

ANSI B16.18

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AMERICAN NATIONAL STANDARD

Cast Copper Alloy Solder Joint Pressure Fittings

ANSI B16.18 - 1984

REAFFIRMED 1994

FOR CURRENT COMMITTEE PERSONNEL
PLEASE SEE ASME MANUAL AS-11

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FOREWORD

This American National Standard for solder joint fittings was originally developed by a subcommittee of Sectional Committee A40 on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment. Sectional Committee A40 was organized under the procedure of the American Standards Association in August, 1928, and Subcommittee No. 11 on Solder-Joint Fittings for Tubing was appointed in October, 1936.

Subcommittee No. 11 held its first meeting in New York on October 29, 1936, at which the various problems concerning bore diameter and tolerance, length of joint, and seal were considered. During this discussion the committee was informed of the investigation of solder joints that was being carried on by the National Bureau of Standards. At this meeting a subgroup was appointed to study the limits or tolerances of the solder fittings as now being manufactured, the minimum depth of bore, the laying lengths of joints, and the diameters and tolerances of copper tubing. At this first meeting the subcommittee also decided that its scope would be limited to solder fittings for use in plumbing.

Subcommittee No. 11 held six meetings. The first draft of a proposed standard for solder joint fittings was prepared and sent to the members of the subcommittee in February, 1939. A revised draft was set in type in May 1939, and in August 1939 a further revised draft was distributed to a selected list of interested organizations and individuals for criticism and comment. At the November 1939 meeting of Subcommittee No. 11, the comments on the July 1939 draft were discussed, and a new draft dated March 1940 was prepared in line with these suggestions and later approved by the members of the subcommittee. Several further refinements agreed to by Subcommittee No. 11 were included in the April 1940 draft which was approved by letter ballot vote of the members of Sectional Committee A40 on which twenty-seven national organizations were officially represented. Following approval of the sponsor body, it was presented to the American Standards Association with recommendation for approval as an American Standard. This approval was given on January 13, 1941, with the designation A40.3-1941.

The committee was very fortunate in having the advantage of the study on solder joints that was begun at the National Bureau of Standards about a year prior to its appointment and the continuance of the work by Mr. A. R. Maupin at the Bureau during the development of this standard.

In 1949, the sponsors transferred this activity to Sectional Committee B16 on the Standardization of Pipe Flanges and Fittings because the expanded use of solder joint fittings had resulted in many applications outside the field of plumbing and plumbing equipment. The chairman of Sectional Committee B16 established Subcommittee No. 9 on Standardization of Solder Joint Fittings to develop a revised standard.

Proofs dated April 1949 were distributed to industry for criticism and comment. Certain recommendations for changes were described in a letter to the sectional committee when the proposed standard was submitted for letter ballot vote. Following approval by this body, the proposal was next approved by the sponsor organizations and the American Standards Association, and was finally designated as an American Standard with the new designation B16.18-1950.

In 1958, work was begun on a revision of the standard to bring it into agreement with practices that had proven successful since the issuance of the 1950 edition. This work together with considerable polishing of the language was approved by letter ballot of the sectional committee and sponsors. After presentation, the American Standards Association granted approval as an American Standard on April 24, 1963.

Starting in 1969, a comprehensive review of the standard was initiated. An extensive revision was proposed to clarify much of the text and which also permitted an additional material to be used. This proposal was approved consecutively by Subcommittee No. 9, the standards committee, and the co-secretariat. Final approval was granted by ANSI on March 2, 1972.

Starting in April 1974, consideration began for updating and metricating the standard. A number of editorial changes were adopted which included the redesignation to copper alloy from bronze, along with metrication. Also added were dimensions for supply and return tees, baseboard tees, and flush bushings. Following approval by Subcommittee I (formerly 9), the standards committee, and the co-secretariat, ANSI granted approval on November 21, 1978.

Starting in February 1982, a general review was begun. A number of editorial changes and a few pictorial errors were corrected. Table 2 was updated by rounding four place decimals to three place. This was done in an effort to bring the table more in line with practical gaging methods. Table B2 was correspondingly corrected.

Dimensions and tolerances shown as whole or multiples of 0.5 mm may differ slightly in absolute value from the customary dimensions. It is the intent of this standard that any dimension which is within tolerance by either metric or customary measurement is considered to be in conformance with this standard.

Following approval by Subcommittee I, the B16 Standards Committee, and ASME, the American National Standards Institute granted approval on January 13, 1984.

All requests for interpretations or suggestions for revisions should be sent to the Secretary of B16, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017.

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CAST COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS

1 SCOPE

1.1 This Standard, for cast copper alloy solder joint pressure fittings designed for use with copper water tube, covers:

- (a) Pressure-temperature ratings
- (b) Abbreviations for end connections
- (c) Sizes, and method of designating openings of reducing fittings
- (d) Marking
- (e) Material
- (f) Dimensions and tolerances
- (g) Tests

1.2 Metric equivalents of the customary inch dimensions listed in Table 2 are found in Annex B.

2 PRESSURE-TEMPERATURE RATING

2.1 Fittings manufactured to this Standard may be used for the same pressure-temperature ratings as straight, seamless ASTM B88 Type L Copper Water Tube, annealed.

2.2 To insure adequacy of fitting design, the actual bursting strength of fittings shall not be less than the computed bursting strength of Type L Copper Water Tube, annealed.

2.3 The safe working pressure-temperature rating for a solder joint piping system is dependent not only on fitting and tube strength but also on the composition of the solder used for joints.

2.4 Pressure-temperature ratings for solder joints conforming to the dimensions of Table 2 and made with typical commercial solders are given in Annex A.

3 ABBREVIATIONS

The following symbols are used to designate the type of fitting end:

Symbol

- | | |
|------------|--|
| <i>C</i> | Solder joint fitting end machined to receive copper tube diameter (female) |
| <i>FTG</i> | Solder joint fitting end machined to copper tube diameter (male) |
| <i>F</i> | Internal ANSI Standard Taper Pipe Thread (female) NPTI |
| <i>M</i> | External ANSI Standard Taper Pipe Thread (male) NPTE |

4 SIZE

4.1 The size of the fittings shown in Tables 2 and B2 corresponds to standard water tube size as shown in the American Standard Specifications for Copper Water Tube, ASTM B88. The size of the threaded ends corresponds to nominal pipe size.¹

4.2 Reducing fittings are designated by the size of the openings in the sequence illustrated in Fig. 1. The size of the threaded ends will be identified by the corresponding nominal pipe size.¹

5 MARKING

Each fitting shall be permanently marked with the manufacturer's name or trademark in accordance with MSS SP-25. Marking of fittings less than ½ in. is optional and may be omitted if not practical.

¹The use of the word nominal as a modifier of a dimension or size is intended to indicate that the stated dimension or size is used for purposes of designation only. The actual dimension may be the nominal dimension subject to the variation of established tolerances.

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Table 1 Inspection Tolerances

Standard Water Tube and Pipe Thread Size	Plus or Minus	
	in.	mm
$\frac{1}{4}$, $\frac{3}{8}$	0.05	1.3
$\frac{1}{2}$, $\frac{3}{4}$	0.06	1.5
1 to 2 incl	0.08	2.0
$2\frac{1}{2}$ to $3\frac{1}{2}$ incl	0.11	2.8
4, 5	0.12	3.2
6, 8	0.16	4.0
10, 12	0.20	5.2

6 MATERIAL

Castings shall be copper alloy produced to meet

(a) the requirements of ASTM B62 Alloy C83600, or

(b) the chemical and tensile requirements of ASTM B584 Alloy C83800 or C84400 and in all other respects comply with the requirements of ASTM B62.

7 METAL THICKNESS

It is recognized that some variations are unavoidable in the making of patterns and castings. Fittings or components shall be designed to produce metal thicknesses given in Table 2. At no point shall metal thickness be less than 90% of the thickness given in Table 2. Additional thickness may be required to meet the provisions of 2.2.

8 INSPECTION TOLERANCE

8.1 An inspection tolerance as shown in Table 1 shall be allowed on center-to-shoulder, center-to-center, center-to-threaded end, shoulder-to-solder end, and shoulder-to-threaded end dimensions on all fittings having solder cup or female solder ends and on center-to-solder end, and solder-to-threaded end dimensions on all fittings having fittings or male solder ends.

8.2 The inspection tolerances for laying lengths of couplings (dimensions M, N, and W, Table 6) shall be double the tolerances shown in Table 1 except that the minus tolerances applied to dimensions M, Tables 6 and B6, shall not result in a dimension less than 0.06 in. (1.5 mm) for sizes $\frac{1}{4}$ through 1 in., inclusive,

or a dimension less than 0.09 in. (2.3 mm) for the larger sizes.

8.3 The largest opening in the fitting governs the tolerance to be applied to all openings.

9 THREADED ENDS

9.1 Fitting threads shall be right hand, conforming to the ANSI Standard for Pipe Threads (ANSI/ASME B1.20.1). They shall be taper threads (NPT).

9.2 All internal threads shall be countersunk a distance not less than one-half the pitch of the thread at an angle of approximately 45 deg. with the axis of the thread, and all external threads shall be chamfered at an angle of 30 to 45 deg. from the axis, for the purpose of easier entrance in making a joint and protection of the thread. Countersinking and chamfering shall be concentric with the threads.

9.3 The length of threads specified in all tables shall be measured to include the countersink or chamfer.

9.4 Tapered pipe threads (NPT) shall be checked by use of working plug or ring gages in either standard or limit types. Gages shall be screwed on/in hand tight. The gage reference point (notch) on the internal thread is at the bottom of the 45 deg. countersink (approximately $\frac{1}{2}$ thread from face). On the external thread it shall be flush with the end of the fitting.

9.5 Tolerance for an internal threaded end having an internal shoulder shall be from the gage reference point (notch) to one turn small. Tolerance for an internal threaded end without shoulder shall be from one turn small to one turn large. The tolerance for external threads shall be one turn small or large.

10 DESIGN OPTION FOR THREADED ENDS

At the manufacturer's option, female ends of fittings may be furnished with a polygon or bead with or without ribs, and male ends of fittings may be furnished with a polygon, ribs or flats.

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11 ALIGNMENT

The maximum allowable deviation in the alignment of the thread of any threaded opening, and the outside diameter (male) and inside diameter (female) of a solder joint end shall be 0.06 in./ft (0.5%).

12 TEST

These fittings shall be tested at a gage air pressure of 60 psi (4.1 bar) minimum while under water or to a hydrostatic gage pressure of 250 psi (17.2 bar) for sufficient length of time to assure tightness.

13 STANDARD GAGING METHOD

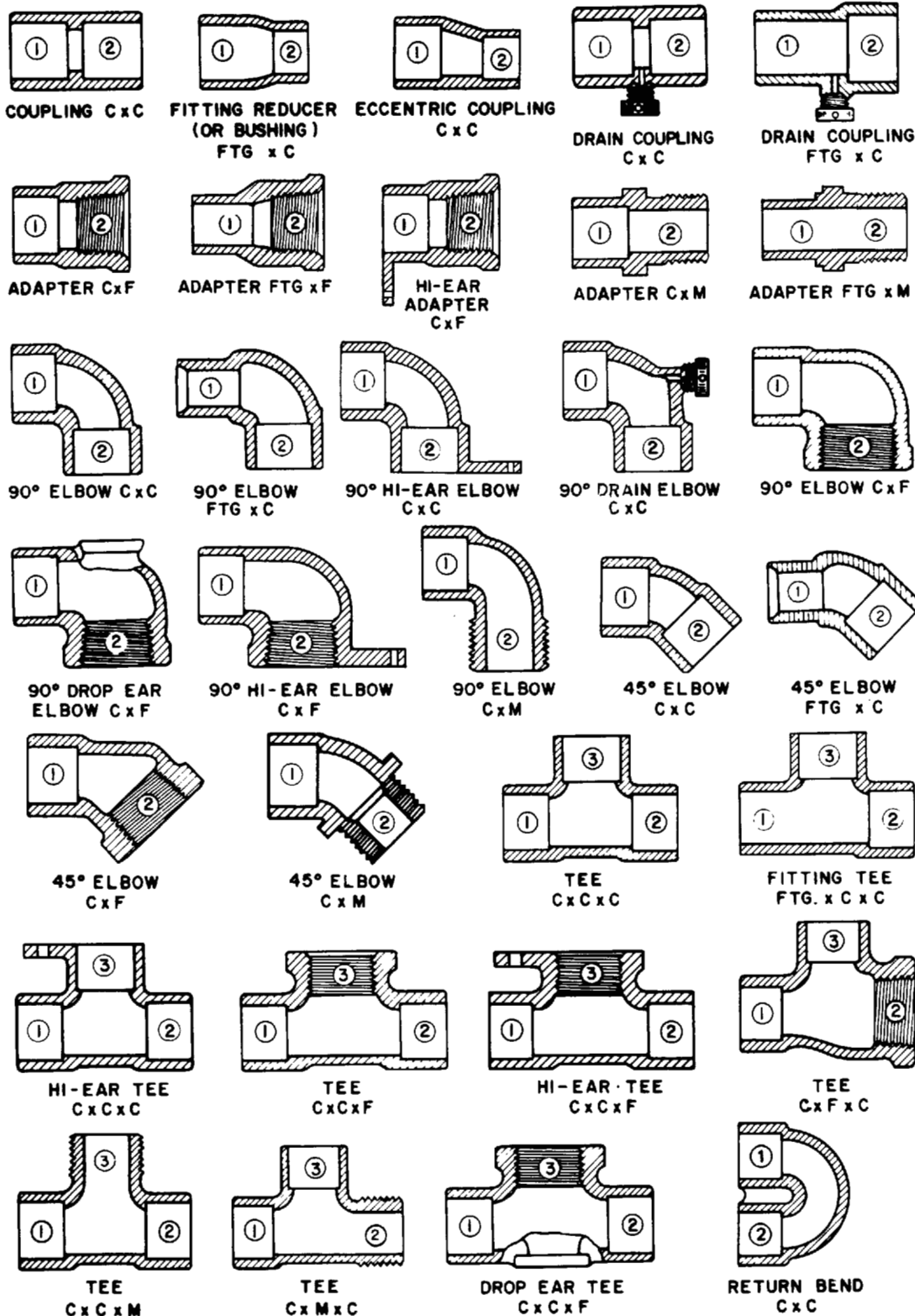
The standard method of gaging the diameter tolerances for male and female ends shall be by the use of plain plug and ring gages designed to hold the product within the limits established in Tables 2 and B2.

14 OPTIONAL GAGING METHOD

When gaging the diameters of male and female ends, using direct reading instruments, refer to Note (4) of Tables 2 and B2.

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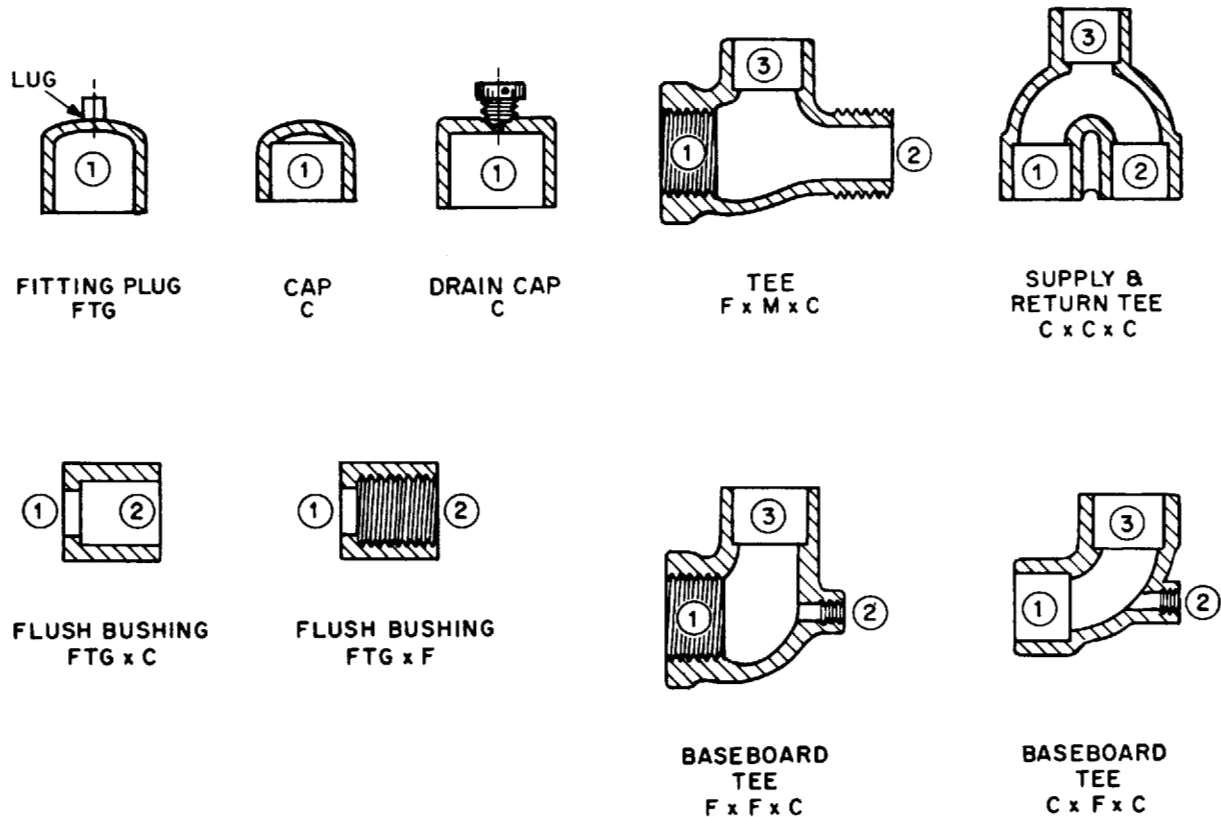
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GENERAL NOTE: Fittings are designated by size in the order shown—i.e., 1 x 2 x 3
FIG. 1 METHOD OF DESIGNATING OPENINGS OF REDUCING FITTINGS

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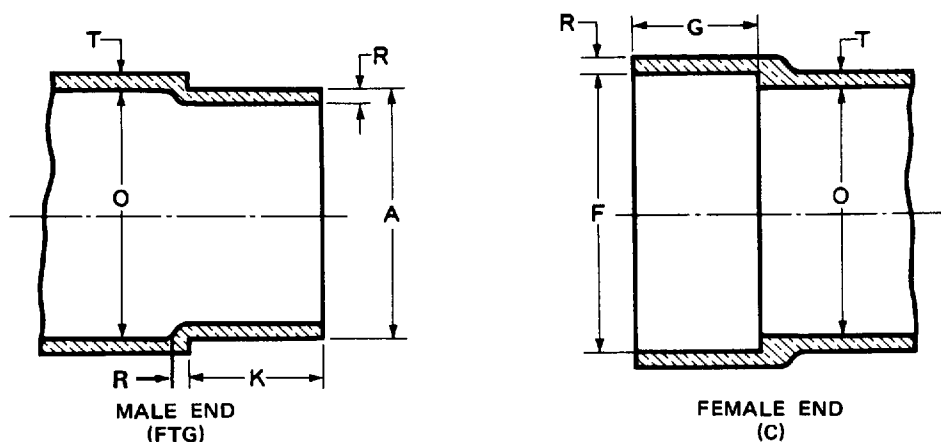


GENERAL NOTE: Fittings are designated by size in the order shown — i.e., 1 X 2 X 3

FIG. 1 METHOD OF DESIGNATING OPENINGS OF REDUCING FITTINGS (CONT'D)

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Table 2 Dimensions of Solder Joint Ends¹

Standard Water Tube Size ²	Male End			Female End			Metal Thickness ³		Inside Diameter of Fitting O
	Outside Diameter A ⁴		Length K	Inside Diameter F		Depth G	Body T	Joint R	
	Min.	Max.	Min.	Min.	Max.	Min.			Min.
1/4	0.373	0.376	0.38	0.377	0.381	0.31	0.08	0.05	0.31
3/8	0.497	0.501	0.44	0.502	0.506	0.38	0.09	0.05	0.43
1/2	0.622	0.626	0.56	0.627	0.631	0.50	0.09	0.05	0.54
3/4	0.872	0.876	0.81	0.877	0.881	0.75	0.10	0.06	0.78
1	1.122	1.127	0.97	1.128	1.132	0.91	0.11	0.07	1.02
1 1/4	1.372	1.377	1.03	1.378	1.382	0.97	0.12	0.07	1.26
1 1/2	1.621	1.627	1.16	1.628	1.633	1.09	0.13	0.08	1.50
2	2.121	2.127	1.41	2.128	2.133	1.34	0.15	0.09	1.98
2 1/2	2.621	2.627	1.53	2.628	2.633	1.47	0.17	0.10	2.46
3	3.121	3.127	1.72	3.128	3.133	1.66	0.19	0.11	2.94
3 1/2	3.621	3.627	1.97	3.628	3.633	1.91	0.20	0.12	3.42
4	4.121	4.127	2.22	4.128	4.133	2.16	0.22	0.13	3.90
5	5.121	5.127	2.72	5.128	5.133	2.66	0.28	0.17	4.87
6	6.121	6.127	3.22	6.128	6.133	3.09	0.34	0.20	5.84
8	8.119	8.127	4.09	8.128	8.133	3.97	0.38	0.31	7.72
10	10.119	10.127	4.12	10.128	10.133	4.00	0.48	0.48	9.62
12	12.119	12.127	4.62	12.128	12.133	4.50	0.56	0.56	11.56

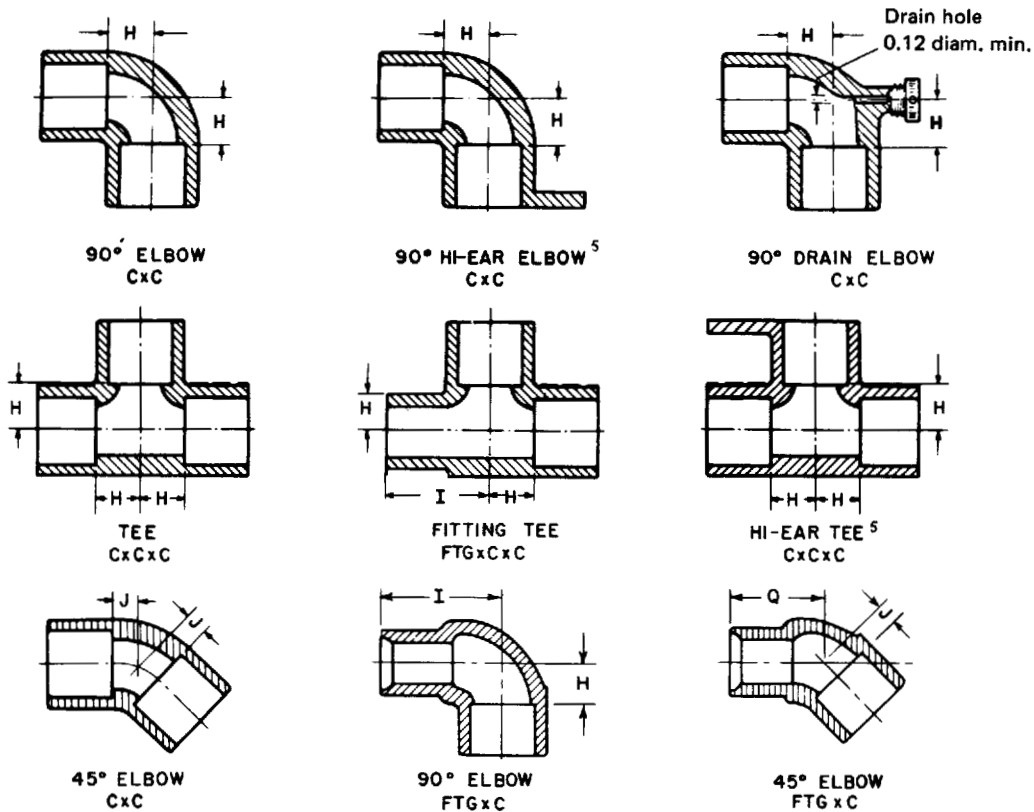
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) The sketches and designs of fittings are illustrative only. The dimensions herein shall govern in all cases.
- (2) For size designation of fitting, see 4.1.
- (3) For metal thickness tolerance, see 7.
- (4) Maximum ovality shall not exceed 1% of the diameter in Table 2. The average of the maximum and minimum diameters must be within the dimensions shown in this table.

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Table 3 Dimensions of Elbows, Tees, and 45 Deg. Elbows^{2,3,4}

Standard Water Tube Size ¹	Laying Length Tee and 90 Deg. Elbow ³	Center-to-End 90 Deg. Elbow and Tee ³	Laying Length 45 Deg. Elbow ³	Center-to-End 45 Deg. Elbow ³
	H	I	J	Q
1/4	0.25	0.75	...	...
3/8	0.31	0.88	0.19	0.75
1/2	0.44	1.12	0.19	0.88
3/4	0.56	1.50	0.25	1.19
1	0.75	1.84	0.31	1.31
1 1/4	0.88	2.03	0.44	1.56
1 1/2	1.00	2.28	0.50	1.75
2	1.25	2.78	0.56	2.12
2 1/2	1.50	3.16	0.62	...
3	1.75	3.59	0.75	...
3 1/2	2.00	...	0.88	...
4	2.25	4.59	0.94	...
5	3.12	...	1.44	...
6	3.62	...	1.62	...
8	4.88	...	2.12	...

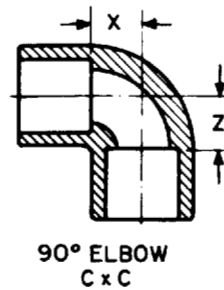
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table 2.
- (5) Hi-ear fittings are designed for use with 9/16 in. maximum width strap.

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Table 4 Dimensions of Reducing 90 Deg. Elbows^{2,3,4}

Standard Water Tube Size ¹	Laying Length ³	
	X	Z
3/8 x 1/4	0.25	0.31
1/2 x 3/8	0.38	0.44
3/4 x 1/2	0.44	0.56
1 x 3/4	0.62	0.75
1 x 1/2	0.50	0.75
1 1/4 x 1	0.75	0.88
1 1/4 x 3/4	0.62	0.88
1 1/4 x 1/2	0.50	0.88
1 1/2 x 1 1/4	0.88	1.00
1 1/2 x 1	0.75	1.00
1 1/2 x 3/4	0.62	1.00
2 x 1 1/2	1.00	1.25
2 x 1 1/4	0.88	1.25
2 x 1	0.75	1.25
2 x 3/4	0.62	1.25
2 1/2 x 2	1.25	1.50
2 1/2 x 1 1/2	1.00	1.50
2 1/2 x 1 1/4	0.88	1.50
2 1/2 x 1	0.75	1.50
3 x 2 1/2	1.50	1.75
3 x 2	1.25	1.75
3 x 1 1/2	1.00	1.75
3 x 1 1/4	0.88	1.75
4 x 3	1.75	2.25
4 x 2 1/2	1.50	2.25
4 x 2	1.25	2.25
6 x 4	2.62	3.62
6 x 3	2.00	3.62
8 x 6	3.88	4.88

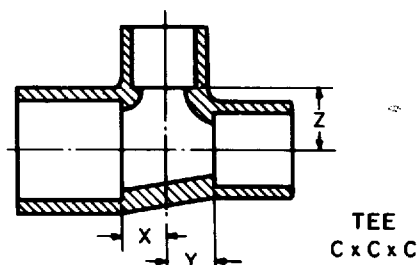
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
 (2) For dimensions not given in this table, see Table 2.
 (3) For inspection tolerances, see 8 and Table 1.
 (4) See Note (4) of Table 2.

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Table 5 Dimensions of Reducing Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Length ³			Standard Water Tube Size ¹	Laying Length ³		
	X	Y	Z		X	Y	Z
3/8 x 3/8 x 1/2	0.44	0.44	0.38	1 1/4 x 3/4 x 3/4	0.62	0.62	0.88
3/8 x 3/8 x 1/4	0.25	0.25	0.31	1 1/4 x 1/2 x 1 1/4	0.88	0.88	0.88
1/2 x 1/2 x 3/4	0.56	0.56	0.44	1 1/4 x 1/2 x 1	0.75	0.75	0.88
1/2 x 1/2 x 3/8	0.38	0.38	0.44	1 1/2 x 1 1/2 x 2 1/2	1.50	1.50	1.00
1/2 x 1/2 x 1/4	0.31	0.31	0.44	1 1/2 x 1 1/2 x 2	1.25	1.25	1.00
1/2 x 3/8 x 1/2	0.44	0.44	0.44	1 1/2 x 1 1/2 x 1 1/4	0.88	0.88	1.00
1/2 x 3/8 x 3/8	0.38	0.38	0.44	1 1/2 x 1 1/2 x 1	0.75	0.75	1.00
3/4 x 3/4 x 1	0.75	0.75	0.62	1 1/2 x 1 1/2 x 3/4	0.62	0.62	1.00
3/4 x 3/4 x 1/2	0.44	0.44	0.56	1 1/2 x 1 1/2 x 1/2	0.50	0.50	1.00
3/4 x 3/4 x 3/8	0.38	0.38	0.56	1 1/2 x 1 1/4 x 1 1/2	1.00	1.00	1.00
3/4 x 1/2 x 3/4	0.56	0.56	0.56	1 1/2 x 1 1/4 x 1 1/4	0.88	0.88	1.00
3/4 x 1/2 x 1/2	0.44	0.44	0.56	1 1/2 x 1 1/4 x 1	0.75	0.75	1.00
3/4 x 1/2 x 3/8	0.38	0.38	0.56	1 1/2 x 1 1/4 x 3/4	0.62	0.62	1.00
1 x 1 x 1 1/2	1.00	1.00	0.75	1 1/2 x 1 1/4 x 1/2	0.50	0.50	1.00
1 x 1 x 1 1/4	0.88	0.88	0.75	1 1/2 x 1 x 1 1/2	1.00	1.00	1.00
1 x 1 x 3/4	0.62	0.62	0.75	1 1/2 x 1 x 1 1/4	0.88	0.88	1.00
1 x 1 x 1/2	0.50	0.50	0.75	1 1/2 x 1 x 1	0.75	0.75	1.00
1 x 1 x 3/8	0.44	0.44	0.75	1 1/2 x 3/4 x 1 1/2	1.00	1.00	1.00
1 x 3/4 x 1	0.75	0.75	0.75	1 1/2 x 1/2 x 1 1/2	1.00	1.00	1.00
1 x 3/4 x 3/4	0.62	0.62	0.75	2 x 2 x 4	2.25	2.25	1.25
1 x 3/4 x 1/2	0.50	0.50	0.75	2 x 2 x 3	1.75	1.75	1.25
1 x 1/2 x 1	0.75	0.75	0.75	2 x 2 x 2 1/2	1.50	1.50	1.25
1 x 1/2 x 3/4	0.62	0.62	0.75	2 x 2 x 1 1/2	1.00	1.00	1.25
1 x 1/2 x 1/2	0.50	0.50	0.75	2 x 2 x 1 1/4	0.88	0.88	1.25
1 1/4 x 1 1/4 x 2	1.25	1.25	0.88	2 x 2 x 1	0.75	0.75	1.25
1 1/4 x 1 1/4 x 1 1/2	1.00	1.00	0.88	2 x 2 x 3/4	0.62	0.62	1.25
1 1/4 x 1 1/4 x 1	0.75	0.75	0.88	2 x 2 x 1/2	0.50	0.50	1.25
1 1/4 x 1 1/4 x 3/4	0.62	0.62	0.88	2 x 1 1/2 x 2	1.25	1.25	1.25
1 1/4 x 1 1/4 x 1/2	0.50	0.50	0.88	2 x 1 1/2 x 1 1/2	1.00	1.00	1.25
1 1/4 x 1 x 1 1/4	0.88	0.88	0.88	2 x 1 1/2 x 1 1/4	0.88	0.88	1.25
1 1/4 x 1 x 1	0.75	0.75	0.88	2 x 1 1/2 x 1	0.75	0.75	1.25
1 1/4 x 1 x 3/4	0.62	0.62	0.88	2 x 1 1/2 x 3/4	0.62	0.62	1.25
1 1/4 x 1 x 1/2	0.50	0.50	0.88	2 x 1 1/2 x 1/2	0.50	0.50	1.25
1 1/4 x 3/4 x 1 1/4	0.88	0.88	0.88	2 x 1 1/4 x 2	1.25	1.25	1.25
1 1/4 x 3/4 x 1	0.75	0.75	0.88	2 x 1 1/4 x 1 1/2	1.00	1.00	1.25

GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table 2.

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Table 5 Dimensions of Reducing Tees^{2,3,4} (Cont'd)

Standard Water Tube Size ¹	Laying Length ³			Standard Water Tube Size ¹	Laying Length ³		
	X	Y	Z		X	Y	Z
2 x 1 1/4 x 1 1/4	0.88	0.88	1.25	3 x 2 x 1 1/2	1.00	1.00	1.75
2 x 1 x 2	1.25	1.25	1.25	3 x 1 1/2 x 3	1.75	1.75	1.75
2 x 3/4 x 2	1.25	1.25	1.25	3 x 1 1/4 x 3	1.75	1.75	1.75
2 x 1/2 x 2	1.25	1.25	1.25	3 x 1 x 3	1.75	1.75	1.75
2 1/2 x 2 1/2 x 4	2.25	2.25	1.50	3 1/2 x 3 1/2 x 3	1.75	1.75	2.00
2 1/2 x 2 1/2 x 3	1.75	1.75	1.50	3 1/2 x 3 x 3 1/2	2.00	2.00	2.00
2 1/2 x 2 1/2 x 2	1.25	1.25	1.50	4 x 4 x 6	3.62	3.62	2.62
2 1/2 x 2 1/2 x 1 1/2	1.00	1.00	1.50	4 x 4 x 3	1.75	1.75	2.25
2 1/2 x 2 1/2 x 1 1/4	0.88	0.88	1.50	4 x 4 x 2 1/2	1.50	1.50	2.25
2 1/2 x 2 1/2 x 1	0.75	0.75	1.50	4 x 4 x 2	1.25	1.25	2.25
2 1/2 x 2 1/2 x 3/4	0.62	0.62	1.50	4 x 4 x 1 1/2	1.00	1.00	2.25
2 1/2 x 2 1/2 x 1/2	0.50	0.50	1.50	4 x 4 x 1 1/4	0.88	0.88	2.25
2 1/2 x 2 x 2 1/2	1.50	1.50	1.50	4 x 4 x 1	0.75	0.75	2.25
2 1/2 x 2 x 2	1.25	1.25	1.50	4 x 4 x 3/4	0.62	0.62	2.25
2 1/2 x 2 x 1 1/2	1.00	1.00	1.50	4 x 3 x 4	2.25	2.25	2.25
2 1/2 x 2 x 1 1/4	0.88	0.88	1.50	4 x 3 x 3	1.75	1.75	2.25
2 1/2 x 2 x 1	0.75	0.75	1.50	4 x 3 x 2 1/2	1.50	1.50	2.25
2 1/2 x 2 x 3/4	0.62	0.62	1.50	4 x 3 x 2	1.25	1.25	2.25
2 1/2 x 2 x 1/2	0.50	0.50	1.50	4 x 2 1/2 x 4	2.25	2.25	2.25
2 1/2 x 1 1/2 x 2 1/2	1.50	1.50	1.50	4 x 2 x 4	2.25	2.25	2.25
2 1/2 x 1 1/2 x 2	1.25	1.25	1.50	4 x 2 x 3	1.75	1.75	2.25
2 1/2 x 1 1/2 x 1 1/2	1.00	1.00	1.50	4 x 2 x 2	1.25	1.25	2.25
2 1/2 x 1 1/4 x 2 1/2	1.50	1.50	1.50	4 x 1 1/2 x 4	2.25	2.25	2.25
2 1/2 x 1 x 2 1/2	1.50	1.50	1.50	4 x 1 1/4 x 4	2.25	2.25	2.25
2 1/2 x 3/4 x 2 1/2	1.50	1.50	1.50	4 x 1 x 4	2.25	2.25	2.25
2 1/2 x 1/2 x 2 1/2	1.50	1.50	1.50	5 x 5 x 4	2.62	2.62	3.12
3 x 3 x 4	2.25	2.25	1.75	5 x 4 x 5	3.12	3.12	3.12
3 x 3 x 2 1/2	1.50	1.50	1.75	6 x 6 x 8	4.88	4.88	3.88
3 x 3 x 2	1.25	1.25	1.75	6 x 6 x 4	2.62	2.62	3.62
3 x 3 x 1 1/2	1.00	1.00	1.75	6 x 6 x 3	2.00	2.00	3.62
3 x 3 x 1 1/4	0.88	0.88	1.75	6 x 6 x 2 1/2	1.88	1.88	3.62
3 x 3 x 1	0.75	0.75	1.75	6 x 6 x 2	1.62	1.62	3.62
3 x 3 x 3/4	0.62	0.62	1.75	6 x 6 x 1 1/2	1.38	1.38	3.62
3 x 3 x 1/2	0.50	0.50	1.75	6 x 6 x 1 1/4	1.25	1.25	3.62
3 x 2 1/2 x 3	1.75	1.75	1.75	6 x 6 x 1	1.12	1.12	3.62
3 x 2 1/2 x 2 1/2	1.50	1.50	1.75	6 x 4 x 6	3.62	3.62	3.62
3 x 2 1/2 x 2	1.25	1.25	1.75	6 x 4 x 4	2.62	2.62	3.62
3 x 2 1/2 x 1 1/2	1.00	1.00	1.75	6 x 3 x 6	3.62	3.62	3.62
3 x 2 1/2 x 1 1/4	0.88	0.88	1.75	6 x 2 1/2 x 6	3.62	3.62	3.62
3 x 2 1/2 x 1	0.75	0.75	1.75	6 x 2 x 6	3.62	3.62	3.62
3 x 2 x 3	1.75	1.75	1.75	8 x 8 x 6	3.88	3.88	4.88
3 x 2 x 2 1/2	1.50	1.50	1.75	8 x 8 x 4	2.88	2.88	4.88
3 x 2 x 2	1.25	1.25	1.75				

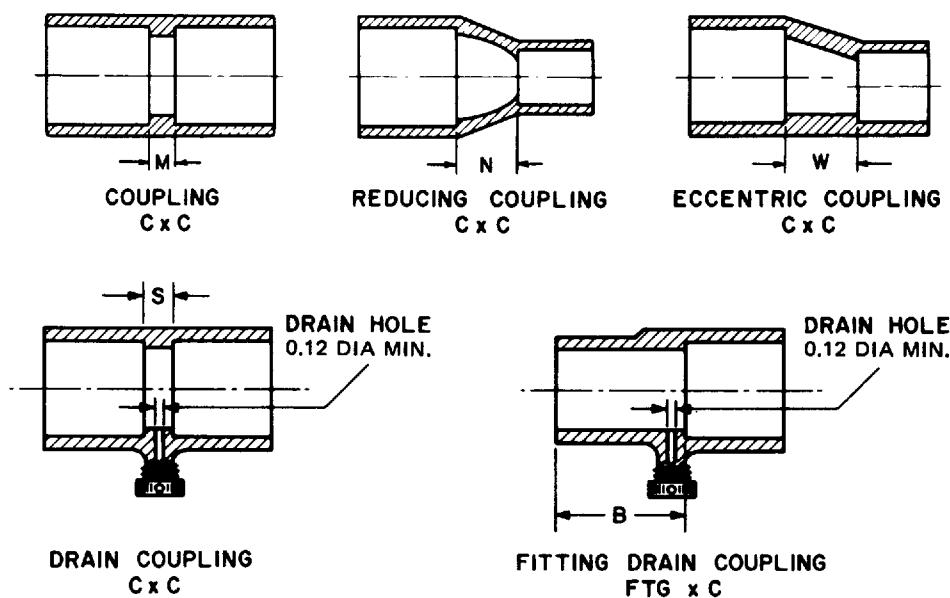
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table 2.

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Table 6 Dimensions of Couplings^{2,3,4}

Straight		Reducing		Eccentric		Drain	
Standard Water Tube Size ¹	Laying Length M ³	Standard Water Tube Size ¹	Laying Length N ³	Standard Water Tube Size ¹	Laying Length W ³	Laying Length S ³	Laying Length B ³
1/4	0.06	3/4 x 1/2	0.31	3/4 x 1/2	0.62	0.25	....
3/8	0.06	1 x 3/4	0.38	1 x 3/4	0.69	0.25	....
1/2	0.12	1 1/4 x 1	0.38	1 1/4 x 1	0.75	0.25	1.00
3/4	0.12	1 1/4 x 3/4	0.38	1 1/4 x 3/4	0.75	0.25	1.28
1	0.12	1 1/2 x 1 1/4	0.38	1 1/2 x 1 1/4	0.69	0.25	....
1 1/4	0.12	1 1/2 x 1	0.38	1 1/2 x 1	0.69	0.25	....
1 1/2	0.12	1 1/2 x 3/4	0.44	2 x 1 1/2	1.12	0.25	....
2	0.19	2 x 1 1/2	0.50	2 x 1 1/4	0.94	0.25	....
2 1/2	0.19	2 x 1 1/4	0.50	2 1/2 x 2	1.19	....	....
3	0.19	2 x 1	0.50	3 x 2 1/2	1.25	....	....
3 1/2	0.25	2 x 3/4	0.50	3 x 2	1.31	....	....
4	0.25	2 1/2 x 2	0.56	4 x 3	2.00	....	....
5	0.25	2 1/2 x 1 1/2	0.56	....	....	....	....
6	0.25	2 1/2 x 1 1/4	0.62	....	....	....	....
8	0.62	2 1/2 x 1	0.62	....	....	....	....
....	....	3 x 2 1/2	0.62	....	....	....	....
....	....	3 x 2	0.62	....	....	....	....
....	....	4 x 3	0.69	....	....	....	....
....	....	4 x 2 1/2	1.12	....	....	....	....
....	....	4 x 2	1.19	....	....	....	....
....	....	6 x 4	1.31	....	....	....	....
....	....	8 x 6	1.38	....	....	....	....

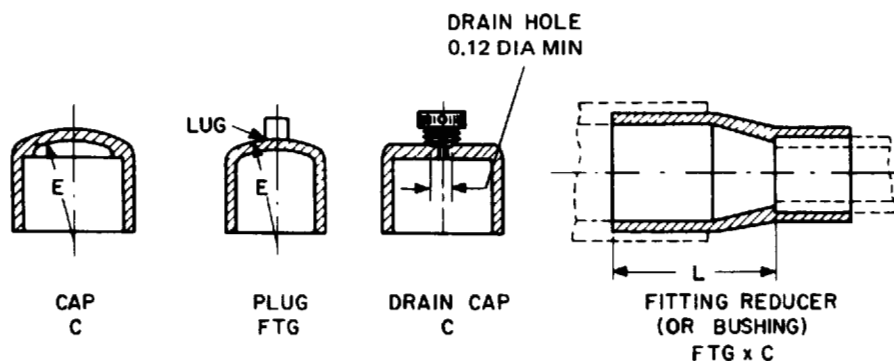
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table 2.

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Table 7 Dimensions of Caps
and Plugs^{2,3,4,5}

Standard Water Tube Size ¹	Caps and Plugs
	Radius E ³
1/4	0.38
3/8	0.50
1/2	0.62
3/4	0.88
1	1.12
1 1/4	1.38
1 1/2	1.62
2	2.12
2 1/2	2.62
3	3.12
3 1/2	3.62
4	4.12
5	5.12
6	6.12

GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For other dimensions, see Table 2.
- (3) Caps may have either flat or rounded top.
- (4) Casting of lug or square on plugs shall be optional.
- (5) See Note (4) of Table 2.

Table 8 Dimensions of Fitting Reducers^{2,3}

Standard Water Tube Size ¹	Length L
3/8 x 1/4	0.69
1/2 x 3/8	0.94
1/2 x 1/4	0.94
3/4 x 1/2	1.19
3/4 x 3/8	1.25
1 x 3/4	1.50
1 x 1/2	1.50
1 1/4 x 1	1.62
1 1/4 x 3/4	1.62
1 1/4 x 1/2	1.62
1 1/2 x 1 1/4	1.81
1 1/2 x 1	1.81
1 1/2 x 3/4	1.81
2 x 1 1/2	2.12
2 x 1 1/4	2.12
2 x 1	2.12
2 1/2 x 2	2.38
2 1/2 x 1 1/2	2.38
2 1/2 x 1 1/4	2.38
3 x 2 1/2	2.62
3 x 2	2.62
3 x 1 1/2	2.62
4 x 3	3.44
4 x 2 1/2	3.44
4 x 2	3.44

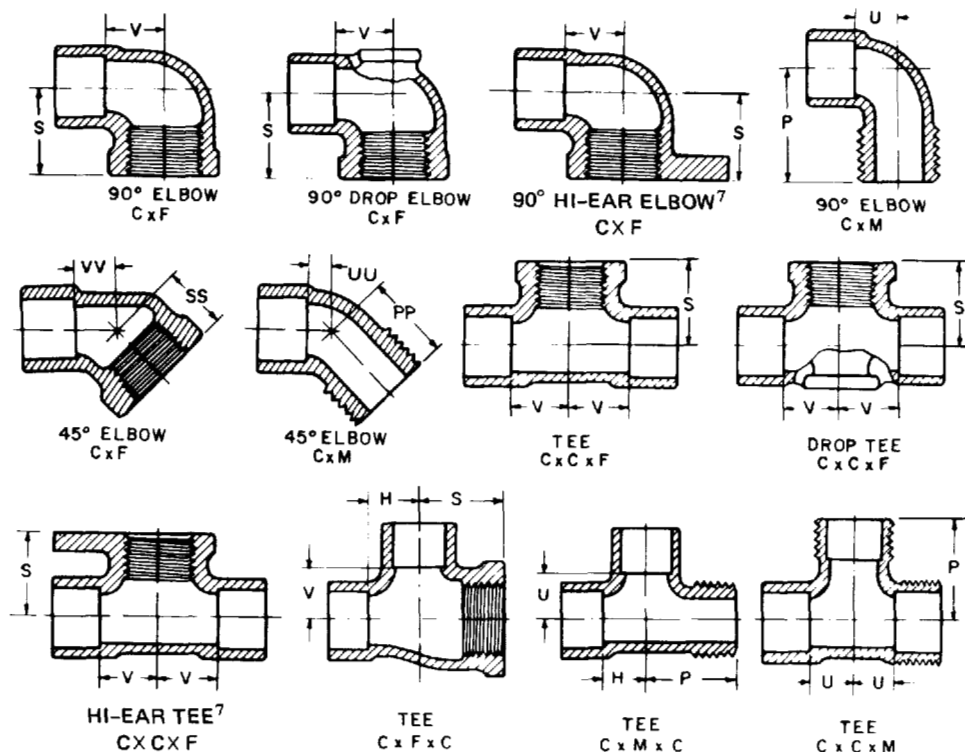
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For other dimensions, see Table 2.
- (3) See Note (4) of Table 2.

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Table 9 Dimensions of Solder Joint Elbows and Tees with Pipe Thread Ends
(Straight Sizes)^{3,4,5,6}

Standard Water Tube and Pipe Thread Size ¹	Internal Threads ²					External Threads ²				
	Center-to-End ⁵		Laying Length ⁵			Center-to-End ⁵		Laying Length ⁵		
	Ell And Tee S	45 Deg. Ell SS	Ell And Tee V	Tee H	45 Deg. Ell VV	Ell And Tee P	45 Deg. Ell PP	Ell And Tee U	Tee H	45 Deg. Ell UU
1/4	0.56	....	0.38	....	....	0.94	....	0.25	....	....
3/8	0.69	0.69	0.44	0.31	0.19	1.06	0.81	0.31	0.31	0.19
1/2	0.88	0.94	0.56	0.44	0.19	1.31	1.00	0.44	0.44	0.19
3/4	1.00	1.00	0.69	0.56	0.25	1.50	1.19	0.56	0.56	0.25
1	1.25	1.19	0.88	0.75	0.31	1.81	1.31	0.75	0.75	0.31
1 1/4	1.50	....	1.00	0.88	....	2.00	....	0.88	....	....
1 1/2	1.62	....	1.12	1.00	....	2.19	....	1.00	....	....
2	1.94	....	1.38	1.25	....	2.62	....	1.25	....	....
2 1/2	2.50	....	1.62	....	....	....	....	....	....	....
3	2.81	....	1.94	....	....	....	....	....	....	....
4	3.44	....	2.44	....	....	....	....	....	....	....
6	4.88	....	3.88	....	....	....	....	....	....	....

GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For threads of threaded ends, see 9.
- (3) For dimensions of threaded ends, see ANSI B16.15. For optional design of threaded end, see 10.1. For dimensions of solder joint ends, see Table 2.
- (4) For dimensions of reducing tees and ells, see Table 10.
- (5) For inspection tolerances, see 8 and Table 1.
- (6) See Note (4) of Table 2.
- (7) Hi-ear fittings are designed for use with 9/16 in. maximum width strap.

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(Sketches above Table 9 are applicable to Table 10)

Table 10 Dimensions of Solder Joint Elbows and Tees with Pipe Thread Ends
(Reducing Sizes)^{3,4,5}

Standard Water Tube and Pipe Thread Size ¹	Internal Threads ²							External Threads ²	
	Center-to-End			Laying Length ⁴				Center- to- End	Laying Length ⁴
	S			V			H	P	U
	90 Deg. Ell C-F	Tee C-C-F	Tee C-F-C	90 Deg. Ell C-F	Tee C-C-F	Tee C-F-C	Tee C-F-C	90 Deg. Ell C-M	90 Deg. Ell C-M
3/8 x 3/8 x 1/2	....	0.81	....	....	0.56	....	....	....	....
3/8 x 1/2	0.81	....	....	0.56	....	....	....	1.25	0.44
1/2 x 1/2 x 3/4	....	0.94	....	....	0.69	....	....	....	....
1/2 x 3/4	0.94	....	....	0.69	....	....	....	1.38	0.56
1/2 x 1/2 x 3/8	....	0.81	....	....	0.50	....	....	....	....
1/2 x 3/8	0.81	....	....	0.50	....	....	....	1.12	0.31
3/4 x 3/4 x 1	....	1.12	....	....	0.88	....	....	....	....
3/4 x 1	1.12	....	....	0.88	....	....	....	1.69	0.75
3/4 x 3/4 x 1/2	....	0.94	0.94	....	0.56	0.69	0.44	....	....
3/4 x 1/2	0.94	....	....	0.56	....	....	....	1.44	0.44
3/4 x 3/4 x 3/8	....	0.88	....	....	0.50	....	....	....	....
3/4 x 3/8	0.88	....	....	0.50	....	....	....	....	....
3/4 x 1/2 x 3/4	....	....	0.94	....	....	0.56	0.56	....	....
3/4 x 1/2 x 1/2	....	0.94	0.88	....	0.56	0.56	0.44	....	....
1 x 1 x 1 1/4	1.38	....	....	1.00	....	....	....	....	....
1 x 1 x 3/4	....	1.19	....	....	0.69	....	....	....	....
1 x 3/4	1.19	....	....	0.69	....	....	....	1.62	0.56
1 x 1 x 1/2	....	1.12	....	....	0.56	....	....	....	....
1 x 1 x 3/8	....	1.06	....	....	0.50	....	....	....	....
1 x 3/4 x 1	....	1.25	1.19	....	0.88	0.75	0.75	....	....
1 x 3/4 x 3/4	....	1.19	....	....	0.69	....	....	....	....
1 x 3/4 x 1/2	....	1.12	....	....	0.56	....	....	....	....
1 x 1/2 x 1	....	....	1.12	....	....	0.75	0.75	....	....
1 1/4 x 1 1/4 x 1	....	1.44	....	....	0.88	....	....	....	....
1 1/4 x 1	1.44	....	....	0.88	....	....	....	....	....
1 1/4 x 1 1/4 x 3/4	....	1.31	....	....	0.69	....	....	....	....
1 1/4 x 1 1/4 x 1/2	....	1.25	....	....	0.56	....	....	....	....
1 1/4 x 1 1/4 x 3/8	....	1.19	....	....	0.50	....	....	....	....
1 1/4 x 3/4 x 1	....	....	1.19	....	....	0.88	0.75	....	....
1 1/2 x 1 1/2 x 1	....	1.50	1.38	....	0.88	1.12	0.75	....	....
1 1/2 x 1 1/2 x 3/4	....	1.44	....	....	0.69	....	....	....	....
1 1/2 x 1 1/2 x 1/2	....	1.38	....	....	0.56	....	....	....	....
1 1/2 x 3/4 x 1	....	....	1.19	....	....	1.00	0.75	....	....
2 x 2 x 1 1/2	....	1.88	....	....	1.12	....	....	....	....
2 x 2 x 1	....	1.75	....	....	0.88	....	....	....	....
2 x 2 x 3/4	....	1.69	....	....	0.69	....	....	....	....
2 x 2 x 1/2	....	1.62	....	....	0.56	....	....	....	....
2 1/2 x 2 1/2 x 3/4	....	2.06	....	....	0.69	....	....	....	....

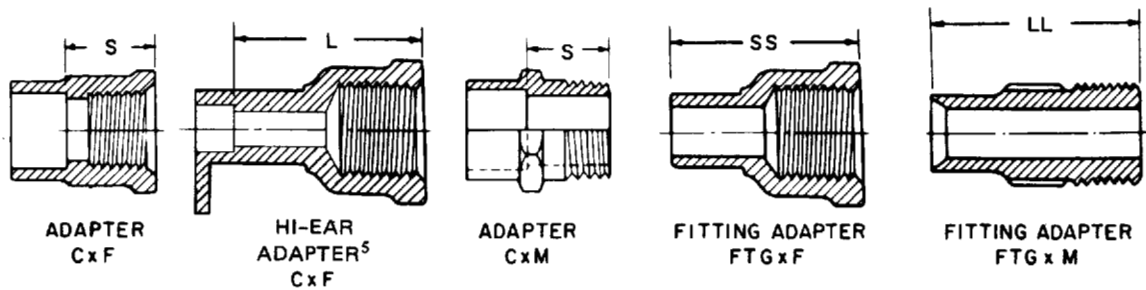
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For threads of threaded ends, see 8.
- (3) For dimensions of threaded ends, see ANSI B16.15. For optional design of threaded ends, see 10.1. For dimensions of solder joint ends, see Table 2.
- (4) For inspection tolerance, see 8 and Table 1.
- (5) See Note (4) of Table 2.

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ANSI B16.18-1984



**Table 11 Dimensions of Solder Joint Adapters and Fitting Adapters
with Pipe Thread Ends
(Straight and Reducing Sizes)^{2,3,4}**

Standard Water Tube and Pipe Thread Size ¹		Shoulder-to- End	End-to-End		End-to-Tube Stop
Solder Joint	Pipe Thread	S	SS	LL	L
1/4	3/8	0.62	....	....	....
1/4	1/4	0.62	....	1.00	....
3/8	1/2	0.75	....	1.25	....
3/8	3/8	0.62	1.06	1.12	....
1/2	1	1.00	....	....	....
1/2	3/4	0.88	1.44	1.47	....
1/2	1/2	0.75	1.38	1.38	1.25
1/2	3/8	0.62	1.22	1.25	....
3/4	1	1.00	1.81	1.91	....
3/4	3/4	0.88	1.66	1.72	....
3/4	1/2	0.75	1.62	1.62	....
1	1 1/4	1.06	2.09	2.16	....
1	1	1.00	1.97	2.09	....
1	3/4	0.88	1.81	1.91	....
1 1/4	2	1.12	....	2.38	....
1 1/4	1 1/2	1.06	2.22	2.28	....
1 1/4	1 1/4	1.06	2.03	2.22	....
1 1/4	1	1.06	2.03	2.12	....
1 1/2	2	1.12	....	2.50	....
1 1/2	1 1/2	1.06	2.22	2.41	....
1 1/2	1 1/4	1.06	2.22	2.34	....
1 1/2	1	1.00	....	2.25	....
2	2	1.12	2.53	2.75	....
2	1 1/2	1.12	....	2.66	....
2 1/2	2 1/2	1.38	3.09	3.12	....
3	3	1.50	3.22	3.41	....
4	4	1.69	3.81	4.12	....
6	6	2.00	5.34	5.75	....
8	8	2.25	....	....	....

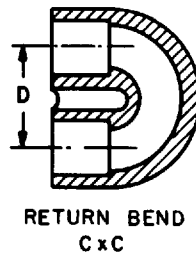
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see Section 4.1.
- (2) For threaded ends, see 9.
- (3) For dimensions of threaded ends, see ANSI B16.15, Class 125. For sizes not listed in ANSI B16.15, Class 125, refer to ANSI B16.3, Class 150. For optional design of threaded ends, see 10. For dimensions of solder joint ends, see Table 2.
- (4) See Note (4) of Table 2.
- (5) Hi-ear fittings are designed for use with 9/16 in. maximum width strap.

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**Table 12 Dimensions of Return Bends (Straight Sizes)^{2,3}**

Standard Water Tube Sizes ¹	Center-to-Center D
1/2	1.00
3/4	1.31
1	1.88
1 1/4	2.00
1 1/2	2.50
2	3.00
3	4.00
4	5.00

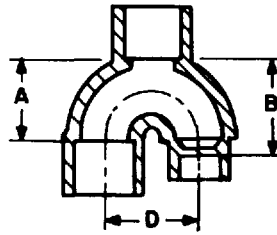
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fitting, see Section 4.
 (2) For dimensions not given in this table, see Table 2.
 (3) See Note (4) of Table 2.

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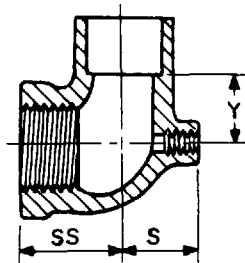
SUPPLY &
RETURN TEE
C x C x CTable 13 Dimensions of Supply and Return Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		Center-to-Center D
	A	B	
1/2	0.81	0.81	1.00
3/4	1.09	1.09	1.31
3/4 x 3/4 x 1/2	1.09	1.09	1.31
3/4 x 1/2 x 1/2	1.09	1.28	1.31

GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 3 and Table 2.
- (4) See Note (4) of Table 2.

BASEBOARD
TEE
F x F x CTable 14 Dimensions of Baseboard Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		
	SS	S	Y
1/2 x 1/8 x 1	1.12	0.81	0.56
1/2 x 1/8 x 3/4	0.94	0.69	0.56
3/4 x 1/8 x 1	1.19	0.81	0.69
3/4 x 1/8 x 3/4	1.00	0.69	0.69
1 1/4 x 1/8 x 1 1/4	1.84	0.94	0.88

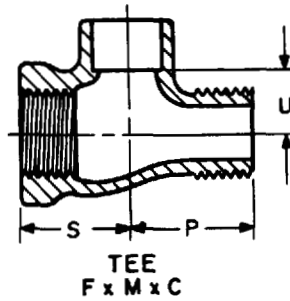
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 3 and Table 2.
- (4) See Note (4) of Table 2.

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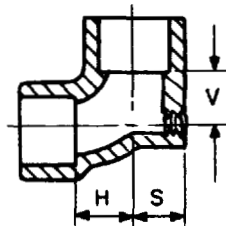
Table 15 Dimensions of Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		
	U	P	S
1/2 x 3/4 x 1/2	0.69	1.22	0.97
3/4	0.69	1.34	1.00
3/4 x 3/4 x 1/2	0.69	1.22	0.97

GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 3 and Table 2.
- (4) See Note (4) of Table 2.

Table 16 Dimensions of Baseboard Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		
	H	S	V
3/8 x 1/8 x 3/8	0.59	0.97	0.59
1/2 x 1/8 x 1	0.75	0.81	0.44
1/2 x 1/8 x 3/4	0.56	0.69	0.44
1/2 x 1/8 x 1/2	0.44	0.56	0.44
3/4 x 1/8 x 1 1/4	0.81	0.94	0.56
3/4 x 1/8 x 1	0.75	0.81	0.62
3/4 x 1/8 x 3/4	0.56	0.69	0.56
1 x 1/8 x 1	0.72	0.75	0.72
1 1/4 x 1/8 x 1 1/4	0.88	0.94	0.88

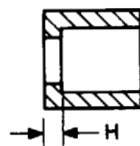
GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 3 and Table 2.
- (4) See Note (4) of Table 2.

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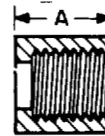
FLUSH BUSHING
FTG x CTable 17 Dimensions of
Flush Bushings^{2,3,4}

Standard Water Tube Size ¹	Laying Length H
1/4 x 1/8	0.06
3/8 x 1/4	0.06
1/2 x 3/8	0.09
1/2 x 1/4	0.25
5/8 x 1/2	0.06
3/4 x 5/8	0.19
3/4 x 1/2	0.09
3/4 x 3/8	0.44
1 x 3/4	0.12
1 x 1/2	0.47
1 1/4 x 1	0.09
1 1/2 x 1 1/4	0.16
2 x 1 1/2	0.12

GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 3 and Table 2.
- (4) See Note (4) of Table 2.

FLUSH BUSHING
FTG x FTable 18 Dimensions of
Flush Bushings^{2,3,4}

Standard Water Tube Size ¹	Laying Length A
1/2 x 1/8	0.56
3/4 x 3/8	0.81
1 x 1/2	0.97
1 1/4 x 3/4	1.03
1 1/2 x 1	1.16
2 x 1 1/2	1.41

GENERAL NOTE: All dimensions are in inches.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table 2.
- (3) For inspection tolerances, see 3 and Table 2.
- (4) See Note (4) of Table 2.

ANNEX A STRENGTH OF SOLDER JOINTS

(This Annex is an integral part of American National Standard B16.18 and placed after the main text for convenience.)

The maximum recommended pressure-temperature ratings for solder joints made with copper tube and cast copper alloy fittings, using representative commercial solders, are listed in the table below for customary and metric units.

NOTE: For extremely low working temperatures, in the 0°F to -100°F (-18°C to -73°C) range, it is recommended that a brazing alloy melting at or above 1000°F (540°C) be used.⁴

Table A1 Pressure-Temperature Ratings

Joining Material	Working Temperature		Maximum Working Gage Pressure									
	° F	° C	Size 1/8 thru 1 ¹		Size 1 1/4 thru 2 ¹		Size 2 1/2 thru 4 ¹		Size 5 thru 8 ¹		Size 10 and 12 ¹	
			psi	bar	psi	bar	psi	bar	psi	bar	psi	bar
50-50 Tin-Lead Solder ²	100	38	200	14	175	12	150	10	135	9	100	7
	150	66	150	10	125	9	100	7	90	6	70	5
	200	93	100	7	90	6	75	5	70	5	50	3
	250	120	85	6	75	5	50	3	45	3	40	3
95-5 Tin-Antimony Solder ³	100	38	500	35	400	28	300	20	270	19	150	10
	150	66	400	28	350	24	275	19	250	17	150	10
	200	93	300	20	250	17	200	14	180	13	140	10
	250	120	200	14	175	12	150	10	135	9	110	8
Joining ⁴ Materials Melting at or above 1000°F (540°C)	Pressure-temperature ratings consistent with the materials and procedures employed											

GENERAL NOTE:

1 bar = 10⁵ Pa

NOTES:

(1) Standard water tube sizes.

(2) ANSI/ASTM B32 Alloy Grade 50A.

(3) ANSI/ASTM B32 Alloy Grade 95TA.

(4) These joining materials are defined as brazing alloys by the American Welding Society.

ANNEX B METRIC (SI) TABLES

(This Annex is an integral part of American National Standard B16.18 and placed after the main text for convenience.)

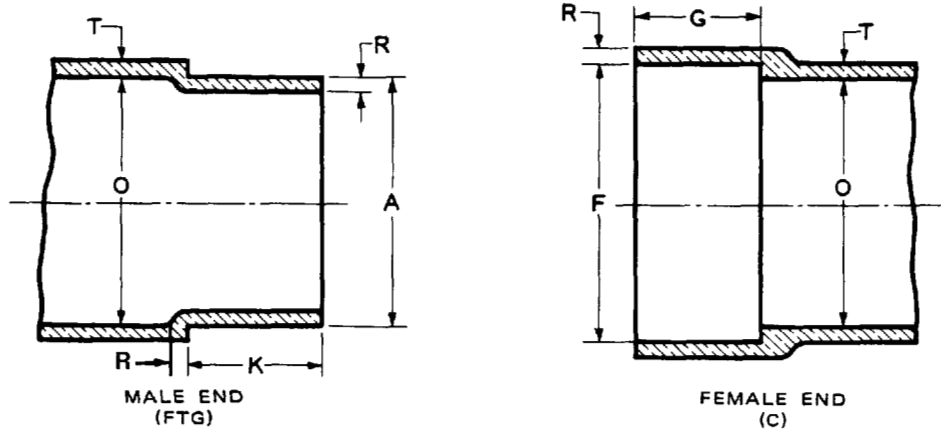


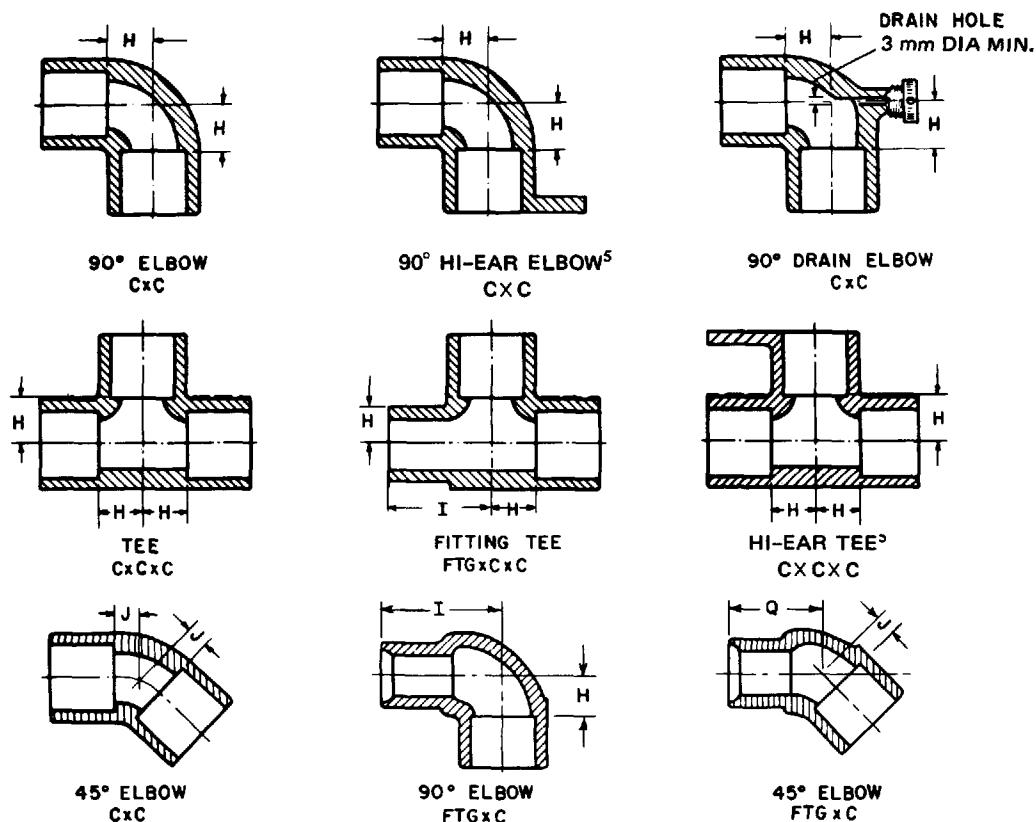
Table B2 Dimensions of Solder Joint Ends¹

Standard Water Tube Size ²	Male End			Female End			Metal Thickness ³		Inside Diameter of Fitting O
	Outside Diameter A ⁴		Length K	Inside Diameter F		Depth G	Body T	Joint R	
	Min.	Max.	Min.	Min.	Max.	Min.			Min.
1/4	9.47	9.55	9.5	9.58	9.68	8.0	2.0	1.3	7.9
3/8	12.62	12.73	11.0	12.75	12.85	9.5	2.3	1.3	10.9
1/2	15.80	15.90	14.5	15.93	16.03	12.5	2.3	1.3	13.7
3/4	22.15	22.25	20.5	22.28	22.38	19.0	2.5	1.5	19.8
1	28.50	28.63	24.5	28.65	28.75	23.0	2.8	1.8	25.9
1 1/4	34.85	34.98	26.0	35.00	35.10	24.5	3.0	1.8	32.0
1 1/2	41.17	41.33	29.5	41.35	41.48	28.0	3.3	2.0	38.1
2	53.87	54.03	35.5	54.05	54.18	34.0	3.8	2.3	50.3
2 1/2	66.57	66.73	39.0	66.75	66.88	37.5	4.3	2.5	62.5
3	79.27	79.43	43.5	79.45	79.58	42.0	4.8	2.8	74.7
3 1/2	91.97	92.13	50.0	92.15	92.28	48.5	5.1	3.0	86.9
4	104.67	104.83	56.5	104.85	104.98	55.0	5.6	3.3	99.1
5	130.07	130.23	69.0	130.25	130.38	67.5	7.1	4.3	123.7
6	155.47	155.63	82.0	155.65	155.78	78.5	8.6	5.1	148.3
8	206.22	206.43	104.0	206.45	206.58	101.0	9.5	7.9	196.1
10	257.02	257.23	104.6	257.25	257.38	101.6	12.2	12.2	244.3
12	307.82	308.03	117.3	308.05	308.18	114.3	14.2	14.2	293.6

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) The sketches and designs of fittings are illustrative only. The dimensions herein shall govern in all cases.
- (2) For size designation of fitting, see 4.1.
- (3) For metal thickness tolerance, see 7.
- (4) Maximum ovality shall not exceed 1% of the diameter listed above. The average of the maximum and minimum diameters must be within the dimensions shown above.

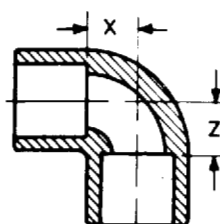
Table B3 Dimensions of Elbows, Tees, and 45 Deg. Elbows^{2,3,4}

Standard Water Tube Size ¹	Laying Length Tee and 90 Deg. Elbow ³ H	Center-to-End 90 Deg. Elbow and Tee ³ I	Laying Length 45 Deg. Elbow ³ J	Center-to-End 45 Deg. Elbow ³ Q
1/4	6.5	19.0	....	....
3/8	8.0	22.0	5.0	19.0
1/2	11.0	28.5	5.0	22.0
3/4	14.5	38.0	6.5	30.0
1	19.0	47.0	8.0	33.5
1 1/4	22.0	51.5	11.0	39.5
1 1/2	25.5	58.0	12.5	44.5
2	32.0	70.5	14.5	54.0
2 1/2	38.0	80.0	16.0	....
3	44.5	91.5	19.0	....
3 1/2	51.0	....	22.0	....
4	57.0	116.5	24.0	....
5	79.5	....	36.5	....
6	92.0	....	41.5	....
8	124.0	....	54.0	....

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.
- (5) Hi-ear fittings are designed for use with 14 mm maximum width strap.



90° ELBOW
C x C

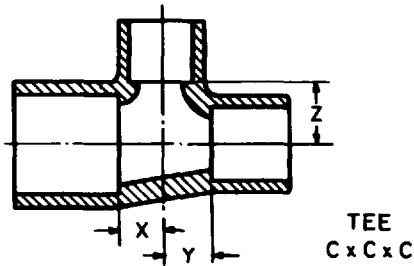
Table B4 Dimensions of Reducing 90 Deg. Elbows^{2,3,4}

Standard Water Tube Size ¹	Laying Length ³	
	X	Z
3/8 x 1/4	6.5	8.0
1/2 x 3/8	9.5	11.0
3/4 x 1/2	11.0	14.5
1 x 3/4	16.0	19.0
1 x 1/2	12.5	19.0
1 1/4 x 1	19.0	22.0
1 1/4 x 3/4	16.0	22.0
1 1/4 x 1/2	12.5	22.0
1 1/2 x 1 1/4	22.0	25.5
1 1/2 x 1	19.0	25.5
1 1/2 x 3/4	16.0	25.5
2 x 1 1/2	25.5	31.5
2 x 1 1/4	22.0	31.5
2 x 1	19.0	31.5
2 x 3/4	16.0	31.5
2 1/2 x 2	31.5	38.0
2 1/2 x 1 1/2	25.5	38.0
2 1/2 x 1 1/4	22.0	38.0
2 1/2 x 1	19.0	38.0
3 x 2 1/2	38.0	44.5
3 x 2	31.5	44.5
3 x 1 1/2	25.5	44.5
3 x 1 1/4	22.0	44.5
4 x 3	44.5	57.0
4 x 2 1/2	38.0	57.0
4 x 2	31.5	57.0
6 x 4	66.5	92.0
6 x 3	51.0	92.0
8 x 6	98.5	124.0

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see Section 4.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.

Table B5 Dimensions of Reducing Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Length ³			Standard Water Tube Size ¹	Laying Length ³		
	X	Y	Z		X	Y	Z
3/8 x 3/8 x 1/2	11.0	11.0	9.5	1 1/4 x 3/4 x 3/4	16.0	16.0	22.0
3/8 x 3/8 x 1/4	6.5	6.5	8.0	1 1/4 x 1/2 x 1 1/4	22.0	22.0	22.0
1/2 x 1/2 x 3/4	14.5	14.5	11.0	1 1/4 x 1/2 x 1	19.0	19.0	22.0
1/2 x 1/2 x 3/8	9.5	9.5	11.0	1 1/2 x 1 1/2 x 2 1/2	38.0	38.0	25.5
1/2 x 1/2 x 1/4	8.0	8.0	11.0	1 1/2 x 1 1/2 x 2	32.0	32.0	25.5
1/2 x 3/8 x 1/2	11.0	11.0	11.0	1 1/2 x 1 1/2 x 1 1/4	22.0	22.0	25.5
1/2 x 3/8 x 3/8	9.5	9.5	11.0	1 1/2 x 1 1/2 x 1	19.0	19.0	25.5
3/4 x 3/4 x 1	19.0	19.0	16.0	1 1/2 x 1 1/2 x 3/4	16.0	16.0	25.5
3/4 x 3/4 x 1/2	11.0	11.0	14.5	1 1/2 x 1 1/2 x 1/2	12.5	12.5	25.5
3/4 x 3/4 x 3/8	9.5	9.5	14.5	1 1/2 x 1 1/4 x 1 1/2	25.5	25.5	25.5
3/4 x 1/2 x 3/4	14.5	14.5	14.5	1 1/2 x 1 1/4 x 1 1/4	22.0	22.0	25.5
3/4 x 1/2 x 1/2	11.0	11.0	14.5	1 1/2 x 1 1/4 x 1	19.0	19.0	25.5
3/4 x 1/2 x 3/8	9.5	9.5	14.5	1 1/2 x 1 1/4 x 3/4	16.0	16.0	25.5
1 x 1 x 1 1/2	25.5	25.5	19.0	1 1/2 x 1 1/4 x 1/2	12.5	12.5	25.5
1 x 1 x 1 1/4	22.0	22.0	19.0	1 1/2 x 1 x 1 1/2	25.5	25.5	25.5
1 x 1 x 3/4	16.0	16.0	19.0	1 1/2 x 1 x 1 1/4	22.0	22.0	25.5
1 x 1 x 1/2	12.5	12.5	19.0	1 1/2 x 1 x 1	19.0	19.0	25.5
1 x 1 x 3/8	11.0	11.0	19.0	1 1/2 x 3/4 x 1 1/2	25.5	25.5	25.5
1 x 3/4 x 1	19.0	19.0	19.0	1 1/2 x 1/2 x 1 1/2	25.5	25.5	25.5
1 x 3/4 x 3/4	16.0	16.0	19.0	2 x 2 x 4	57.0	57.0	32.0
1 x 3/4 x 1/2	12.5	12.5	19.0	2 x 2 x 3	44.5	44.5	32.0
1 x 1/2 x 1	19.0	19.0	19.0	2 x 2 x 2 1/2	38.0	38.0	32.0
1 x 1/2 x 3/4	16.0	16.0	19.0	2 x 2 x 1 1/2	25.5	25.5	32.0
1 x 1/2 x 1/2	12.5	12.5	19.0	2 x 2 x 1 1/4	22.0	22.0	32.0
1 1/4 x 1 1/4 x 2	32.0	32.0	22.0	2 x 2 x 1	19.0	19.0	32.0
1 1/4 x 1 1/4 x 1 1/2	25.5	25.5	22.0	2 x 2 x 3/4	16.0	16.0	32.0
1 1/4 x 1 1/4 x 1	19.0	19.0	22.0	2 x 2 x 1/2	12.5	12.5	32.0
1 1/4 x 1 1/4 x 3/4	16.0	16.0	22.0	2 x 1 1/2 x 2	32.0	32.0	32.0
1 1/4 x 1 1/4 x 1/2	12.5	12.5	22.0	2 x 1 1/2 x 1 1/2	25.5	25.5	32.0
1 1/4 x 1 x 1 1/4	22.0	22.0	22.0	2 x 1 1/2 x 1 1/4	22.0	22.0	32.0
1 1/4 x 1 x 1	19.0	19.0	22.0	2 x 1 1/2 x 1	19.0	19.0	32.0
1 1/4 x 1 x 3/4	16.0	16.0	22.0	2 x 1 1/2 x 3/4	16.0	16.0	32.0
1 1/4 x 1 x 1/2	12.5	12.5	22.0	2 x 1 1/2 x 1/2	12.5	12.5	32.0
1 1/4 x 3/4 x 1 1/4	22.0	22.0	22.0	2 x 1 1/4 x 2	32.0	32.0	32.0
1 1/4 x 3/4 x 1	19.0	19.0	22.0	2 x 1 1/4 x 1 1/2	25.5	25.5	32.0

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.

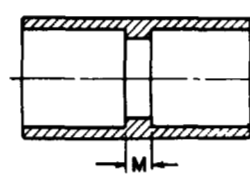
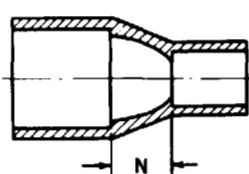
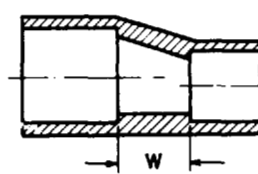
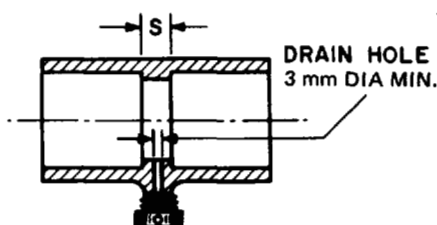
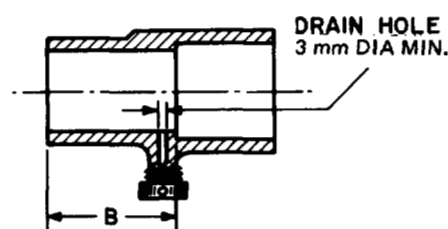
Table B5 Dimensions of Reducing Tees^{2,3,4} (Cont'd)

Standard Water Tube Size ¹	Laying Length ³			Standard Water Tube Size ¹	Laying Length ³		
	X	Y	Z		X	Y	Z
2 x 1 1/4 x 1 1/4	22.0	22.0	32.0	3 x 2 x 1 1/2	25.5	25.5	44.5
2 x 1 x 2	32.0	32.0	32.0	3 x 1 1/2 x 3	44.5	44.5	44.5
2 x 3/4 x 2	32.0	32.0	32.0	3 x 1 1/4 x 3	44.5	44.5	44.5
2 x 1/2 x 2	32.0	32.0	32.0	3 x 1 x 3	44.5	44.5	44.5
2 1/2 x 2 1/2 x 4	57.0	57.0	38.0	3 1/2 x 3 1/2 x 3	44.5	44.5	51.0
2 1/2 x 2 1/2 x 3	44.5	44.5	38.0	3 1/2 x 3 x 3 1/2	51.0	51.0	51.0
2 1/2 x 2 1/2 x 2	32.0	32.0	38.0	4 x 4 x 6	92.0	92.0	66.0
2 1/2 x 2 1/2 x 1 1/2	25.5	25.5	38.0	4 x 4 x 3	44.5	44.5	57.0
2 1/2 x 2 1/2 x 1 1/4	22.0	22.0	38.0	4 x 4 x 2 1/2	38.0	38.0	57.0
2 1/2 x 2 1/2 x 1	19.0	19.0	38.0	4 x 4 x 2	32.0	32.0	57.0
2 1/2 x 2 1/2 x 3/4	16.0	16.0	38.0	4 x 4 x 1 1/2	25.5	25.5	57.0
2 1/2 x 2 1/2 x 1/2	12.5	12.5	38.0	4 x 4 x 1 1/4	22.0	22.0	57.0
2 1/2 x 2 x 2 1/2	38.0	38.0	38.0	4 x 4 x 1	19.0	19.0	57.0
2 1/2 x 2 x 2	32.0	32.0	38.0	4 x 4 x 3/4	16.0	16.0	57.0
2 1/2 x 2 x 1 1/2	25.5	25.5	38.0	4 x 3 x 4	57.0	57.0	57.0
2 1/2 x 2 x 1 1/4	22.0	22.0	38.0	4 x 3 x 3	44.5	44.5	57.0
2 1/2 x 2 x 1	19.0	19.0	38.0	4 x 3 x 2 1/2	38.0	38.0	57.0
2 1/2 x 2 x 3/4	16.0	16.0	38.0	4 x 3 x 2	32.0	32.0	57.0
2 1/2 x 2 x 1/2	12.5	12.5	38.0	4 x 2 1/2 x 4	57.0	57.0	57.0
2 1/2 x 1 1/2 x 2 1/2	38.0	38.0	38.0	4 x 2 x 4	57.0	57.0	57.0
2 1/2 x 1 1/2 x 2	32.0	32.0	38.0	4 x 2 x 3	44.5	44.5	57.0
2 1/2 x 1 1/2 x 1 1/2	25.5	25.5	38.0	4 x 2 x 2	32.0	32.0	57.0
2 1/2 x 1 1/4 x 2 1/2	38.0	38.0	38.0	4 x 1 1/2 x 4	57.0	57.0	57.0
2 1/2 x 1 x 2 1/2	38.0	38.0	38.0	4 x 1 1/4 x 4	57.0	57.0	57.0
2 1/2 x 3/4 x 2 1/2	38.0	38.0	38.0	4 x 1 x 4	57.0	57.0	57.0
2 1/2 x 1/2 x 2 1/2	38.0	38.0	38.0	5 x 5 x 4	66.0	66.0	79.5
3 x 3 x 4	57.0	57.0	44.5	5 x 4 x 5	79.5	79.5	79.5
3 x 3 x 2 1/2	38.0	38.0	44.5	6 x 6 x 8	124.0	124.0	98.5
3 x 3 x 2	32.0	32.0	44.5	6 x 6 x 4	66.5	66.5	92.0
3 x 3 x 1 1/2	25.5	25.5	44.5	6 x 6 x 3	50.5	50.5	92.0
3 x 3 x 1 1/4	22.0	22.0	44.5	6 x 6 x 2 1/2	47.5	47.5	92.0
3 x 3 x 1	19.0	19.0	44.5	6 x 6 x 2	41.5	41.5	92.0
3 x 3 x 3/4	16.0	16.0	44.5	6 x 6 x 1 1/2	35.0	35.0	92.0
3 x 3 x 1/2	12.5	12.5	44.5	6 x 6 x 1 1/4	32.0	32.0	92.0
3 x 2 1/2 x 3	44.5	44.5	44.5	6 x 6 x 1	28.5	28.5	92.0
3 x 2 1/2 x 2 1/2	38.0	38.0	44.5	6 x 4 x 6	92.0	92.0	92.0
3 x 2 1/2 x 2	32.0	32.0	44.5	6 x 4 x 4	66.5	66.5	92.0
3 x 2 1/2 x 1 1/2	25.5	25.5	44.5	6 x 3 x 6	92.0	92.0	92.0
3 x 2 1/2 x 1 1/4	22.0	22.0	44.5	6 x 2 1/2 x 6	92.0	92.0	92.0
3 x 2 1/2 x 1	19.0	19.0	44.5	6 x 2 x 6	92.0	92.0	92.0
3 x 2 x 3	44.5	44.5	44.5	8 x 8 x 6	98.5	98.5	124.0
3 x 2 x 2 1/2	38.0	38.0	44.5	8 x 8 x 4	73.0	73.0	124.0
3 x 2 x 2	32.0	32.0	44.5				

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.

COUPLING
C x CREDUCING COUPLING
C x CECCENTRIC COUPLING
C x CDRAIN COUPLING
C x CFITTING DRAIN COUPLING
FTG x CTable B6 Dimensions of Couplings^{2,3,4}

Straight		Reducing		Eccentric		Drain	
Standard Water Tube Size ¹	Laying Length M ³	Standard Water Tube Size ¹	Laying Length Size ³	Standard Water Tube Size ¹	Laying Length W ³	Laying Length S ³	Laying Length B ³
1/4	1.5	3/4 x 1/2	8.0	3/4 x 1/2	16.0	6.5	....
3/8	1.5	1 x 3/4	9.5	1 x 3/4	17.5	6.5	....
1/2	3.0	1 1/4 x 1	9.5	1 1/4 x 1	19.0	6.5	25.5
3/4	3.0	1 1/4 x 3/4	9.5	1 1/4 x 3/4	19.0	6.5	32.5
1	3.0	1 1/2 x 1 1/4	9.5	1 1/2 x 1 1/4	17.5	6.5	....
1 1/4	3.0	1 1/2 x 1	9.5	1 1/2 x 1	17.5	6.5	....
1 1/2	3.0	1 1/2 x 3/4	11.0	2 x 1 1/2	28.5	6.5	....
2	4.5	2 x 1 1/2	12.5	2 x 1 1/4	24.0	6.5	....
2 1/2	4.5	2 x 1 1/4	12.5	2 1/2 x 2	30.0	....	....
3	4.5	2 x 1	12.5	3 x 2 1/2	32.0	....	....
3 1/2	6.5	2 x 3/4	12.5	3 x 2	33.5	....	....
4	6.5	2 1/2 x 2	14.5	4 x 3	51.0	....	....
5	6.5	2 1/2 x 1 1/2	14.5	....	....	....	....
6	6.5	2 1/2 x 1 1/4	16.0	....	....	....	....
8	16.0	2 1/2 x 1	16.0	....	....	....	....
....	....	3 x 2 1/2	16.0	....	....	....	....
....	....	3 x 2	16.0	....	....	....	....
....	....	4 x 3	17.5	....	....	....	....
....	....	4 x 2 1/2	28.5	....	....	....	....
....	....	4 x 2	30.0	....	....	....	....
....	....	6 x 4	33.5	....	....	....	....
....	....	8 x 6	35.0	....	....	....	....

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.

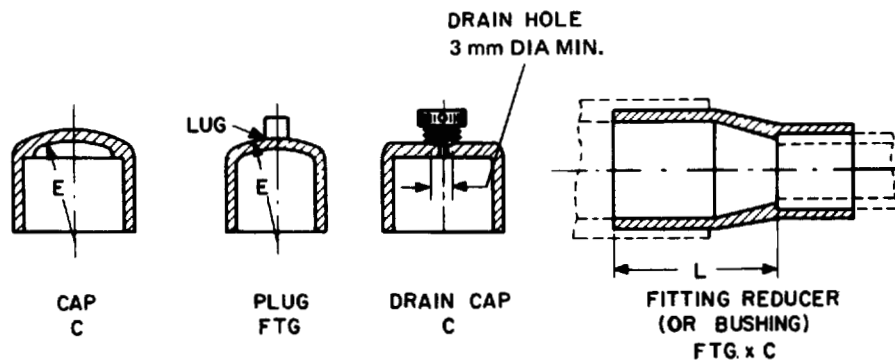


Table B7 Dimensions of Caps and Plugs^{2,3,4,5}

Standard Water Tube Size ¹	Caps and Plugs
	Radius B ³
1/4	9.5
3/8	12.5
1/2	16.0
3/4	22.0
1	28.5
1 1/4	35.0
1 1/2	41.5
2	54.0
2 1/2	66.5
3	79.5
3 1/2	92.0
4	105.0
5	130.0
6	155.5

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For other dimensions, see Table B2.
- (3) Caps may have either flat or rounded top.
- (4) Casting of lug or square on plugs shall be optional.
- (5) See Note (4) of Table B2.

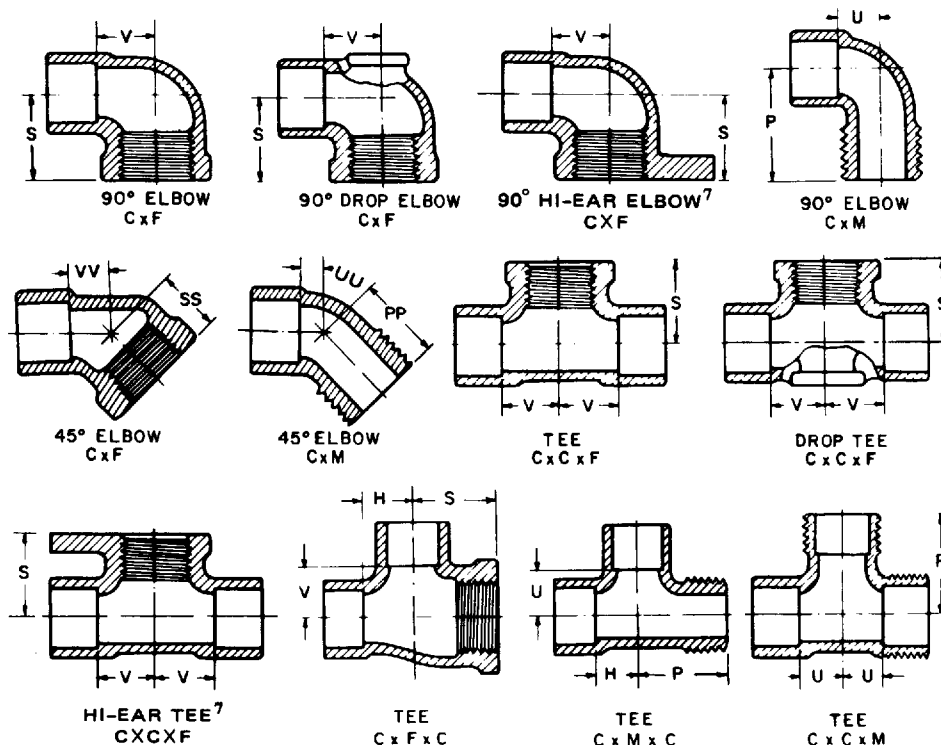
Table B8 Dimensions of Fitting Reducers^{2,3}

Standard Water Tube Size ¹	Length L
3/8 x 1/4	17.5
1/2 x 3/8	24.0
1/2 x 1/4	24.0
3/4 x 1/2	30.0
3/4 x 3/8	32.0
1 x 3/4	38.0
1 x 1/2	38.0
1 1/4 x 1	41.5
1 1/4 x 3/4	41.5
1 1/4 x 1/2	41.5
1 1/2 x 1 1/4	46.0
1 1/2 x 1	46.0
1 1/2 x 3/4	46.0
2 x 1 1/2	54.0
2 x 1 1/4	54.0
2 x 1	54.0
2 1/2 x 2	60.5
2 1/2 x 1 1/2	60.5
2 1/2 x 1 1/4	60.5
3 x 2 1/2	66.5
3 x 2	66.5
3 x 1 1/2	66.5
4 x 3	87.5
4 x 2 1/2	87.5
4 x 2	87.5

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For other dimensions, see Table B2.
- (3) See Note (4) of Table B2.



GENERAL NOTE: These sketches are also applicable to Table B10.

Table B9 Dimensions of Solder Joint Elbows and Tees with Pipe Thread Ends (Straight Sizes)^{3,4,5,6}

Standard Water Tube and Pipe Thread Size ¹	Internal Threads ²					External Threads ²				
	Center-to-End ⁵		Laying Length ⁵			Center-to-End ⁵		Laying Length ⁵		
	Ell and Tee S	45 Deg. Ell SS	Ell and Tee V	Tee H	45 Deg. Ell VV	Ell and Tee P	45 Deg. Ell PP	Ell and Tee U	Tee H	45 Deg. Ell UU
1/4	14.5	....	9.5	....	....	24.0	....	6.5	....	....
3/8	17.5	17.5	11.0	8.0	4.5	27.0	20.5	8.0	8.0	4.5
1/2	22.0	24.0	14.5	11.0	4.5	33.5	25.5	11.0	11.0	4.5
3/4	25.5	25.5	17.5	14.5	6.5	38.0	30.0	14.5	14.5	6.5
1	32.0	30.0	22.0	19.0	8.0	46.0	33.5	19.0	19.0	8.0
1 1/4	38.0	....	25.5	22.0	....	51.0	....	22.0	....	....
1 1/2	41.5	....	28.5	25.5	....	55.5	....	25.5	....	....
2	49.0	....	35.0	32.0	....	66.5	....	32.0	....	....
2 1/2	63.5	....	41.5	....	....	....	....	....	....	....
3	71.5	....	49.0	....	....	....	....	....	....	....
4	87.5	....	62.0	....	....	....	....	....	....	....
6	124.0	....	98.5	....	....	....	....	....	....	....

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For threads of threaded ends, see 9.
- (3) For dimensions of threaded ends, see ANSI B16.15. For optional design of threaded ends, see 10. For dimensions of solder joint ends, see Table B2.
- (4) For dimensions of reducing tees and ells, see Table B10.
- (5) For inspection tolerances, see 8 and Table 1.
- (6) See Note (4) of Table B2.
- (7) Hi-ear fittings are designed for use with 14 mm maximum width strap.

Table B10 Dimensions of Solder Joint Elbows and Tees with Pipe Thread Ends
(Reducing Sizes)^{3,4,5}

Standard Water Tube and Pipe Thread Size ¹	Internal Threads ²							External Threads ¹	
	Center-to-End			Laying Length ⁴				Center- to- End	Laying Length ⁴
	S			V			H	P	U
	90 Deg. Elbow C-F	Tee C-C-F	Tee C-F-C	90 Deg. Elbow C-F	Tee C-C-F	Tee C-F-C	Tee C-F-C	90 Deg. Elbow C-M	90 Deg. Elbow C-M
3/8 x 3/8 x 1/2	....	20.5	....	....	14.5	....	....	....	....
3/8 x 1/2	20.5	....	....	14.5	....	....	....	32.0	11.0
1/2 x 1/2 x 3/4	....	23.5	....	....	17.5	....	....	....	....
1/2 x 3/4	24.0	....	....	17.5	....	....	....	35.0	14.5
1/2 x 1/2 x 3/8	....	20.5	....	....	12.5	....	....	....	....
1/2 x 3/8	20.5	....	....	12.5	....	....	....	28.5	8.0
3/4 x 3/4 x 1	....	28.5	....	....	22.0	....	....	....	....
3/4 x 1	28.5	....	....	22.0	....	....	....	43.0	19.0
3/4 x 3/4 x 1/2	....	24.0	24.0	....	14.5	17.5	11.0	....	....
3/4 x 1/2	24.0	....	....	14.5	....	....	....	36.5	11.0
3/4 x 3/4 x 3/8	....	22.0	....	....	12.5	....	....	....	....
3/4 x 3/8	22.0	....	....	12.5	....	....	....	....	....
3/4 x 1/2 x 3/4	....	....	24.0	....	....	14.5	14.5	....	....
3/4 x 1/2 x 1/2	....	24.0	22.0	....	14.5	14.5	11.0	....	....
1 x 1 1/4	35.0	....	....	25.5	....	....	....	....	....
1 x 1 x 3/4	....	30.0	....	....	17.5	....	....	....	....
1 x 3/4	30.0	....	....	17.5	....	....	....	41.5	14.5
1 x 1 x 1/2	....	28.5	....	....	14.5	....	....	....	....
1 x 1 x 3/8	....	27.0	....	....	12.5	....	....	....	....
1 x 3/4 x 1	....	32.0	30.0	....	22.0	19.0	19.0	....	....
1 x 3/4 x 3/4	....	30.0	....	....	17.5	....	....	....	....
1 x 3/4 x 1/2	....	28.5	....	....	14.5	....	....	....	....
1 x 1/2 x 1	....	....	28.5	....	....	19.0	19.0	....	....
1 1/4 x 1 1/4 x 1	....	36.5	....	....	22.0	....	....	....	....
1 1/4 x 1	36.5	....	....	22.0	....	....	....	....	....
1 1/4 x 1 1/4 x 3/4	....	33.5	....	....	17.5	....	....	....	....
1 1/4 x 1 1/4 x 1/2	....	32.0	....	....	14.5	....	....	....	....
1 1/4 x 1 1/4 x 3/8	....	30.0	....	....	12.5	....	....	....	....
1 1/4 x 3/4 x 1	....	....	30.0	....	....	22.0	19.0	....	....
1 1/2 x 1 1/2 x 1	....	38.0	35.0	....	22.0	28.5	19.0	....	....
1 1/2 x 1 1/2 x 3/4	....	36.5	....	....	17.5	....	....	....	....
1 1/2 x 1 1/2 x 1/2	....	35.0	....	....	14.5	....	....	....	....
1 1/2 x 3/4 x 1	....	....	30.0	....	....	25.5	19.0	....	....
2 x 2 x 1 1/2	....	47.5	....	....	28.5	....	....	....	....
2 x 2 x 1	....	44.5	....	....	22.0	....	....	....	....
2 x 2 x 3/4	....	43.0	....	....	17.5	....	....	....	....
2 x 2 x 1/2	....	41.5	....	....	14.5	....	....	....	....
2 1/2 x 2 1/2 x 3/4	....	52.5	....	....	17.5	....	....	....	....

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For threads of threaded ends, see 8.
- (3) For dimensions of threaded ends, see ANSI B16.15. For optional design of threaded ends, see 10. For dimensions of solder joint ends, see Table B2.
- (4) For inspection tolerance, see 8 and Table 1.
- (5) See Note (4) of Table B2.

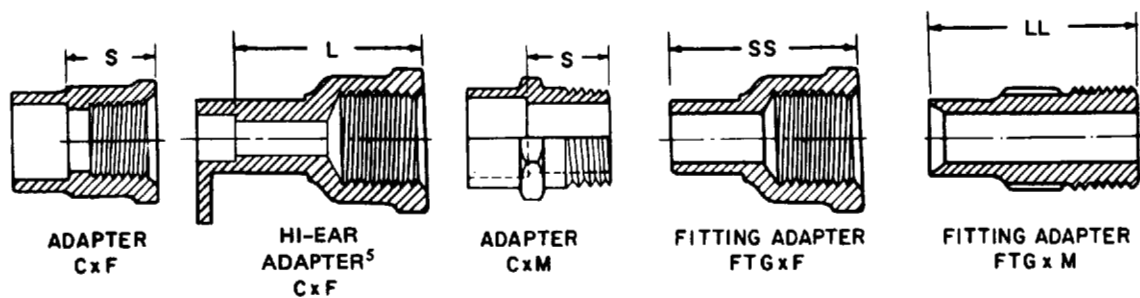


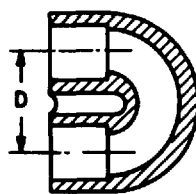
Table B11 Dimensions of Solder Joint Adapters and Fitting Adapters with Pipe Thread Ends (Straight and Reducing Sizes)^{2,3,4}

Standard Water Tube and Pipe Thread Size ¹		Shoulder-to-End	End-to-End		End-to-Tube Stop
Solder Joint	Pipe Thread	S	SS	LL	L
1/4	3/8	16.0	....	....	....
1/4	1/4	16.0	....	25.5	....
3/8	1/2	19.0	....	32.0	....
3/8	3/8	16.0	27.0	28.5	....
1/2	1	25.5	....	....	....
1/2	3/4	22.0	36.5	37.5	....
1/2	1/2	18.0	35.0	35.0	32.0
1/2	3/8	16.0	31.0	32.0	....
3/4	1	25.5	46.0	48.5	....
3/4	3/4	22.0	42.0	43.5	....
3/4	1/2	19.0	41.5	41.5	....
1	1 1/4	27.0	53.0	55.0	....
1	1	25.5	50.0	53.0	....
1	3/4	22.0	46.0	48.5	....
1 1/4	2	28.5	....	60.5	....
1 1/4	1 1/2	27.0	56.5	58.0	....
1 1/4	1 1/4	27.0	51.5	56.5	....
1 1/4	1	27.0	51.5	54.0	....
1 1/2	2	28.5	....	63.5	....
1 1/2	1 1/2	27.0	56.5	61.0	....
1 1/2	1 1/4	27.0	56.5	59.5	....
1 1/2	1	25.5	....	57.0	....
2	2	28.5	64.5	70.0	....
2	1 1/2	28.5	....	67.5	....
2 1/2	2 1/2	35.0	78.5	79.5	....
3	3	38.0	82.0	86.5	....
4	4	43.0	97.0	105.0	....
6	6	50.5	135.5	146.0	....
8	8	57.0	....	....	....

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For threaded ends, see 9.
- (3) For dimensions of threaded ends, see ANSI B16.15, Class 125. For sizes not listed in ANSI B16.15, Class 125, refer to ANSI B16.3, Class 150. For optional design of threaded ends, see 10. For dimensions of solder joint ends, see Table B2.
- (4) See Note (4) of Table B2.
- (5) Hi-ear fittings are designed for use with 14 mm maximum width strap.



RETURN BEND
C x C

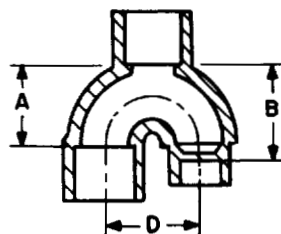
**Table B12 Dimensions of Return Bends
(Straight Sizes)^{2,3}**

Standard Water Tube Sizes ¹	Center-to-Center D
1/2	25.5
3/4	33.5
1	47.5
1 1/4	51.0
1 1/2	63.5
2	76.0
3	101.5
4	127.0

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fitting, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) See Note (4) of Table B2.



**SUPPLY &
RETURN TEE**
C x C x C

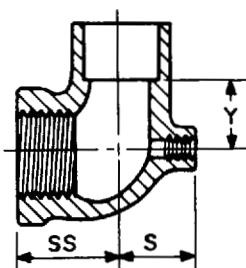
Table B13 Dimensions of Supply and Return Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		Center-to-Center D
	A	B	
1/2	20.5	20.5	25.5
3/4	28.0	28.0	33.5
3/4 x 3/4 x 1/2	28.0	28.0	33.5
3/4 x 1/2 x 1/2	28.0	32.5	33.5

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.



**BASEBOARD
TEE**
F x F x C

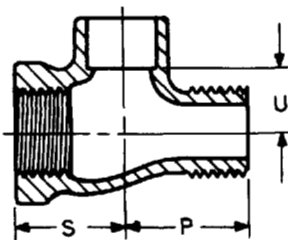
Table B14 Dimensions of Baseboard Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		
	SS	S	Y
1/2 x 1/8 x 1	28.5	20.5	14.5
1/2 x 1/8 x 3/4	24.0	17.5	14.5
3/4 x 1/8 x 1	30.0	20.5	17.5
3/4 x 1/8 x 3/4	25.5	17.5	17.5
1 1/4 x 1/8 x 1 1/4	47.0	24.0	22.0

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.



TEE
F x M x C

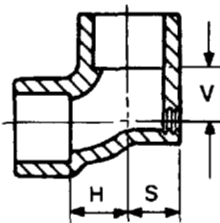
Table B15 Dimensions of Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		
	U	P	S
1/2 x 3/4 x 1/2	17.5	31.0	24.5
3/4	17.5	34.0	25.5
3/4 x 3/4 x 1/2	17.5	31.0	24.5

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.



BASEBOARD
TEE
C x F x C

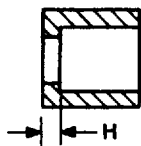
Table B16 Dimensions of Baseboard Tees^{2,3,4}

Standard Water Tube Size ¹	Laying Lengths		
	H	S	V
3/8 x 1/8 x 3/8	15.0	24.5	15.0
1/2 x 1/8 x 1	19.0	20.5	11.0
1/2 x 1/8 x 3/4	14.5	17.5	11.0
1/2 x 1/8 x 1/2	11.0	14.5	11.0
3/4 x 1/8 x 1 1/4	20.5	24.0	14.5
3/4 x 1/8 x 1	19.0	20.5	16.0
3/4 x 1/8 x 3/4	11.0	17.5	11.0
1 x 1/8 x 1	18.0	19.0	15.0
1 1/4 x 1/8 x 1 1/4	22.0	24.0	22.0

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.



FLUSH BUSHING
FTG x C

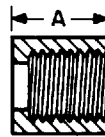
Table B17 Dimensions of
Flush Bushings^{2,3,4}

Standard Water Tube Size ¹	Laying Length ¹ H
1/4 x 1/8	2.0
3/8 x 1/4	2.0
1/2 x 3/8	2.5
1/2 x 1/4	6.5
5/8 x 1/2	2.0
3/4 x 5/8	5.0
3/4 x 1/2	2.5
3/4 x 3/8	11.0
1 x 3/4	3.0
1 x 1/2	12.0
1 1/4 x 1	2.5
1 1/2 x 1 1/4	4.0
2 x 1 1/2	3.0

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designations of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.



FLUSH BUSHING
FTG x F

Table B18 Dimensions of
Flush Bushings^{2,3,4}

Standard Water Tube Size ¹	Laying Length A
1/2 x 1/8	14.0
3/4 x 3/8	20.5
1 x 1/2	24.5
1 1/4 x 3/4	26.0
1 1/2 x 1	29.5
2 x 1 1/2	35.5

GENERAL NOTE: All dimensions are in millimeters.

NOTES:

- (1) For size designation of fittings, see 4.1.
- (2) For dimensions not given in this table, see Table B2.
- (3) For inspection tolerances, see 8 and Table 1.
- (4) See Note (4) of Table B2.

ANNEX C REFERENCES

(This Annex is an integral part of American National Standard B16.18 and placed after the main text for convenience.)

List of standards and specifications referenced in this Standard showing the year of approval.

ASME Publications (Approved as American National Standards)

ANSI/ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ANSI B16.3-1977	Malleable Iron Threaded Fittings
ANSI B16.15-1971	Cast Bronze Threaded Fittings, 125 and 250 lb

ASTM Publications

ASTM B32-76	Specification for Solder Metal
ASTM B62-76	Specification for Composition Bronze or Ounce Metal Castings
ASTM B88-76	Specification for Seamless Copper Water Tube
ASTM B584-77	Specification for Copper Alloy Sand Castings for General Applications

Publications of the following organizations appear in the above list:

ASME	The American Society of Mechanical Engineers 345 East 47th Street, New York, New York 10017
ASTM	American Society for Testing and Materials 1916 Race Street, Philadelphia, Pennsylvania 19103

Publications appearing above which have been approved as American National Standards may also be obtained from:

ANSI	American National Standards Institute, Inc. 1430 Broadway, New York, New York 10018
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J07184

AMERICAN NATIONAL STANDARDS FOR PIPING, PIPE FLANGES, FITTINGS, AND VALVES

(Published by The American Society of Mechanical Engineers)

TITLE OF STANDARD

Pipe Threads (Except Dryseal) 1983	B1.20.1
Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800, 1975	B16.1
Malleable Iron Threaded Fittings, Class 150 and 300, 1977	B16.3
Cast Iron Threaded Fittings, Class 125 and 250, 1977	B16.4
Steel Pipe Flanges and Flanged Fittings, Including Ratings for Class 150, 300, 400, 600, 900, 1500, and 2500, 1981	B16.5
Factory-Made Wrought Steel Buttwelding Fittings, 1978	B16.9
Face-to-Face and End-to-End Dimensions of Ferrous Valves, 1973	B16.10
Forged Steel Fittings, Socket Welding and Threaded, 1980	B16.11
Cast Iron Threaded Drainage Fittings, 1983	B16.12
Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads, 1983	B16.14
Cast Bronze Threaded Fittings, 125 and 250 lb, 1978	B16.15
Cast Copper Alloy Solder-Joint Pressure Fittings, 1978	B16.18
Ring-Joint Gaskets and Grooves for Steel Pipe Flanges, 1973	B16.20
Nonmetallic Flat Gaskets for Pipe Flanges, 1978	B16.21
Wrought Copper and Bronze Solder-Joint Pressure Fittings, 1980	B16.22
Cast Copper Alloy Solder-Joint Drainage Fittings, DWV, 1976	B16.23
Bronze Flanges and Flanged Fittings, 150 and 200 lb, 1979	B16.24
Buttwelding Ends, 1979	B16.25
Cast Copper Alloy Fittings for Flared Copper Tubes, 1983	B16.26
Wrought Steel Buttwelding Short Radius Elbows and Returns, 1978	B16.28
Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings, 1980	B16.29
Cast Bronze Solder Joint Fittings for Solvent Drainage Systems, 1979	B16.32
Small Manually Operated Metallic Gas Valves in Gas Distribution Systems Whose Maximum Allowable Operating Pressure Does Not Exceed 60 psig or 125 psig, 1981	B16.33
Steel Valves, Flanged and Buttwelding End, 1981	B16.34
Steel Orifice Flanges, Class 300, 600, 900, 1500, and 2500, 1975	B16.36
Large Manually Operated Metallic Gas Valves in Gas Distribution Systems Whose Maximum Allowable Operating Pressure Does Not Exceed 125 psig (8.6 bar, gage), 1978	B16.38
Malleable Iron Threaded Pipe Unions, Class 150, 250 and 300, 1977	B16.39
Manually Operated Thermoplastic Gas Shut-Offs and Valves in Gas Distribution Systems, 1977	B16.40
Power Piping, 1983	B31.1
Fuel Gas Piping, 1968	B31.2
Chemical Plant and Petroleum Refinery Piping, 1980	B31.3
Liquid Petroleum Transportation Piping Systems, 1979	B31.4
Refrigeration Piping, 1983	B31.5
Gas Transmission and Distribution Piping Systems, 1982	B31.8
ASME Guide for Gas Transmission and Distribution Piping Systems, 1976 (Not an American National Standard)	
Welded and Seamless Wrought Steel Pipe, 1979	B36.10
Stainless Steel Pipe, 1976	B36.19
Self-Operated and Power-Operated Safety-Related Valves, Functional Specification Standard, 1975	N278.1

The ASME Publications Catalog shows a complete list of all Standards published by the Society.

The catalog, and binders for holding these Standards, are available upon request.

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