British Standard

BRITISH STANDARD

BS 1965-1: 1963

Incorporating Amendment Nos. 1 and 2

Specification for

Butt-welding pipe fittings —

For pressure purposes —

Part 1: Carbon steel

UDC 621.643.4 – 186:621.791.762.1:669.14

Co-operating organizations

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

Admiralty
Air Ministry
Associated Offices' Technical Committee*
Association of Consulting Engineers (Incorporated)
Association of Mining Electrical and Mechanical Engineers
British Chemical Plant Manufacturers' Association*
British Compressed Air Society
British Electrical and Allied Manufacturers' Association
British Engineers' Association
British Gear Manufacturers' Association
British Internal Combustion Engine Manufacturers' Association
British Iron and Steel Federation*
British Railways Board
Crown Agents for Oversea Governments and Administrations
D.S.I.R.-National Engineering Laboratory
Electricity Council, the Generating Board and the Area Board in England and Wales*
Engineering Equipment Users' Association
Gas Council*
High Commission of India
Institute of Marine Engineers
Institute of Petroleum
Institution of Civil Engineers
Institution of Gas Engineers*
Institution of Heating and Ventilating Engineers*
Institution of Mechanical Engineers
Institution of Mechanical Engineers (Automobile Division)
Institution of Production Engineers
Locomotive and Allied Manufacturers' Association of Great Britain
Machine Tool Trades Association
Ministry of Labour (H.M. Factory Inspectorate)
Ministry of Power
Ministry of Public Building and Works
Ministry of Transport*
National Coal Board
National Physical Laboratory (D.S.I.R.)
Radio Industry Council
War Office

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this standard:

Association of Heating, Ventilating & Domestic Engineering Employers
Institute of Welding
Institution of Municipal Engineers
Lloyd's Register of Shipping
Metropolitan Water Board
Water-tube Boilermakers Association
Wrought Fittings Makers Association
Individual firm

This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 10 May 1963

First published March 1953
First revision May 1963

The following BSI references relate to the work on this standard:
Committee references MEE/121, MEE/121/1
Draft for comment AA(MEE) 6970

ISBN 0 580 02254 4

Amendments issued since publication

Amd. No.	Date of issue	Comments
4169	February 1983	Indicated by a sideline in the margin

Contents

Foreword

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

This standard makes reference to the following British Standards:

BS 10, *Flanges and bolting for pipes, valves and fittings.*

BS 350, *Conversion factors and tables.*

BS 806, *Ferrous pipes and piping installations for and in connection with land boilers.*

BS 970, *Wrought steels. En series.*

BS 1501, *Steels for fired and unfired pressure vessels. Plates.*

BS 1640, *Steel butt-welding pipe fittings for the petroleum industry.*

BS 1821, *Class I oxy-acetylene welding of steel pipelines and pipe assemblies for carrying fluids.*

BS 2633, *Class I metal-arc welding of steel pipelines and pipe assemblies for carrying fluids.*

BS 2640, *Class II oxy-acetylene welding of steel pipelines and pipe assemblies for carrying fluids.*

BS 2971, *Class II metal-arc welding of steel pipelines and pipe assemblies for carrying fluids.*

BS 3601, *Steel pipes and tubes for pressure purposes — Carbon steel — ordinary duties.*

BS 3602, *Steel pipes and tubes for pressure purposes — Carbon steel — high duties.*

This British Standard was first published in 1953 and the present revision has been carried out with the main object of including the following developments:

a) the use of electric resistance welded (E.R.W.) pipe;

b) the raising of the minimum tensile requirements for the steel from 23 to 27 tonf/in^2 (36 to 42 kgf/mm^2);

c) the inclusion of 14 inch and 16 inch nominal size fittings;

d) *Text deleted.*

e) the inclusion of equal tees.

It relates to butt-welding fittings for pressure purposes for use with pipe to BS 3601[1)] and BS 3602[2)].

The range of fittings and the range of sizes covered have been chosen to meet existing demands. In view of the wide diversity of use of these fittings, the user should satisfy himself that they are suitable for the conditions intended.

The complementary standard for steel butt-welding fittings for the petroleum industry is BS 1640.

Part 2 of this standard which dealt with austenitic stainless steel butt-welding fittings has been withdrawn.

NOTE 1 The figures in British units are regarded as standard. Metric conversions of the outside diameters and thicknesses of pipes and of the dimensions and tolerances of elbows and return bends given in Appendix B. Table 11 and Table 12 are ISO agreed corresponding values: other metric conversions are given in Appendix B. Table 13 are approximate and more accurate conversions of these should be based on Tables in BS 350, "Conversion factors and tables".

1) BS 3601. "Steel pipes and tubes for pressure purposes: carbon steel with specified room temperature properties".

2) BS 3602. "Specification for steel pipes and tubes for pressure purposes: carbon and carbon manganese steels with specified elevated temperature properties".

NOTE 2 In place of the customary, but incorrect, use of the pound and kilogramme as units of force, the units called pound-force (abbreviation lbf) and kilogramme-force (abbreviation kgf) have been used in this standard. These are the forces which, when acting on a body of mass one pound or one kilogramme respectively, give it an acceleration equal to that of standard gravity. The unit called ton-force (abbreviation tonf) has also been used where appropriate.

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 10 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.

blank

1 Scope

This British Standard applies to wrought carbon steel butt-welding pipe fittings for pressure purposes. It covers:

90° and 45° elbows;

180° return bends;

concentric and eccentric reducers;

equal tees;

caps.

Welding neck flanges are not included, but they are provided for in BS 10[3)].

2 Sizes

Dimensions are standardized for the sizes and to the extent shown in Table 6 to Table 9.

The size by which the fitting is designated shall be its nominal size except that for the 6 inch nominal size the outside diameter shall also be given.

NOTE The nominal size corresponds to the nominal bore except for fittings of 14 in and 16 in sizes when the nominal size corresponds to the outside diameter.

3 Materials

Unless otherwise agreed, fittings to this standard shall be made of materials complying with one of the undernoted standards:

BS 3602[a]	Grade 410 seamless or E.R.W. tubing.
BS 1501[b]	151-430 (A or B) or 161-430 (A or B) Plate.
BS 1503[c]	221-430 or 430E Forgings.

[a] BS 3602, "Specification for steel pipes and tubes for pressure purposes: carbon and carbon manganese steels with specified elevated temperature properties".

[b] BS 1501, "Steels for fired and unfired pressure vessels. Plates".

[c] BS 1503, "Specification for steel forgings (including semi-finished forged products) for pressure purposes".

4 Methods of manufacture

Elbows, return bends and reducers shall be made from seamless or electric resistance welded pipe at manufacturer's option unless otherwise agreed with the purchaser. Tees shall be made from seamless pipe or from forgings. Caps shall be made from plate.

5 Pressure ratings

The maximum service pressure rating of a fitting to this standard shall be the same as that for a straight pipe of the same or equivalent material and the same nominal size and thickness. Where pressure/temperature conditions are important the relevant requirements of BS 806[4)] shall be observed.

6 Heat treatment

Fittings on which the final forming operation is completed at a temperature in the range 620 °C (1 150 °F) to 980 °C (1 800 °F) need not be heat treated provided they are cooled in still air.

Fittings completed at temperatures below 620 °C (1 150 °F) shall be stress relieved at a temperature of from 580 °C (1 075 °F) to 620 °C (1 150 °F).

7 Dimensions of fittings

Dimensions of fittings shall be in accordance with Table 6 to Table 10 subject to the provisions of Clause **8** and Table 2 to Table 5.

The outside diameters and thicknesses of the welding ends of the fittings shall be as specified in Table 1.

The body thickness of a fitting shall be such that it is at least equal in strength to that of a straight pipe of the same material and the same nominal size and thickness. To ensure adequacy of design the manufacturer shall carry out bursting tests on prototype fittings. These bursting tests shall be in accordance with Appendix A.

Where standard fittings are intended for use with thinner pipes, the bores at the ends of the fitting shall be increased by machining, grinding or other suitable means to suit the bore of the pipe within the tolerances given in Table 3. Any taper resulting shall be not steeper than 1 in 4 measured on the thickness.

NOTE Whereas this standard controls the dimensions and tolerances of butt-welding pipe fittings as supplied, reference should be made to the following standards in regard to the matching of the ends of the fittings to the pipes, before welding:
BS 1821, *"Class I oxy-acetylene welding of steel pipelines and pipe assemblies for carrying fluids".*
BS 2640, *"Class II oxy-acetylene welding of steel pipelines and pipe assemblies for carrying fluids".*
BS 2633, *"Class I arc welding of ferritic steel pipework for carrying fluids".*
BS 2971, *"Specification for Class II arc welding of carbon steel pipework for carrying fluids".*

[3)] BS 10, "Flanges and bolting for pipes, valves and fittings" (obsolescent).

[4)] BS 806, "Ferrous pipings systems for and in connection with land boilers".

Table 1 — Outside diameter and thickness at ends of fitting

Nominal size	Outside diameter at ends		Thickness		
in	in	in	in	in	in
1	$1^{11}/_{32}$	1.344	0.128		
$1^1/_4$	$1^{11}/_{16}$	1.688	0.128		
$1^1/_2$	$1^{29}/_{32}$	1.906	0.128	0.160	
2	$2^3/_8$	2.375	0.144	0.176	
$2^1/_2$	3	3.000	0.144	0.176	
3	$3^1/_2$	3.500	0.160	0.192	
$3^1/_2$[a]	4	4.000	0.160	0.192	
4	$4^1/_2$	4.500	0.176	0.212	
5	$5^1/_2$	5.500	0.192	0.212	
6	$6^1/_2$	6.500	0.192	0.212	
6	$6^5/_8$	6.625	0.212	0.250	0.281
8	$8^5/_8$	8.625	0.212	0.250	0.312
10	$10^3/_4$	10.750	0.250	0.312	0.375
12	$12^3/_4$	12.750	0.281	0.312	0.375
—	14	14.000		0.375	0.438
—	16	16.000		0.375	0.500

NOTE The range of standard thicknesses shown above has been selected to meet normal demands. Standard fittings may be used with thinner pipes (see fourth paragraph of Clause **7**).
Where fittings with thicknesses other than those tabulated are required, the thickness should be selected from Table 1 of BS 3600:1976.
[a] The use of $3^1/_2$ inch nominal size fittings should be avoided wherever possible.

8 Tolerances

a) *Tolerances on thickness.* The actual thickness of fittings at any point shall be not less than $87^1/_2$ per cent of the specified thickness.

b) *Tolerances on outside diameter.* The outside diameters at the welding ends shall be subject to the tolerances given in Table 2.

Table 2 — Tolerances on outside diameter at ends of fitting

Nominal size of fitting	Tolerances
in	in
Up to and including $1^1/_4$	+ $^1/_{32}$ – $^1/_{64}$
$1^1/_2$ up to and including $2^1/_2$	+ $^1/_{16}$ – $^1/_{32}$
3 up to and including 4	+ $^1/_{16}$ – $^1/_{16}$
5 up to and including 8	+ $^3/_{32}$ – $^1/_{16}$
10 up to and including 16	+ $^5/_{32}$ – $^1/_8$

c) *Tolerances on bores.* The bores of the fittings at the welding ends, i.e. the outside diameter as given in Table 1 less twice the specified thickness, shall be subject to the tolerances given in Table 3.

Table 3 — Tolerances on bore at ends of fitting

Nominal size of fitting	Tolerances
in	in
Up to and including $2^1/_2$	± $^1/_{32}$
3 up to and including 8	± $^1/_{16}$
10 up to and including 16	± $^1/_8$

d) *Tolerances on dimensions.* The dimensions of fittings in Table 6, Table 7, Table 8, Table 9 shall be subject to the tolerances given in Table 4.

Table 4 — Tolerances on dimensions of fittings

Fitting	Dimensions	Nominal size	Tolerances
90° Elbows 45° Elbows	Centre to end *A* or *B* (see Figure 3 and Figure 4)	in Up to and including $1^1/_4$	in $\pm\ ^3/_{32}$
		$1^1/_2$ to 4	$\pm\ ^1/_8$
		5 to 8	$\pm\ ^5/_{32}$
		10 and over	$\pm\ ^3/_{16}$
Return Bends (180°)	Centre to centre *O* (see Figure 5)	Up to and including $1^1/_4$	$\pm\ ^3/_{16}$
		$1^1/_2$ to 4	$\pm\ ^1/_4$
		5 to 8	$\pm\ ^5/_{16}$
		10 and 12	$\pm\ ^3/_8$
	Back to face *K* (see Figure 5)	All sizes	$\pm\ ^1/_4$
	Alignment of faces *F* (see Figure 5)	Up to and including 8	$\pm\ ^1/_{32}$
		10 and 12	$\pm\ ^1/_{16}$
Reducers	End to end *H* (see Figure 6 and Figure 7)	Up to and including 8	$\pm\ ^1/_{16}$
		10 and over	$\pm\ ^3/_{32}$
Tees	Centre to face *C* (see Figure 8)	Up to and including 8	$\pm\ ^1/_{16}$
		10 and over	$\pm\ ^3/_{32}$
Caps	End to face *E* (see Figure 9)	Up to and including 4	$\pm\ ^1/_8$
		5 and over	$\pm\ ^1/_4$

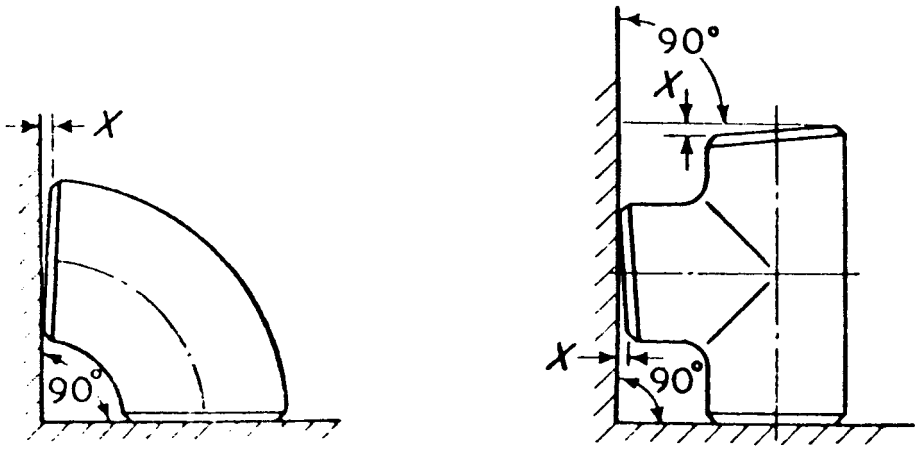


Figure 1 — Typical examples of off-square tolerance "*X*" checked against reference planes

e) *"Off-square" tolerances.* Off-square tolerances shall be as given in Table 5.

Table 5 — "Off-square" tolerances

Nominal size of fitting	"Off-square" tolerance *X*
in	in
Up to and including 4	$^1/_{32}$
5 and 6	$^3/_{64}$
8 to 16 inclusive	$^1/_{16}$

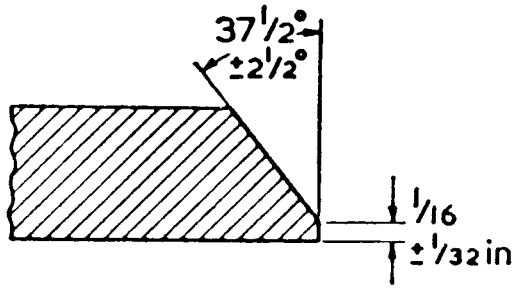


Figure 2 — Weld preparation

9 Preparation of fittings for welding

Unless otherwise specified, the angle of bevel on fittings $^3/_{16}$ in thick and over shall comply with that shown in Figure 2.

Welding ends having a thickness less than $^3/_{16}$ in shall be square unless otherwise agreed between purchaser and manufacturer.

10 Tests

All fittings shall be capable of withstanding a test pressure equal to that prescribed in the British Standard for the pipe with which the fitting is intended to be used. A hydraulic test shall be applied only when agreed between purchaser and manufacturer.

11 Workmanship and finish

Fittings shall be free from injurious defects, and shall have a workmanlike finish.

12 Marking

Each fitting shall be stencilled or otherwise suitably marked with the following:

a) Manufacturer's name or trade mark;

b) Nominal size (in the case of the 6 in nominal size, the outside diameter shall also be given);

c) Thickness (as shown in Table 1);

d) The number of this British Standard, i.e. BS 1965/1.

NOTE The markings given in *b* and *c* above may be waived on $1^1/_4$ inch fittings and smaller sizes.

13 Inspection

The purchaser or his representative shall, for the purpose of inspection, have access at all reasonable times to those parts of the manufacturer's works engaged on the purchaser's order.

14 Certification

By agreement between the purchaser and manufacturer, the basis of acceptance by the purchaser of the fittings covered by his order may be a certificate stating that such fittings comply with the requirements of this standard.

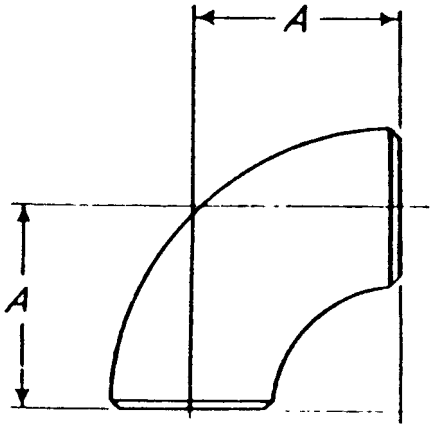


Figure 3 — 90° elbow

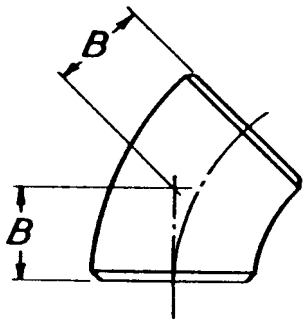


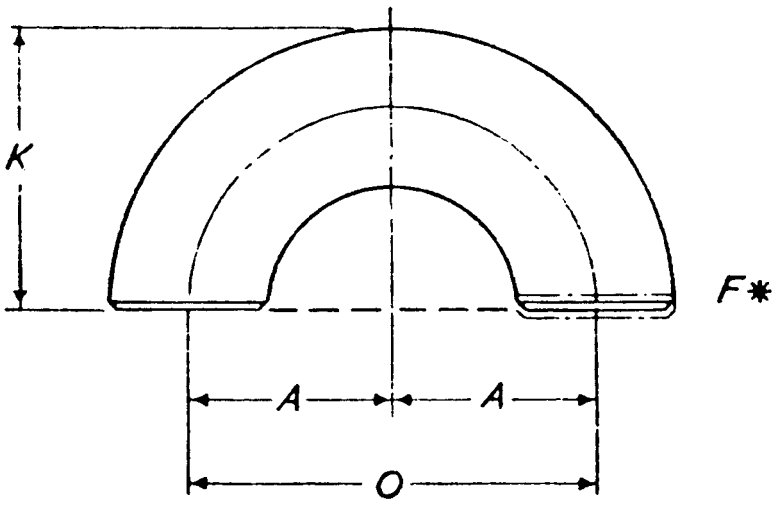
Figure 4 — 45° elbow

Table 6 — Dimensions of elbows

Nominal size of fitting	90° Elbow	45° Elbow
	Centre to end *A*	Centre to end *B*
in	in	in
1	$1^1/_2$	$^7/_8$
$1^1/_4$	$1^7/_8$	1
$1^1/_2$	$2^1/_4$	$1^1/_8$
2	3	$1^3/_8$
$2^1/_2$	$3^3/_4$	$1^3/_4$
3	$4^1/_2$	2
$3^1/_2$	$5^1/_4$	$2^1/_4$
4	6	$2^1/_2$
5	$7^1/_2$	$3^1/_8$
6 ($6^1/_2$ o.d.)	9	$3^3/_4$
6 ($6^5/_8$ o.d.)	9	$3^3/_4$
8	12	5
10	15	$6^1/_4$
12	18	$7^1/_2$
14	21	$8^3/_4$
16	24	10

Table 6A — Dimensions of short radius elbows

Nominal size of fitting	90° Elbow
	Centre to end
in	in
2	2
$2^1/_2$	$2^1/_2$
3	3
4	4
5	5
6 ($6^1/_2$ o.d.)	6



* For tolerances on alignment *F* see Table 4.

Figure 5 — Return bend

Table 7 — Dimensions of return bends

Nominal size of fitting	Return bend	
	Centre to centre *O*	Back to face *K*
in	in	in
1	3	$2^{3}/_{16}$
$1^{1}/_{4}$	$3^{3}/_{4}$	$2^{3}/_{4}$
$1^{1}/_{2}$	$4^{1}/_{2}$	$3^{1}/_{4}$
2	6	$4^{3}/_{16}$
$2^{1}/_{2}$	$7^{1}/_{2}$	$5^{1}/_{4}$
3	9	$6^{1}/_{4}$
$3^{1}/_{2}$	$10^{1}/_{2}$	$7^{1}/_{4}$
4	12	$8^{1}/_{4}$
5	15	$10^{1}/_{4}$
6 ($6^{1}/_{2}$ o.d.)	18	$12^{1}/_{4}$
6 ($6^{5}/_{8}$ o.d.)	18	$12^{5}/_{16}$
8	24	$16^{5}/_{16}$
10	30	$20^{3}/_{8}$
12	36	$24^{3}/_{8}$

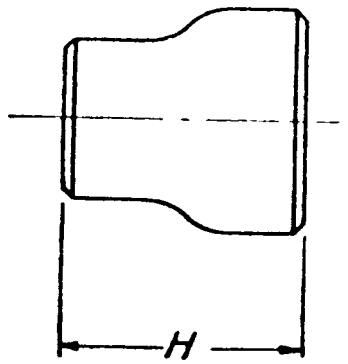


Figure 6 — Reducer: concentric

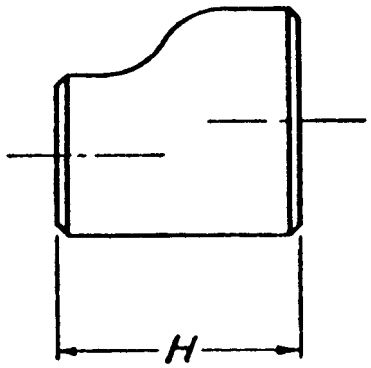


Figure 7 — Reducer: eccentric

Table 8 — Dimensions of reducers (concentric and eccentric)

Nominal size of fitting	End to end *H*	Nominal size of fitting	End to end *H*
in	in	in	in
$1^1/_4 \times 1$	2	6×5	$5^1/_2$
		6×4	$5^1/_2$
$1^1/_2 \times 1^1/_4$	$2^1/_2$	$6 \times 3^1/_2$	$5^1/_2$
$1^1/_2 \times 1$	$2^1/_2$	6×3	$5^1/_2$
$2 \times 1^1/_2$	3	8×6	6
$2 \times 1^1/_4$	3	8×5	6
2×1	3	8×4	6
$2^1/_2 \times 2$	$3^1/_2$	10×8	7
$2^1/_2 \times 1^1/_2$	$3^1/_2$	10×6	7
$2^1/_2 \times 1^1/_4$	$3^1/_2$	10×5	7
$3 \times 2^1/_2$	$3^1/_2$	12×10	8
3×2	$3^1/_2$	12×8	8
$3 \times 1^1/_2$	$3^1/_2$	12×6	8
$3^1/_2 \times 3$	4	14×12	13
$3^1/_2 \times 2^1/_2$	4	14×10	13
$3^1/_2 \times 2$	4	14×8	13
$4 \times 3^1/_2$	4	16×14	14
4×3	4	16×12	14
$4 \times 2^1/_2$	4	16×10	14
4×2	4	16×8	14
5×4	5		
$5 \times 3^1/_2$	5		
5×3	5		
$5 \times 2^1/_2$	5		

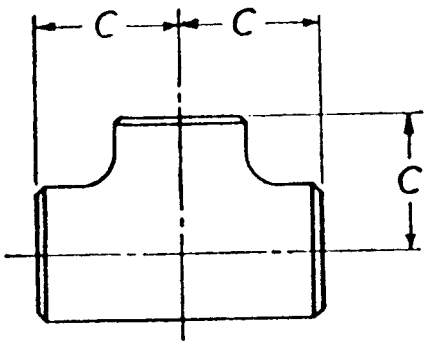


Figure 8 — Equal tee

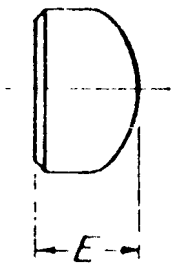


Figure 9 — Cap

Table 9 — Dimensions of equal tees

Nominal size of fitting	Centre to face *C*
in	in
1	$1^1/_2$
$1^1/_4$	$1^7/_8$
$1^1/_2$	$2^1/_4$
2	$2^1/_2$
$2^1/_2$	3
3	$3^3/_8$
$3^1/_2$	$3^3/_4$
4	$4^1/_8$
5	$4^7/_8$
6	$5^5/_8$
8	7
10	$8^1/_2$
12	10
14	11
16	12

Table 10 — Dimensions of caps

Nominal size of fitting	Length *E*
in	in
1	$1^1/_2$
$1^1/_4$	$1^1/_2$
$1^1/_2$	$1^1/_2$
2	$1^1/_2$
$2^1/_2$	$1^1/_2$
3	2
$3^1/_2$	$2^1/_2$
4	$2^1/_2$
5	3
6	$3^1/_2$
8	4
10	5
12	6
14	$6^1/_2$
16	7

NOTE The closed ends of caps are to be semi-ellipsoidal, the minor axis being equal to half the major axis.

Appendix A Bursting tests on prototype fittings (See Clause 7)

Straight pipe of the same material and the same nominal thickness as that of the fitting to be tested and having a length equal to at least twice the pipe outside diameter shall be welded to each end of the fitting. Closures beyond the minimum lengths of the pipes shall be welded to the pipe ends.

Hydraulic pressure shall be applied to the assembly and increased until either the fitting or one of the pipes bursts.

The fitting shall be considered satisfactory if the pressure attained on bursting is equal to or greater than the computed bursting pressure of the straight pipe as ascertained by the following formula:

$$P = \frac{2St}{D}$$

where

P = bursting pressure of the pipe in lbf/in^2;

S = minimum specified tensile strength of the pipe material in lbf/in^2;

t = $87\frac{1}{2}$ per cent of the specified thickness in inches;

D = outside diameter of the pipe in inches.

Appendix B ISO Corresponding values

Table 11 — Outside diameters and thicknesses

Agreed ISO corresponding values for outside diameters in accordance with ISO 64 and thicknesses in accordance with ISO 221.

Outside diameters			
in	mm	in	mm
$1\frac{11}{32}$	33.7	$5\frac{1}{2}$	139.7
$1\frac{11}{16}$	42.4	$6\frac{1}{2}$	165.1
$1\frac{29}{32}$	48.3	$6\frac{5}{8}$	168.3
$2\frac{3}{8}$	60.3	$8\frac{5}{8}$	219.1
3	76.1	$10\frac{3}{4}$	273
$3\frac{1}{2}$	88.9	$12\frac{3}{4}$	323.9
4	101.6	14	355.6
$4\frac{1}{2}$	114.3	16	406.4

Thicknesses			
in	mm	in	mm
0.128	3.2	0.250	6.3
0.144	3.6	0.281	7.1
0.160	4.0	0.312	8.0
0.176	4.5	0.375[a]	—
0.192[a]	—	0.438	11.0
0.212	5.4	0.500	12.5

[a] NOTE Although these are agreed ISO dimensions they have no agreed corresponding metric value.

Table 12 — Dimensions and tolerance

Agreed ISO corresponding values for dimensions and tolerances of 90° elbows and return bends.

Dimensions					
in	mm	in	mm	in	mm
$1\frac{1}{2}$	38	6	152.5	$12\frac{5}{16}$	313
$1\frac{7}{8}$	47.5	$6\frac{1}{4}$	159	15	381
$2\frac{3}{16}$	55	$7\frac{1}{4}$	184	$16\frac{5}{16}$	415
$2\frac{1}{4}$	57	$7\frac{1}{2}$	190	18	457
$2\frac{3}{4}$	70	$8\frac{1}{4}$	210	$20\frac{3}{8}$	517
3	76	9	228.5	21	533.5
$3\frac{1}{4}$	82	$10\frac{1}{4}$	260	24	609.5
$3\frac{3}{4}$	95	$10\frac{1}{2}$	267	$24\frac{3}{8}$	619
$4\frac{3}{16}$	106	12	305	30	762
$4\frac{1}{2}$	114.5	$12\frac{1}{4}$	311	36	914
$5\frac{1}{4}$	133.5				

Tolerances	
in	mm
$\frac{3}{32}$	2.5
$\frac{1}{8}$	3
$\frac{5}{32}$	4
$\frac{3}{16}$	5
$\frac{1}{4}$	6
$\frac{5}{16}$	8
$\frac{3}{8}$	10

Table 13 — Approximate metric conversions of other dimensions

in	mm	in	mm	in	mm	in	mm
1/64	0.40	1 1/8	28.60	3 3/8	85.72	6 1/2	165.10
1/32	0.79	1 1/4	31.75	3 1/2	88.90	7	177.80
3/64	1.19	1 3/8	34.92	3 3/4	95.25	7 1/2	190.50
1/16	1.59	1 1/2	38.10	4	101.60	8	203.20
3/32	2.38	1 3/4	44.45	4 1/8	104.78	8 1/2	215.90
1/8	3.18	1 7/8	47.62	4 7/8	123.83	8 3/4	222.25
5/32	3.97	2	50.80	5	127.00	10	254.00
3/16	4.76	2 1/4	57.15	5 1/2	139.70	11	279.40
1/4	6.35	2 1/2	63.50	5 5/8	142.88	12	304.80
7/8	22.22	3	76.20	6	152.40	13	330.20
1	25.40	3 1/8	79.38	6 1/4	158.75	14	355.60

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL