoring of the wedge faces.

The use of a sealing medium on the threads is not permissible.

The use of soft seals in body seats is dealt with in clause **18**.

8.11 Wedge guides shall be provided in the bodies of all valves to cover for the full travel of the wedge so that the seating surfaces of the wedge do not touch the body seats until near the point of closure. These guides shall be of the male or female type, so placed as to engage with the guide slots or lugs of the wedge. Valve guides shall be integral with the body except that for valves of nominal sizes 650 mm (26 in) and larger the guides may be separate components welded into position.

9 Bonnet

9.1 For bonnets the design criteria specified in **9.2** to **9.8** shall be observed.

9.2 Wall thickness of the bonnet shall conform with shell thickness as shown in Appendix A. Drilling of, or pinning to, the wall of a pressure containing part, e.g. for nameplate fixing, is not permissible where it would reduce the effective thickness below the minimum permitted value.

9.3 The body to bonnet connection shall be flanged and the flange facings shall be male-and-female, tongue-and-groove, or ring joint type, except for Class 150 which may be a plain (flat) face.

Where possible, body/bonnet flange facings and gaskets shall be of standard dimensions in accordance with BS 1560-2, BS 3293 or API Std 605.

9.4 Bonnet flanges and body/bonnet flanges shall be of circular form in all cases, except that:

a) for Class 150 valves they may be oval;

b) for all valves below nominal size 80 mm (3 in) they may be square or rectangular.

Flanges shall be spot-faced or back-faced as specified in BS 1560-2.

9.5 The body to bonnet joint shall have at least four stud-bolts of the following minimum size except that for nominal sizes below 50 mm (2 in) studs may be used (see also **15.2**).

Nominal size	Minimum nominal bolt size
mm	in
25 to 50	$\frac{3}{8}$
80 to 200	$\frac{1}{2}$
250 and larger	$\frac{5}{8}$

9.6 To permit repacking of a valve in the open position while in service, a machined conical or spherical back seat shall be provided in the bonnet to contact a corresponding seating surface on the valve stem. Bonnet back seats shall be in a bushing, except that for a valve with either an austenitic or hard faced trim the seating surface may be a welded deposit. On an austenitic steel valve the back seat may be on either an integral surface or welded-on hardfacing. Welded deposits shall have a minimum finished thickness of 1.6 mm.

9.7 The hole at the back seat shall be designed to provide adequate guidance for the stem and to prevent packing extrusion.

9.8 Valves of nominal size 80 mm (3 in) and larger shall have provision for a $\frac{1}{2}$ in tapping at the location H shown in Figure 3. Provision for a $\frac{1}{2}$ in tapping shall also be made on valves smaller than nominal size 80 mm (3 in) at a position convenient to the manufacturer. The thread shall be stated if other than API Std 5B.

10 Wedge

10.1 For wedges the design criteria specified in **10.2** to **10.5** shall be observed.

10.2 A solid wedge, which may be fabricated by welding, shall be provided. It may be either a plain wedge, having essentially a trapezoidal (or an I) cross section, or a flexible wedge having a tapered H or inverted U cross section. It shall be free from pockets which could form liquid traps when the valve is mounted with the stem vertical. Unless the order specifies a plain wedge or a flexible wedge, either may be supplied.

10.3 Wedges may have integral faces or may have separate facing rings rolled in, welded on or directly deposited. Directly deposited facings shall have a minimum finished thickness of 1.6 mm.

The use of soft seals in wedge seats is dealt with in clause **18**.

10.4 Guide slots or lugs to engage the body guides shall be provided on the wedges of all valves. The slots or lugs shall be of ample length and shall extend below the horizontal centre line of the wedge. Wedges shall be provided with a suitable slot at the top to receive the button or tee-head of the stem.

10.5 The design shall provide adequate seating width, both before and afar wear of the seating surfaces. The minimum values of wear travel shall be as follows:

Nominal size	Minimum wear travel
mm	mm
25 to 50	2
65 to 150	3
200 to 300	6
350 to 450	10
500 to 600	13
650 to 1 050	15

11 Yoke

The yoke may be integral with the bonnet or, if separate, self-locating on the bonnet and attached by suitable bolting. The yoke shall be machined where it comes in contact with the bonnet and the yoke sleeve. When specified in the order the yoke shall be provided with an actuator or gearbox mounting flange (see **16.4**). The yoke and the actuator or gearbox mounting shall be of adequate strength to support the actuator or gearbox at any angle of installation of the valve.

12 Handwheel and handwheel nut

12.1 The handwheel shall be of the spoke-and-rim design, preferably with not more than six spokes. In the smaller sizes, where the space between the spokes is limited, the provision of knobs or studs projecting beyond the outside diameter of the handwheel is desirable.

12.2 The valve shall be opened by turning the handwheel in an anti-clockwise direction. The handwheel shall be suitably marked with an arrow and the word OPEN to indicate the direction of rotation to open the valve.

12.3 The handwheel shall be retained on the yoke sleeve by a threaded handwheel nut.

13 Stem and yoke sleeve

13.1 The minimum stem diameter shall be as given in Appendix A.

13.2 The stem shall be of one piece design and shall have a bevelled or spherical seat machined on it to seat on the bonnet back seat when the valve is fully opened.

13.3 The projection outside the yoke sleeve of the stem threads on a new closed valve shall be as follows unless a closer tolerance is required by the purchaser:

Nominal size		Limits of stem projection
mm	(in)	mm
25 to 50	(1 to 2)	2 to 10
65 to 150	($2\frac{1}{2}$ to 6)	3 to 15
200 to 300	(8 to 12)	6 to 20
350 to 450	(14 to 18)	10 to 30
500 to 600	(20 to 24)	13 to 40
650 to 1 050	(26 to 42)	15 to 50

13.4 The stem shall have threads of Acme or other trapezoidal form and shall have an integral end of button or tee-head form, fitting into a slot in the top of the wedge, to provide flexibility between the stem and the wedge. The design shall prevent turning of the stem or disengagement of the stem from the wedge during service. Threaded or pinned connections between the stem and the wedge shall not be used.

13.5 The yoke sleeve shall be internally threaded to suit the stem and shall be designed to permit ready removal of the handwheel without allowing any axial movement of the stem.

13.6 All surfaces of the yoke sleeve in contact with the yoke shall be machined. Rolling bearings shall be fitted to the following nominal sizes of valve:

Class 400	250 mm (10 in) and larger.
Class 600 and upwards	150 mm (6 in) and larger.

Adequate provision for lubrication shall be made in all classes and nominal sizes.

14 Stuffing box, packing and lantern ring

14.1 The stuffing box bore shall conform to the dimensions given in Table 1 and shall have a minimum depth, based on square section packing of the nominal width shown in the table, as follows.

Class 150	equivalent to six rings of packing.
Class 300 and above	equivalent to a lantern ring length and seven rings of packing.

14.2 Packing glands shall be of one piece, one piece bushed, or two piece self-aligning design. Vertically split glands shall not be used. The gland proper of a two piece gland shall have a shoulder on its outer end to prevent complete entry of the gland into the stuffing box.

14.3 The packing width shall be as specified in Table 1. The packing may be of square, rectangular or chevron section.

14.4 Class 150 valves shall not have lantern rings. Class 300 to Class 2 500 valves shall be supplied with a lantern ring when specified in the order. Lantern rings shall have two holes, spaced at 180°, provided at each end for removal. These holes shall either be through-holes for hooks or tapped 5-40 UNC. When a lantern ring is provided it shall be positioned such that with square section packing there will be five rings of packing above the lantern ring and two below. The stuffing box shall then be tapped opposite the centre of the installed lantern ring and fitted with a round head pipe plug in accordance with BS 3799 of not less than $\frac{1}{4}$ nominal size. A boss shall be provided if necessary to ensure minimum thread engagement.

15 Bolting

15.1 This clause is concerned only with that bolting which forms part of the valve and is not concerned with bolting for flanged connections between the valve and a pipeline or pipe fitting.

15.2 The allowable working stress in bolting material for bonnet flanges at the primary service pressures given in clause **4** shall not exceed 62 MPa assuming that the pressure acts upon an area circumscribed by the outside periphery of the gasket or, for a ring joint, that the pressure acts through the pitch circle of the ring joint.

Bonnet flange bolting shall be by stud-bolts with a nut at each end of the stud-bolt except that for valve sizes below 50 mm (2 in) studs in accordance with BS 2693-1 may be used. Stud-bolts and nuts shall comply with the requirements of BS 4882:1973, sections **1** and **3**.

15.3 Gland bolting may be of one of the following types.

a) Hinged bolt secured by either a headed bolt passed through the eye and secured by a nut or a pin passed through the eye and effectively secured. Cotter pins are not acceptable as the sole securing devices.

b) Stud-bolt passed through a plain hole in the flange on the bonnet neck and secured to the flange by two nuts.

c) Stud-bolt screwed into a tapped hole in the flange on the bonnet neck and secured by a lock nut.

d) Headed bolt passed through a plain hole in the flange on the bonnet neck.

Headed bolts in slotted brackets on the bonnet neck shall not be used. Bolts, stud-bolts and nuts shall be threaded metric or UNC and dimensioned in accordance with BS 4882, BS 1768 (below $\frac{1}{2}$ in nominal size), BS 1769, BS 3692 or BS 4190 except that square head, side head and tee head bolts are acceptable. Studs are not permissible.

15.4 Yoke bolting shall be threaded metric or UNC and dimensioned in accordance with BS 4882, BS 1769, BS 3692 or BS 4190. Studs are not permissible.

16 Operation

16.1 Valves shall be direct-handwheel operated unless otherwise specified in the order.

16.2 If chainwheel operation is required, the type of chainwheel shall be specified in the order which shall also specify any chain to be supplied.

16.3 If gear operation is required, the type of gearing and its arrangement and the design maximum differential pressure across the valve shall be specified in the order.

16.4 If actuator operation is required, the details of the actuator and its power supply together with the design maximum pressure differential across the valve shall be specified in the order.

For multi-turn actuators the attachment dimensions shall be as specified in BS . . . . "*Flange attachment dimensions of actuators to general purpose valves*" (in course of preparation).

Table 1 — Stuffing box bore and packing width[a]

1	2	3	4	5	6
Nominal stem diameter		**Nominal packing width**		**Nominal bore of stuffing box**	
mm	(in)	mm	(in)	mm	(in)
15.9	$\left(\frac{5}{8}\right)$	6.4	$\left(\frac{1}{4}\right)$	29.4	$\left(1\frac{5}{32}\right)$
17.5	$\left(\frac{11}{16}\right)$	6.4	$\left(\frac{1}{4}\right)$	31.0	$\left(1\frac{7}{32}\right)$
19.0	$\left(\frac{3}{4}\right)$	6.4	$\left(\frac{1}{4}\right)$	32.5	$\left(1\frac{9}{32}\right)$
22.2	$\left(\frac{7}{8}\right)$	6.4	$\left(\frac{1}{4}\right)$	35.7	$\left(1\frac{13}{32}\right)$
25.4	(1)	6.4	$\left(\frac{1}{4}\right)$	38.9	$\left(1\frac{17}{32}\right)$
28.6	$\left(1\frac{1}{8}\right)$	7.9	$\left(\frac{5}{16}\right)$	45.2	$\left(1\frac{25}{32}\right)$
31.8	$\left(1\frac{1}{4}\right)$	7.9	$\left(\frac{5}{16}\right)$	48.4	$\left(1\frac{29}{32}\right)$
34.9	$\left(1\frac{3}{8}\right)$	7.9	$\left(\frac{5}{16}\right)$	51.6	$\left(2\frac{1}{32}\right)$
38.1	$\left(1\frac{1}{2}\right)$	9.5	$\left(\frac{3}{8}\right)$	57.9	$\left(2\frac{9}{32}\right)$
41.3	$\left(1\frac{5}{8}\right)$	9.5	$\left(\frac{3}{8}\right)$	61.1	$\left(2\frac{13}{32}\right)$
44.4	$\left(1\frac{3}{4}\right)$	9.5	$\left(\frac{3}{8}\right)$	64.3	$\left(2\frac{17}{32}\right)$
47.6	$\left(1\frac{7}{8}\right)$	9.5	$\left(\frac{3}{8}\right)$	67.5	$\left(2\frac{21}{32}\right)$
50.8	(2)	11.1	$\left(\frac{7}{16}\right)$	73.8	$\left(2\frac{29}{32}\right)$
54.0	$\left(2\frac{1}{8}\right)$	11.1	$\left(\frac{7}{16}\right)$	77.0	$\left(3\frac{1}{32}\right)$
57.2	$\left(2\frac{1}{4}\right)$	12.7	$\left(\frac{1}{2}\right)$	83.3	$\left(3\frac{9}{32}\right)$
60.3	$\left(2\frac{3}{8}\right)$	12.7	$\left(\frac{1}{2}\right)$	86.5	$\left(3\frac{13}{32}\right)$
63.5	$\left(2\frac{1}{2}\right)$	12.7	$\left(\frac{1}{2}\right)$	89.7	$\left(3\frac{17}{32}\right)$
69.8	$\left(2\frac{3}{4}\right)$	12.7	$\left(\frac{1}{2}\right)$	96.0	$\left(3\frac{25}{32}\right)$
73.0	$\left(2\frac{7}{8}\right)$	14.3	$\left(\frac{9}{16}\right)$	102.4	$\left(4\frac{1}{32}\right)$
76.2	(3)	14.3	$\left(\frac{9}{16}\right)$	105.6	$\left(4\frac{5}{32}\right)$
82.6	$\left(3\frac{1}{4}\right)$	19.0	$\left(\frac{3}{4}\right)$	121.4	$\left(4\frac{25}{32}\right)$
88.9	$\left(3\frac{1}{2}\right)$	19.0	$\left(\frac{3}{4}\right)$	127.8	$\left(5\frac{1}{32}\right)$
95.2	$\left(3\frac{3}{4}\right)$	19.0	$\left(\frac{3}{4}\right)$	134.1	$\left(5\frac{9}{32}\right)$
101.6	(4)	19.0	$\left(\frac{3}{4}\right)$	140.5	$\left(5\frac{17}{32}\right)$
108.0	$\left(4\frac{1}{4}\right)$	19.0	$\left(\frac{3}{4}\right)$	146.8	$\left(5\frac{25}{32}\right)$
127.0	(5)	25.4	(1)	178.6	$\left(7\frac{1}{32}\right)$

[a] For intermediate sizes of stem one of the standard packing widths listed shall be used.

17 Bypass

17.1 A bypass shall not be provided unless specified in the order.

17.2 Any bypass supplied shall be external to the main valve and be of the following size:

Nominal size	Bypass size
mm	in
50 to 100	$\frac{1}{2}$
150 to 200	$\frac{3}{4}$
250 to 300	1
350 and larger	$1\frac{1}{2}$

18 Soft seal rings

18.1 Soft seal rings may be fitted in either the body seats or in the wedge seats as specified by the purchaser. The rings shall be designed to compress down to the level of the metal seats to give a tight shut-off on both sides of the wedge and thus provide a "double block and bleed" facility. They shall also give a tight metal-to-metal seal through the valve if the soft seals are damaged or removed.

18.2 The seal rings shall be designed to withstand a minimum of 2 000 cycles of operation in dry atmospheric conditions and there shall then be no evidence of damage or cold flow, as revealed by spreading over the metal seats. The valves shall then meet the hydrostatic and air tests specified in BS 5146.

A $\frac{1}{2}$ in tapping fitted with a plug shall be provided in the bonnet for testing the double block and bleed facility. This shall be located in position H (see Figure 3) unless specified otherwise by the purchaser. The type of thread shall be stated if other than API Std 5B.

18.3 The effective operating temperature range of soft seal valves will be limited by the service temperature of the seal material.

Section 3. Materials

19 Shell

The body and bonnet shall be of the material specified in the order, the selection being made from those listed in BS 1560-2. All pressure containing parts involved in welding operations shall have the carbon content restricted as follows:

a) 0.25 % maximum for carbon or carbon/molybdenum steels;

b) 0.15 % maximum for 5 % Cr $\frac{1}{2}$ % Mo steel.

20 Body seat rings

A body seat ring made of a material different from its seating surface shall be of a material not inferior to that of the shell.

21 Bonnet gasket

Bonnet flange gaskets shall be metallic spiral wound as specified in BS 3381, or steel or soft iron, except that, for Class 150 valves only, compressed asbestos fibre complying with the requirements of BS 1832 is an acceptable alternative. They shall be suitable for the pressure/temperature rating of the valve. Any metallic part of the gasket shall have at least the same corrosion resistance as the shell.

NOTE Free chlorides in compressed asbestos fibre materials when used with low alloy or austenitic stainless steels may cause stress corrosion cracking in the flange and the use of alternative gasket materials should be considered.

22 Wedge

A wedge fitted with separate facing rings, or on which seating surfaces are deposited by welding, shall be of a material equal to that of the shell.

23 Yoke

A yoke separate from the bonnet shall be of carbon steel or of the same material as that of the shell.

24 Handwheel or chainwheel

The handwheel or chainwheel shall be of steel, malleable iron or nodular iron.

25 Handwheel or chainwheel nut

The handwheel or chainwheel nut shall be of copper alloy, steel, malleable iron or nodular iron. If of carbon steel it shall be suitably protected against corrosion.

26 Yoke sleeve

The yoke sleeve shall be of non-rusting metal having a suitable bearing quality and a melting point above 955 °C.

27 Yoke sleeve retaining nut

The yoke sleeve retaining nut shall be of a material having a melting point above 955 °C. Grey cast iron shall not be used. If malleable cast iron is used it shall comply with the requirements of BS 6681 for grade B 32-10 or grade B 35-12. If spheroidal graphite cast iron is used it shall comply with the requirements of BS 2789 grades 350/22, 400/18 or 420/12.

28 Gland

A one piece gland or any gland flange shall be of steel. The bushing of a one piece bushed gland or the gland proper of a two piece gland shall be made of a material having a minimum melting point above 955 °C.

29 Trim

29.1 Trim comprises the following:

a) stem;

b) body seat surfaces;

c) wedge seat surfaces;

d) back seat bushing.

29.2 The trim materials shall be selected from those listed in Table 2 and specified in the order by quoting the relevant nominal trim symbol.

29.3 If a combination trim, e.g. CR 13 and Cu-Ni, is specified, either material may be used for the body seat surface. The other material of the combination shall be used for the wedge seat surface.

29.4 Stems shall be of wrought material.

29.5 The temperature limitations of certain trim materials may restrict the pressure/temperature ratings of the valve to which they are fitted.

30 Lantern ring

A lantern ring, when supplied, shall be of a material not inferior to that of the shell.

31 Stem packing

The packing shall be of braided asbestos containing a suitable corrosion inhibitor. Unless the order specifies other packing or a higher packing design temperature, it shall be suitable for use with steam or petroleum fluid at a minimum packing design temperature of 400 °C.

32 Bolting

32.1 Bonnet bolts shall comply with the requirements of BS 1506-630-860 (BS 4882:1973, section **3**, grade B7) and nuts shall comply with the requirements of BS 1506-162 (BS 4882:1973, section **3**, grade 2H) unless other bolting material is specified in the order.

32.2 Material for gland and yoke bolting shall be carbon steel of at least 392 N/mm^2 [1)] tensile strength unless other bolting material is specified in the order. Free cutting steels shall not be used.

33 Plugs

Material for shell plugs shall be not inferior to that of the shell.

34 Nameplate

34.1 For valves of nominal size 150 mm (6 in) and larger the nameplate shall be of 18-8 Cr-Ni steel or nickel alloy attached to the valve by pins of similar material or by welding.

34.2 For smaller valves, the nameplate material and attachment shall be of corrosion resistant material in accordance with the manufacturer's standard. Brass and aluminium are acceptable.

35 Soft seals

Soft seals shall be of the manufacturer's standard material for the duties specified. Any retaining ring in the wedge shall be of the same material as the stem but any fixing screws shall be of 18-8 Cr-Ni steel.

36 Special applications

When valves are specified for highly corrosive services or environment, or for low temperature service, the material specification for all parts shall be subject to agreement between the purchaser and the manufacturer.

Section 4. Marking

37 Required markings

Every valve in accordance with this standard shall be clearly marked as follows.

a) Body and bonnet markings shall be integral.

b) Every valve shall have a nameplate securely fastened to it.

38 Body and nameplate markings

Body and nameplate markings shall be as follows.

a) Nominal size designation. The numeral(s) denoting the nominal size prefixed by the letters DN, e.g. DN 100 (see clause **6**).

b) Class rating. The numerals denoting the class rating (see clause **4**).

c) Body material identification. Standard symbol from BS 1560-2:1970, Table 25.

d) Manufacturer's name or trade mark.

e) The number of this British Standard, i.e. BS 1414.

[1)] 1 N/mm^2 = 1 MPa.

Table 2 — Trim materials, hardness and acceptable specifications

1	2	3	4	5	6	7	8	9	10	11	12	13
Nominal trim symbol	**Material type**			**Minimum Brinell hardness**[a]			**Acceptable material specifications**					
	Seat surfaces	**Stem**	**Back seat bushing**[c]	**Seat surfaces**	**Stem**	**Back seat bushing**	**Cast**[b]		**Forged**		**Bar**	
							BS	**ASTM**	**BS**	**ASTM**	**BS**	**ASTM**
CR 13	13 Cr	13 Cr	13 Cr	[d]	200	250	1504-420C29	A487-CA15 A487-CA6NM	1503-410S21	A182-F6	1506-410S21	A276-410
18-8 Ti	18-8 Cr-Ni-Ti	18-8 Cr-Ni-Ti	18-8 Cr-Ni-Ti	Manufacturer's standard			1504-347C17	—	1503-321S31 1503-321S51	A182-F321	1506-321S31	A276-321
18-8 Nb	18-8 Cr-Ni-Nb	18-8 Cr-Ni-Nb	18-8 Cr-Ni-Nb	Manufacturer's standard			1504-347C17	A351-CF8C	1503-347S31 1503-347S51	A182-F347	1506-347S31	A276-347
18-10-2	18-10-2 Cr-Ni-Mo	18-10-2 Cr-Ni-Mo	18-10-2 Cr-Ni-Mo	Manufacturer's standard			1504-316C16	A351-CF8M	1503-316S31 1503-316S33	A182-F316	1506-316S31 1506-316S33	A276-316
18-12-3	18-12-3 Cr-Ni-Mo	18-12-3 Cr-Ni-Mo	18-12-3 Cr-Ni-Mo	Manufacturer's standard			1504-317C16	—	1503-316S33	—	—	A276-317
25-20	25-20 Cr-Ni	25-20 Cr-Ni	25-20 Cr-Ni	Manufacturer's standard			—	—	—	A182-F310	—	—
HF	66-26-5 Co-Cr-W	—	—	350[e]	—	—	—	—	—	—	—	—
	—	13 Cr	13 Cr	—	200	250	1504-420C29	A487-CA15	1503-410S21	A182-F6	1506-410S21	A276-410
CR 13 and Cu-Ni	13 Cr	13 Cr	13 Cr	250[f]	200	250	1504-420C29	A487-CA15	1503-410S21	A182-F6	1506-410S21	A276-410
	Cu-Ni	—	—	175[f]	—	—	Manufacturer's standard with 30 % nickel min.					
CR 13 and HF	13 Cr	13 Cr	13 Cr	300[f]	200	250	1504-420C29	A487-CA15	1503-410S21	A182-F6	1506-410S21	A276-410
	66-26-5 Co-Cr-W	—	—	350[f]	—	—	—	—	—	—	—	—
Ni-Cu	Ni-Cu Alloy	Ni-Cu Alloy	Ni-Cu Alloy	—	—	—	3071 NA1	—	—	—	3076 NA13	—
AB	Aluminium bronze	Aluminium bronze	Aluminium bronze	Manufacturer's standard			1400-AB1, 1400-AB2	B148-952A, B148-955D	2872-CA104	B124-642 B124-630	2874-CA107 2874-CA104	B150-642 B150-630
B	Bronze	—	Bronze	Manufacturer's standard			1400-G1, 1400-LG2	B584-905 B584-836	—	—	—	—
	—	Manganese bronze	Manganese bronze	Manufacturer's standard			1400-HTB1	B584-864 B584-865	2872-CZ114	B138-675	2874-CZ114	B138-675

[a] See BS 240-1.
[b] Castings not applicable to stem materials; see **29.4**.
[c] For austenitic trims the backseat may alternatively be a weld deposit of the same nominal material composition as the trim or a welded-on hard facing. For hard faced (HF) trim the back seat may alternatively be a welded-on hard facing.
[d] Body and wedge seat surfaces 250 HB min., with 50 HB min. differential between body and wedge seat surfaces.
[e] Differential hardness between body and wedge seat surfaces is not required.
[f] Differential hardness between body and wedge seat surfaces shall be the Manufacturer's standard.

39 Body and bonnet markings

39.1 Melt identification. Melt identification is required on all pressure containing steel castings.

39.2 Ring joint number. Pipe end flanges and body/bonnet flanges grooved for ring joints and the rings to be used with them shall be marked with the corresponding ring number (e.g. R 25). This identification shall be placed on the rim of both pipe end flanges or the bonnet end flange of the body as applicable and on the outside periphery of the ring. For ring numbers see Appendix A. In the case of non-standard ring joints for body/bonnet flanges the flange and ring shall be marked R SpL.

40 Nameplate markings

40.1 Pressure/temperature restrictions. Any pressure or temperature restrictions within the appropriate ratings given in BS 1560-2 that may be imposed by the manufacturer due to limitations on materials or design shall be shown on the nameplate.

Such special limiting pressure/temperature ratings shall also comply with the appropriate BS 1560-2 rating table.

40.2 Valve trim identification. Trim materials shall be indicated in the following order, using the appropriate symbol from Table 2,

1) STEM 2) WEDGE 3) SEAT

as in the example below:

STEM	CR 13			CR 13
WEDGE	HF	or	CR 13 HF CR 13	or HF
SEAT	CR 13			CR 13

40.3 Identification number. The manufacturer's figure or number identifying the valve in all respects shall be shown. The same figure or number shall therefore only be used for valves which are identical in design, detail, dimensions and material and which have interchangeable parts.

41 Additional markings

Additional markings may be used at the option of the manufacturer provided they do not conflict with any of the markings specified in this standard.

42 Omission of markings

42.1 Where the size or shape of the valve body precludes the inclusion of all the required markings, they may be omitted from the body only as found necessary subject to the approval of the purchaser. The sequence of omission shall be as follows.

1) Nominal size
2) Manufacturer's name or trade mark
3) Class rating.

42.2 The number of this British Standard may be omitted from the body or the nameplate, but not from both, at the manufacturer's option.

Section 5. Testing

43 Production pressure testing

All valves shall be pressure tested by the manufacturer before despatch in accordance with BS 6755-1 as follows:

a) hydrostatic shell and backseat tests;
b) hydrostatic seat test (see note);
c) pneumatic seat test (see note).

The test durations shall be as given in Table 2a.

NOTE Attention is drawn to note of **D.8.3.2** of BS 6755-1:1986 regarding the sequence of operations when the seat test procedure is carried out. Valves tested to BS 1414 should have the sequence of items b) and c) in **D.8.3.2** of BS 6755-1:1986 reversed. Seat test leakage rate A should apply. For the backseat test there should be no visual leakage for the duration of the test time.

Table 2a — Test durations

Nominal valve size	Minimum test duration		
	Shell test	Backseat test	Seat test
	s	s	s
Up to and including DN 50	15	15	15
DN 65 up to and including DN 150	60	15	60
DN 200 up to and including DN 300	120	15	120
DN 350 and larger	300	15	120

Section 6. Shipping

44 Preliminary

After inspection and before preparation for despatch all valves shall be thoroughly cleaned and dried.

45 Preparation for despatch

45.1 Coating. Coating of valves shall be as follows.

a) Unmachined external surfaces of the valves shall be painted with aluminium finish paint, except for austenitic steel valves which shall not be painted.

b) Machined or threaded surfaces shall be coated with an easily removable rust protective (see BS 1133-6) except that this shall not be required for austenitic steel components.

45.2 End protection. After complying with the requirements of **45.1**, body end ports, flange faces and butt-welding ends shall be covered with suitable close fitting protectors to protect the machined ends and prevent ingress of dirt and moisture.

45.3 Stem packing. The stem packing shall be fitted before shipping.

45.4 Wedge. The wedge shall be closed before shipping except in the case of soft seal valves where the wedge shall be backed off to relieve the pressure on the seals.

46 Packaging

Valves shall be so packaged as to minimize the possibility of damage during storage or transit. Where tropical or special packaging is necessary, the purchaser shall specify his requirements.

Appendix A Particular dimensions for each class of valve

Table 3 — Dimensions of Class 150 valves

1	2	3	4	5	6
Nominal size		**Inside diameter of flanged valves (min)**[a]	**Body and bonnet thickness (min)**	**Ring number for ring joints**	**Stem diameter (min.)**
mm	(in)	mm	mm		mm
25	(1)	25	6.4	R15	15.9
32[b]	($1\frac{1}{4}$)[b]	32	6.4	R17	15.9
40	($1\frac{1}{2}$)	38	6.4	R19	17.5
50	(2)	51	8.7	R22	19.0
65[b]	($2\frac{1}{2}$)[b]	64	9.5	R25	19.0
80	(3)	76	10.3	R29	22.2
100	(4)	102	11.1	R36	25.4
150	(6)	152	11.9	R43	28.6
200	(8)	203	12.7	R48	31.8
250	(10)	254	14.3	R52	34.9
300	(12)	305	15.9	R56	38.1
350	(14)	337	16.7	R59	41.3
400	(16)	387	17.5	R64	44.4
450	(18)	438	18.2	R68	47.6
500	(20)	489	19.0	R72	50.8
600	(24)	591	20.6	R76	57.2
650	(26)	635	21.4	—	60.3
700	(28)	686	22.2	—	63.5
750	(30)	737	23.0	—	63.5
900	(36)	876	25.4	—	69.8
1 050	(42)	1 020	28.6	—	82.6

[a] For details of welding ends including inside diameters see Figure 2.
[b] These sizes have been retained for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.

Table 4 — Dimensions of Class 300 valves

1	2	3	4	5	6
Nominal size		**Inside diameter of flanged valves (min.)**[a]	**Body and bonnet thickness (min.)**	**Ring number for ring joints**	**Stem diameter (min.)**
mm	(in)	mm	mm		mm
25	(1)	25	6.4	R16	15.9
32[b]	($1\frac{1}{4}$)[b]	32	6.4	R18	15.9
40	($1\frac{1}{2}$)	38	7.9	R20	19.0
50	(2)	51	9.5	R23	19.0
65[b]	($2\frac{1}{2}$)[b]	64	11.1	R26	19.0
80	(3)	76	11.9	R31[c]	22.2
100	(4)	102	12.7	R37	25.4
150	(6)	152	15.9	R45	31.8
200	(8)	203	17.5	R49	34.9
250	(10)	254	19.0	R53	38.1
300	(12)	305	20.6	R57	41.3
350	(14)	337	22.2	R61	44.4
400	(16)	387	23.8	R65	47.6
450	(18)	432	25.4	R69	50.8
500	(20)	483	27.0	R73	54.0
600	(24)	584	30.2	R77	63.5
650	(26)	635	31.8	—	69.8
700	(28)	686	33.3	—	76.2
750	(30)	737	34.9	—	82.6
900	(36)	876	41.3	—	88.9
1 050	(42)	1 020	44.4	—	101.6

[a] For details of welding ends including inside diameters see Figure 2.
[b] These sizes have been retained for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.
[c] For valves of 80 mm (3 in) nominal size, if intended to be used in conjunction with lapped flanges, the ring number shall be R30.

Table 5 — Dimensions of Class 400 valves

1	2	3	4	5	6
Nominal size		**Inside diameter of flanged valves (min.)**[a]	**Body and bonnet thickness (min.)**	**Ring number for ring joints**	**Stem diameter (min.)**
mm	(in)	mm	mm		mm
100	(4)	102	12.7	R37	28.6
150	(6)	152	16.7	R45	34.9
200	(8)	203	19.0	R49	38.1
250	(10)	254	21.4	R53	44.4
300	(12)	305	23.8	R57	47.6
350	(14)	333	27.0	R61	47.6
400	(16)	381	28.6	R65	50.8
450	(18)	432	30.2	R69	57.2
500	(20)	479	33.3	R73	63.5
600	(24)	575	36.5	R77	69.8

[a] For details of welding ends including inside diameters see Figure 2.

Table 6 — Dimensions of Class 600 valves

1	2	3	4	5	6
Nominal size		**Inside diameter of flanged valves (min.)**[a]	**Body and bonnet thickness (min.)**	**Ring number for ring joints**	**Stem diameter (min.)**
mm	(in)	mm	mm		mm
25	(1)	25	7.9	R16	15.9
32[b]	($1\frac{1}{4}$)[b]	32	8.6	R18	15.9
40	($1\frac{1}{2}$)	38	9.3	R20	19.0
50	(2)	51	11.1	R23	19.0
65[b]	($2\frac{1}{2}$)[b]	64	11.9	R26	22.2
80	(3)	76	12.7	R31[c]	25.4
100	(4)	102	15.9	R37	28.6
150	(6)	152	19.0	R45	38.1
200	(8)	200	25.4	R49	41.3
250	(10)	248	28.6	R53	47.6
300	(12)	298	31.8	R57	50.8
350	(14)	327	34.9	R61	57.2
400	(16)	375	38.1	R65	60.3
450	(18)	419	41.3	R69	63.5
500	(20)	464	44.4	R73	69.8
600	(24)	559	50.8	R77	76.2

[a] For details of welding ends including inside diameters see Figure 2.
[b] These sizes have been retained only for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.
[c] For valves of 80 mm (3 in) nominal size, if intended to be used in conjunction with lapped flanges, the ring number shall be R30.

Table 7 — Dimensions of Class 900 valves

1	2	3	4	5	6
Nominal size		**Inside diameter of flanged valves (min.)**[a]	**Body and bonnet thickness (min.)**	**Ring number for ring joints**	**Stem diameter (min.)**
mm	(in)	mm	mm		mm
80	(3)	73	19.0	R31	28.6
100	(4)	98	21.4	R37	31.8
150	(6)	146	26.2	R45	41.3
200	(8)	190	31.8	R49	47.6
250	(10)	238	36.5	R53	54.0
300	(12)	283	42.1	R57	57.2
350	(14)	311	46.0	R62	60.3
400	(16)	356	52.4	R66	63.5
450	(18)	400	57.2	R70	76.2
500	(20)	444	63.5	R74	82.6
600	(24)	533	73.0	R78	101.6

[a] For details of welding ends including inside diameters see Figure 2.

Table 8 — Dimensions of Class 1 500 valves

1	2	3	4	5	6
Nominal size		Inside diameter of flanged valves (min.)[a]	Body and bonnet thickness (min.)	Ring number for ring joints	Stem diameter (min.)
mm	(in)	mm	mm		mm
25	(1)	22	12.7	R16	19.0
32[b]	(1¼)[b]	29	14.2	R18	19.0
40	(1½)	35	15.0	R20	22.2
50	(2)	48	19.0	R24	25.4
65[b]	(2½)[b]	57	22.2	R27	28.6
80	(3)	70	23.8	R35	31.8
100	(4)	92	28.6	R39	34.9
150	(6)	137	38.1	R46	44.4
200	(8)	178	47.6	R50	54.0
250	(10)	222	57.2	R54	63.5
300	(12)	264	66.7	R58	69.8
350	(14)	289	69.8	R63	76.2
400	(16)	330	79.4	R67	82.6
450	(18)	371	88.9	R71	95.2
500	(20)	416	98.4	R75	108.0
600	(24)	498	114.3	R79	127.0

[a] For details of welding ends including inside diameters see Figure 2.
[b] These sizes have been retained only for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.

Table 9 — Dimensions of Class 2 500 valves

1	2	3	4	5	6
Nominal size		Inside diameter of flanged valves (min.)[a]	Body and bonnet thickness (min.)	Ring number for ring joints	Stem diameter (min.)
mm	(in)	mm	mm		mm
25	(1)	19	15.1	R18	19.0
32[b]	(1¼)[b]	25	17.5	R21	19.0
40	(1½)	29	19.0	R23	22.2
50	(2)	38	22.2	R26	25.4
65[b]	(2½)[b]	48	25.4	R28	28.6
80	(3)	57	30.2	R32	31.8
100	(4)	73	35.7	R38	34.9
150	(6)	111	48.4	R47	47.6
200	(8)	146	61.9	R51	60.3
250	(10)	184	67.5	R55	73.0
300	(12)	219	86.5	R60	82.6

[a] For details of welding ends including inside diameters see Figure 2.
[b] These sizes have been retained only for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.

Appendix B Application to piping systems with BS 4504 flanges

B.1 General

Valves in accordance with this British Standard, BS 1414, may be supplied for use in piping systems with BS 4504 flanges when specified by the purchaser. When this is the case all the requirements of this British Standard, BS 1414, apply, with the qualifications specified in **B.2** to **B.7**.

B.2 Pressure/temperature ratings

The pressure/temperature ratings of valves with BS 4504 flanges shall be in accordance with BS 4504:1969, Table A.1. Pressure/temperature ratings for valves in materials other than those listed in BS 4504:1969, Table A.1 shall be agreed between the purchaser and the manufacturer.

B.3 Nominal pressure and class ratings and nominal size range

Valves in accordance with this appendix with flanges of the nominal pressure ratings given in column 1 of Table 10 shall have the same face-to-face dimensions as valves with BS 1560-2 flanges of the corresponding class ratings in column 2. Column 3 gives the applicable nominal size range.

Table 10 — Nominal pressure and class ratings and nominal size range

1	2	3	4
Rating		Nominal size range	
PN	Class		
		mm	(in)
10	150	50 to 600	(2 to 24)
16	150	50 to 600	(2 to 24)
25	300	25 to 600	(1 to 24)
40	300	25 to 600	(1 to 24)
64	600	25 to 600	(1 to 24)
100	600	25 to 600	(1 to 24)
160	900	25 to 300	(1 to 12)
250	1 500	25 to 300	(1 to 12)
320	2 500	25 to 250	(1 to 10)
400	2 500	25 to 200	(1 to 8)

B.4 Body end flanges

B.4.1 *Dimensions.* Body end flange dimensions shall comply with the requirements of BS 4504 except that flange thicknesses may be the appropriate values from BS 1560-2. Flange thicknesses shall be not less than those specified in BS 4504. When flange thicknesses comply with those specified in BS 4504, the neck dimensions shall also comply with the requirements of BS 4504.

B.4.2 *Spot-facing or back-facing.* The requirements of BS 1560-2 for spot-facing or back-facing shall be complied with.

B.4.3 *Finish of joint surface.* The joint surface finish shall comply with the requirements of BS 4504.

B.5 *Text deleted.*

B.6 Marking

When supplied for use in piping systems with BS 4504 flanges valves shall be permanently marked with the appropriate nominal pressure rating (i.e. PN. .). This marking may replace or supplement the requirements of clause **38** b) and shall appear on all BS 4504 flanges used.

B.7 Information to be supplied by the purchaser

The information to be supplied by the purchaser shall be as listed in clause **7** of this standard except that a) shall be replaced by the following.

a) State that valves are to comply with the requirements of this appendix and state nominal pressure rating and nominal size.

Publications referred to

This standard makes reference to the following British Standards:

BS 240, *Method for Brinell hardness test.*

BS 240-1, *Testing of metals.*

BS 1133, *Packaging code.*

BS 1133-6, *Temporary protection of metal surfaces against corrosion (during transport and storage).*

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

BS 1503, *Specification for steel forgings (including semi-finished forged products) for pressure purposes.*

BS 1504, *Specification for steel castings for pressure purposes.*

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

BS 1560, *Steel pipe flanges and flanged fittings (nominal sizes ½ in to 24 in) for the petroleum industry.*

BS 1560-2, *Metric dimensions.*

BS 1600, *Dimensions of steel pipe for the petroleum industry.*

BS 1600-2, *Metric units.*

BS 1768, *Unified precision hexagon bolts, screws and nuts (UNC and UNF threads). Normal series.*

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

BS 1832, *Oil resistant compressed asbestos fibre jointing.*

BS 2080, *Face-to-face, centre-to-face, end-to-end and centre-to-end dimensions of flanged and butt-welding end steel valves for the petroleum, petrochemical and allied industries.*

BS 2693, *Screwed studs.*

BS 2693-1, *General purpose studs.*

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

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

BS 2874, *Copper and copper alloys. Rods and sections (other than forging stock).*

BS 3071, *Nickel-copper alloy castings.*

BS 3076, *Nickel and nickel alloys. Rods.*

BS 3293, *Carbon steel pipe flanges (over 24 in nominal size) for the petroleum industry.*

BS 3351, *Piping systems for petroleum refineries and petrochemical plants.*

BS 3381, *Metallic spiral wound gaskets for the petroleum and petrochemical industry.*

BS 3600, *Dimensions and masses per unit length of welded and seamless steel pipes and tubes for pressure purposes.*

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

BS 3799, *Forged steel pipe fittings, screwed and socket-welding for the petroleum industry.*

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

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

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

BS 6681, *Specification for malleable cast iron.*

BS 6755, *Testing of valves.*

BS 6755-1, *Specification for production pressure testing requirements.*

BS . . . ., *Flange attachment dimensions of actuators to general purpose valves*[2)].

[2)] In course of preparation.

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