

Integrally Reinforced Forged Branch Outlet Fittings – Socket Welding, Threaded, and Buttwelding Ends

**Standard Practice
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The SI (metric) units and U.S. customary units in this Standard Practice are regarded separately as the standard; each should be used independently of the other. Combining or converting values between the two systems may result in nonconformance with this Standard Practice.

This Standard Practice has been substantially revised from the previous edition. It is suggested that if the user is interested in knowing what changes have been made, that direct page by page comparison should be made of this document.

Non-toleranced dimensions in the Standard Practice are nominal, and, unless otherwise specified, shall be considered "for reference only".

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Originally Published: June 1987

Current Edition Approved: September 2011

Current Edition Published: May 2012

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INTEGRALLY REINFORCED FORGED BRANCH OUTLET FITTINGS – SOCKET WELDING, THREADED, AND BUTTWELDING ENDS

1. SCOPE

1.1 This Standard Practice covers essential dimensions, finish, tolerances, testing, marking, material, and minimum strength requirements for 90 and 45 degree integrally reinforced forged branch outlet fittings of butt welding, socket welding, and threaded types.

1.2 Fittings manufactured to this Standard Practice are designed to make a fully reinforced branch connection in accordance with applicable piping code requirements, when attached, at an opening in a run pipe by means of a full penetration weld.

1.3 Fittings may be made to special dimensions, size, shape, tolerances, or of other wrought material by agreement between the manufacturer and the purchaser.

1.4 **Standard Units** Tables 2 through 7 show the fitting's dimensional requirements in customary units or inches (decimal). Tables A2 through A7 show the fitting's dimensional requirements in SI (metric) units (e.g., millimeters). The values stated in either customary or SI (metric) units are to be regarded separately as the Standard. Within the body text, the SI (metric) units are shown in parenthesis. Combining values from the two systems may result in non-conformance with the Standard Practice. The values stated in each option are not exact equivalents; therefore, each measurement system must be used independently of the other.

2. SERVICE DESIGNATION

2.1 These fittings are designated by their size, type, and class, as shown in Table 1.

2.2 Design temperature and other service conditions shall be limited as provided by the applicable piping code or regulation for the material of construction of the fitting. Within these limits, the maximum allowable pressure of a fitting shall be that computed for straight seamless run pipe of equivalent material (as shown by comparison of composition and mechanical properties in the respective material specifications). The wall thickness used in such computation shall be that tabulated in ASME B36.10M for the size and applicable schedule of pipe reduced by applicable manufacturing tolerances and other allowances (e.g., threaded allowances).

2.3 Any corrosion allowance and any variation in allowable stress due to temperature or other design factors shall be applied to the pipe and fitting alike. The pipe wall thickness corresponding to each Class of fitting, for rating purposes only, is shown in Table 1.

TABLE 1
Correlation of Fittings Class with Schedule Number or
Wall Designation of Run Pipe for Calculation of Ratings

Class of Fitting	Type	Branch Size	Pipe Wall for Rating Basis ^(a)
Standard	Butt welding	NPS 1/8 – 24	Standard
Extra Strong	Butt welding	NPS 1/8 – 24	Extra Strong
Schedule 160	Butt welding	NPS 1/2 – 6	Schedule 160
3000	Threaded & Socket Welding	NPS 1/8 – 4	Extra Strong
6000	Threaded & Socket Welding	NPS 1/2 – 2	Schedule 160

Note: (a) The use of run or branch pipe wall thickness either thinner or thicker than shown in Table 1 constitutes a deviation from this Standard Practice and is provided for in Section 1.3.

3. SIZE

3.1 The 90 and 45 degree branch outlet sizes considered in this Standard Practice are shown in Table 1. Size on size fittings shall be limited to outlet sizes NPS 1/2 (DN 15) and larger.

3.2 The run (header) pipe size is limited only by the pipe size range listed for each type fitting class.

3.3 The manufacturer has the option to consolidate run sizes for a given branch size for economic reasons, provided the designated consolidation gap distance between the run pipe radius and the fitting inlet radius does not exceed 1/16" (1.6 mm). See Figure 1.

4. MARKING

4.1 Each fitting shall be permanently marked with the required identification by raised lettering, and/or by stamping, electro-etching or vibro tool.

4.2 The marking shall include (but it is not limited to) the following:

a) **Manufacturer's name or trademark.**

b) **Material Identification** The material shall be identified in accordance with the marking requirements of the applicable ASTM Specifications, including Heat Identification.

c) **Class** The Fitting Class - "STD" (Standard), "XS" (Extra Strong), "SCH 160" (Schedule 160), "3000" or "6000". Alternatively, the designation 3M or 6M, as applicable, may be used where "M" stands for 1,000.

d) **Size** The nominal size of the pipe that the fitting's marking identifies –

Run (or consolidated range)
NPS (DN) x Outlet NPS (DN).

e) **SP 97** This marking indicates compliance with MSS SP-97.

4.3 Where size and shape of fittings do not permit all of the above markings, they may be omitted in the reverse order given above.

5. MATERIAL

5.1 The material for fittings, under this Standard Practice, shall consist of forging, bar, and seamless tubular products. The materials shall conform to the requirements of the WP Grade seamless construction materials in ASTM Fitting Specifications A234/A234M, A403/A403M, A420/A420M, or A815/A815M; or the ASTM Forging Specifications A105/A105M, A182/A182M, or A350/A350M.

5.2 All other forging, bar, and seamless tubular products listed in ASME B16.34 Table 1; including the applicable "notes" of ASME B16.34 Table 1, Table 2, or Appendix VII tables, may be used.

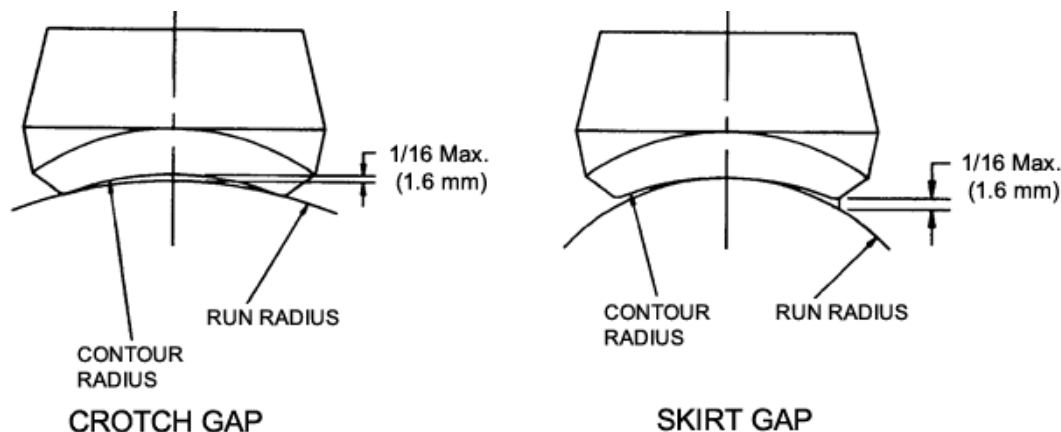


FIGURE 1
Fitting Consolidation Gap Allowance
(Illustrative Only)
Applicable to 90° and 45° Branches

6. DESIGN AND DIMENSION

6.1 A run pipe having a branch connection is weakened by the opening made in it. The branch connection must reinforce the opening and restore the original strength of the run pipe. It is the intent of this Standard Practice that these integrally reinforced branch outlet fittings and the deposited weld metal used to attach the fittings to run pipes contain all the reinforcement required by the applicable pressure vessel or piping codes without the addition of saddles or pads.

6.1.1 The adequacy of the design of branch connection fittings may be established by mathematical analyses contained in pressure vessel or piping codes, or, at the manufacturer's option, by proof testing in accordance with Section 7 and Annex B. Records of design or proof tests shall be available at the manufacturer's facility for inspection by the purchaser.

6.1.2 The pressure vessel or piping codes referred to in Section 6.1.1 permit a variety of attachment welds for these fittings. Typical branch attachments are shown in ASME B31.1 and B31.3.

6.1.3 Fittings shall be contoured to provide a good fit at the opening in the run pipe. The run attachment weld bevel angle design will vary with the size and type of fitting and with the manufacturer. The size of the run opening is dependent on the manufacturer's specification.

6.2 **Buttwelding** Buttwelding end finishes shall comply with the standard welding bevel and root face of ASME B16.25.

6.3 **Threads** Threads in threaded fittings shall comply with ASME B1.20.1 requirements for NPT.

6.3.1 The minimum wall thickness at the root of the thread at the hand tight plane shall be equal to or greater than the nominal wall of the pipe schedule for the appropriate fitting class, as shown in Table 1.

6.4 **Socket Weld** Socket Weld fittings shall meet the minimum socket depth, minimum socket wall thickness and socket diameter of ASME B16.11 for the appropriate class.

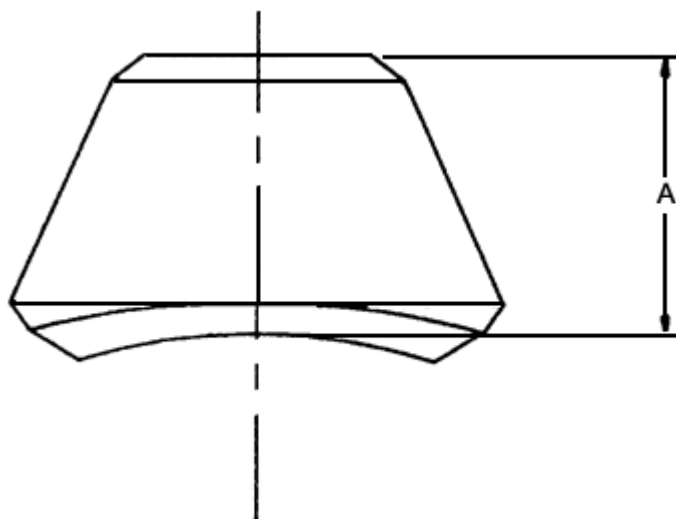
6.5 The contour weld bevel angle on the longitudinal section of the fittings shall be a minimum of 35 degrees. The weld bevel angle on the transverse section of the fitting is based on the manufacturer's specification.

7. TESTS

7.1 Hydrostatic testing of wrought fittings is not required by this Standard Practice. All fittings shall be capable of withstanding, without leakage or impairment of serviceability, a pressure equal to that prescribed in the applicable code or regulation for seamless pipe of equivalent material and schedule listed in Table 1.

7.2 Proof testing is not required, but when performed to meet the requirements of Section 6.1.1, the testing shall be conducted in accordance with Annex B.

TABLE 2
90° Branch Outlets – Buttwelding, U.S. Customary Units

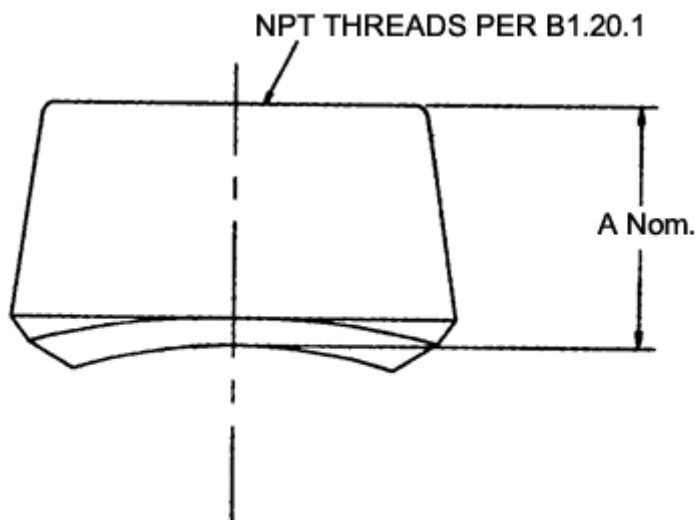


Dimensions are in inches.

Outlet (NPS)	A (Face of Fitting to Crotch)					
	Standard		Extra Strong		Schedule 160	
	Reducing	Full	Reducing	Full	Reducing	Full
1/8	0.62	—	0.62	—	—	—
1/4	0.62	—	0.62	—	—	—
3/8	0.75	—	0.75	—	—	—
1/2	0.75	0.75	0.75	0.75	1.12	1.12
3/4	0.88	0.88	0.88	0.88	1.25	1.25
1	1.06	1.06	1.06	1.06	1.50	1.50
1 1/4	1.25	1.25	1.25	1.25	1.75	1.75
1 1/2	1.31	1.31	1.31	1.31	2.00	2.00
2	1.50	1.50	1.50	1.50	2.18	2.18
2 1/2	1.62	1.62	1.62	1.62	2.44	2.44
3	1.75	1.75	1.75	1.75	2.88	2.88
3 1/2	1.88	2.00	1.88	2.00	—	—
4	2.00	2.00	2.00	2.00	3.31	3.31
5	2.25	2.25	2.25	2.25	3.69	3.69
6	2.38	2.38	3.06	3.06	4.12	4.12
8	2.75	2.75	3.88	3.88	—	—
10	3.06	3.06	3.69	3.50	—	—
12	3.38	3.38	4.06	3.94	—	—
14	3.50	3.50	3.94	4.12	—	—
16	3.69	3.69	4.18	4.44	—	—
18	3.81	4.06	4.38	4.69	—	—
20	4.00	4.62	4.69	5.00	—	—
24	4.56	5.38	5.50	5.50	—	—

Tolerances: 1/8 – 3/4 ± .03 in.
1 – 4 ± .06 in.
5 – 12 ± .12 in.
14 – 24 ± .19 in.

TABLE 3
90° Branch Outlets – Threaded, U.S. Customary Units

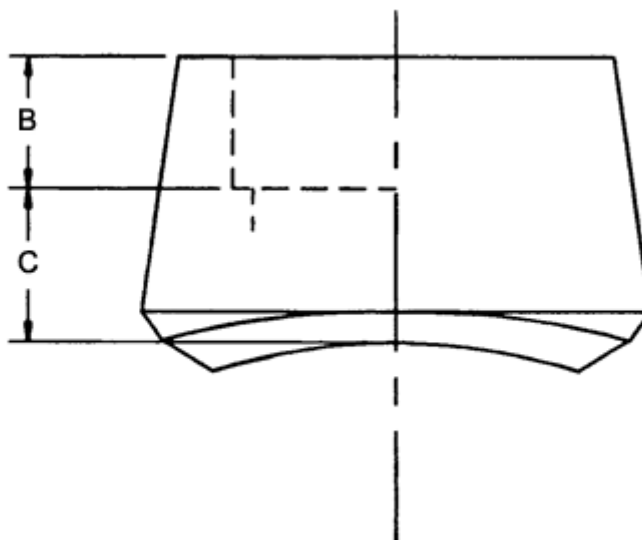


Dimensions are in inches.

Outlet (NPS)	A Nom. (Face of Fitting to Crotch)	
	Threaded	
	Class 3000	Class 6000
1/8	0.75	—
1/4	0.75	—
3/8	0.81	—
1/2	1.00	1.25
3/4	1.06	1.44
1	1.31	1.56
1 1/4	1.31	1.62
1 1/2	1.38	1.69
2	1.50	2.06
2 1/2	1.81	—
3	2.00	—
4	2.25	—

Tolerances: $\frac{1}{8} - \frac{3}{4} \pm .03$ in.
 $1 - 4 \pm .06$ in.

TABLE 4
90° Branch Outlets – Socket Welding, U.S. Customary Units

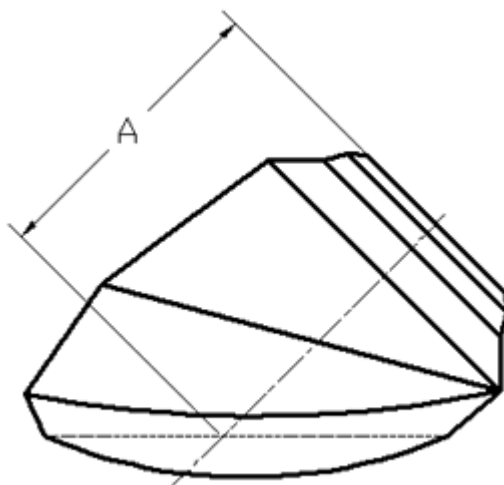


Dimensions are in inches.

Outlet (NPS)	B Min. ^(a)	C Max.	
		Class 3000	Class 6000
1/8	0.38	0.41	—
1/4	0.38	0.41	—
3/8	0.38	0.50	—
1/2	0.38	0.63	0.94
3/4	0.50	0.63	1.00
1	0.50	0.88	1.13
1 ¹ / ₄	0.50	0.88	1.19
1 ¹ / ₂	0.50	0.94	1.25
2	0.62	0.94	1.44
2 ¹ / ₂	0.62	1.00	—
3	0.62	1.19	—
4	0.75	1.19	—

Note: (a) "B" Minimum Socket Depth per ASME B16.11

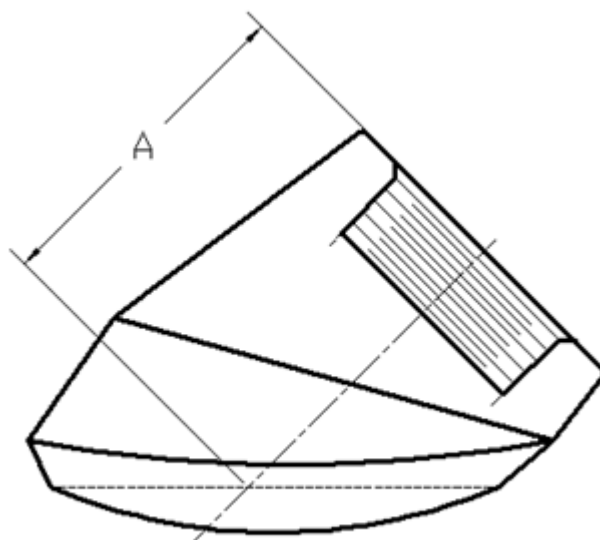
TABLE 5
45° Branch Outlets – Buttwelding, U.S. Customary Units



Dimensions are in inches.

Outlet (NPS)	A (Top of Fitting to Run Pipe)	
	Standard / Extra Strong	
	A Min.	A Max.
1/4	1.500	1.688
3/8	1.500	1.688
1/2	1.500	1.688
3/4	1.750	2.000
1	2.125	2.563
1 ¹ / ₄	2.125	2.563
1 ¹ / ₂	2.500	2.750
2	2.875	3.500

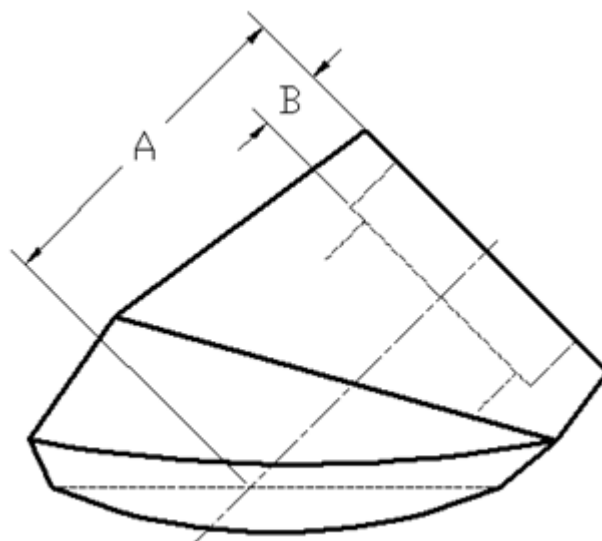
TABLE 6
45° Branch Outlets – Threaded, U.S. Customary Units



Dimensions are in inches.

Outlet (NPS)	A (Top of Fitting to Run Pipe)			
	Class 3000 A		Class 6000 A	
	A Min.	A Max.	A Min.	A Max.
1/4	1.500	1.688	1.531	1.875
3/8	1.500	1.688	1.531	1.875
1/2	1.500	1.750	1.812	2.188
3/4	1.812	2.000	2.125	2.500
1	2.125	2.500	2.406	2.875
1 1/4	2.406	3.000	2.563	3.062
1 1/2	2.500	3.000	3.094	3.375
2	3.000	3.312	3.094	4.125

TABLE 7
45° Branch Outlets – Socket Welding, U.S. Customary Units



Dimensions are in inches.

Outlet (NPS)	B Min. ^(a)	A (Top of Fitting to Run Pipe)			
		Class 3000		Class 6000	
		A Min.	A Max.	A Min.	A Max.
1/4	0.38	1.500	1.688	1.531	1.875
3/8	0.38	1.500	1.688	1.531	1.875
1/2	0.38	1.500	1.750	1.812	2.188
3/4	0.50	1.812	2.000	2.125	2.500
1	0.50	2.125	2.500	2.406	2.875
1 1/4	0.50	2.406	3.000	2.563	3.062
1 1/2	0.50	2.500	3.000	3.094	3.375
2	0.62	3.000	3.312	3.094	4.125

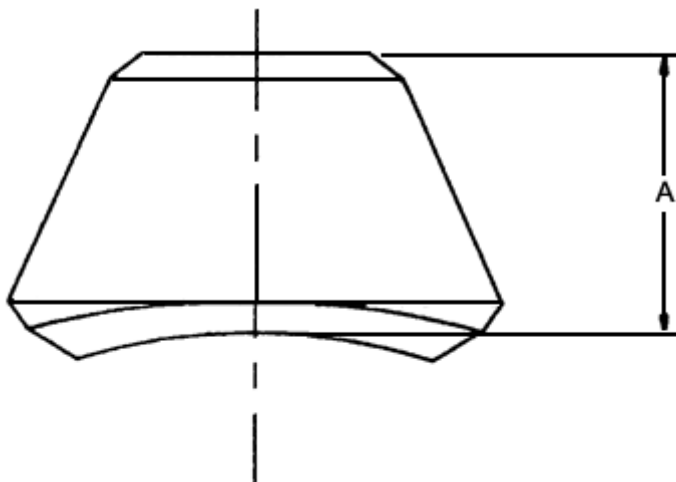
Note: (a) "B" Minimum Socket Depth per ASME B16.11

ANNEX A

SI (Metric) Tables A2 through A7

TABLE A2

90° Branch Outlets – Buttwelding, SI (Metric) Units



Dimensions are in millimeters.

Outlet (DN)	Outlet (NPS)	A (Face of Fitting to Crotch)					
		Standard		Extra Strong		Schedule 160	
		Reducing	Full	Reducing	Full	Reducing	Full
6	1/8	15.7	—	15.7	—	—	—
8	1/4	15.7	—	15.7	—	—	—
10	3/8	19.1	—	19.1	—	—	—
15	1/2	19.1	19.1	19.1	19.1	28.4	28.4
20	3/4	22.4	22.4	22.4	22.4	31.8	31.8
25	1	26.9	26.9	26.9	26.9	38.1	38.1
32	1 1/4	31.8	31.8	31.8	31.8	44.4	44.4
40	1 1/2	33.3	33.3	33.3	33.3	50.8	50.8
50	2	38.1	38.1	38.1	38.1	55.4	55.4
65	2 1/2	41.1	41.1	41.1	41.1	62.0	62.0
80	3	44.4	44.4	44.4	44.4	73.2	73.2
90	3 1/2	47.8	50.8	47.8	50.8	—	—
100	4	50.8	50.8	50.8	50.8	84.1	84.1
125	5	57.2	57.2	57.2	57.2	93.7	93.7
150	6	60.4	60.4	77.7	77.7	104.6	104.6
200	8	69.8	69.8	98.6	98.6	—	—
250	10	77.7	77.7	93.7	88.9	—	—
300	12	85.9	85.9	103.1	100.1	—	—
350	14	88.9	88.9	100.1	104.6	—	—
400	16	93.7	93.7	106.2	112.8	—	—
450	18	96.8	103.1	111.2	119.1	—	—
500	20	101.6	117.3	119.1	127.0	—	—
600	24	115.8	136.6	139.7	139.7	—	—

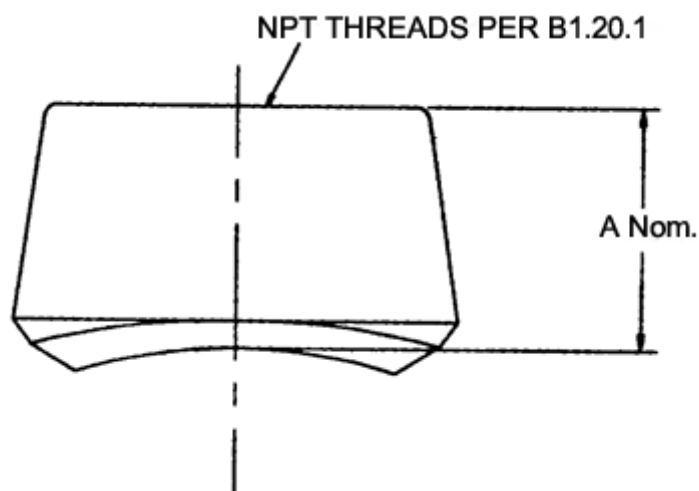
Tolerances: 6 – 20 ± 0.8 mm
 25 – 100 ± 1.6 mm
 125 – 300 ± 3.2 mm
 350 – 600 ± 4.8 mm

ANNEX A (Continued)

SI (Metric) Tables A2 through A7

TABLE A3

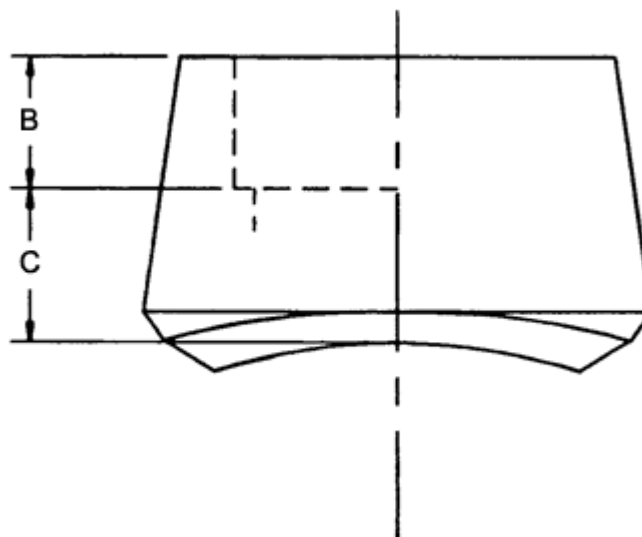
90° Branch Outlets – Threaded, SI (Metric) Units



Dimensions are in millimeters.

Outlet (DN)	Outlet (NPS)	A Nom. (Face of Fitting to Crotch)	
		Threaded	
		Class 3000	Class 6000
6	1/8	19.0	—
8	1/4	19.0	—
10	3/8	20.6	—
15	1/2	25.4	31.8
20	3/4	26.9	36.6
25	1	33.3	39.6
32	1 1/4	33.3	41.1
40	1 1/2	35.0	42.3
50	2	38.1	52.3
65	2 1/2	46.0	—
80	3	50.8	—
100	4	57.2	—

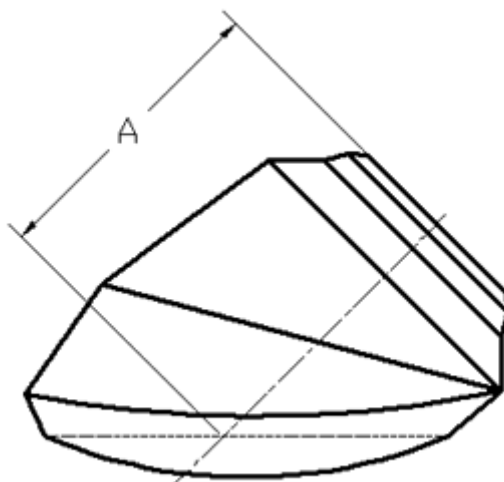
Tolerances: 6 – 20 ± 0.8 mm
 25 – 100 ± 1.6 mm

ANNEX A (Continued)**SI (Metric) Tables A2 through A7****TABLE A4****90° Branch Outlets – Socket Welding, SI (Metric) Units**

Dimensions are in millimeters.

Outlet (DN)	Outlet (NPS)	B Min. ^(a)	C Max.	
			Class 3000	Class 6000
6	1/8	9.5	11	—
8	1/4	9.5	11	—
10	3/8	9.5	13	—
15	1/2	9.5	16	24
20	3/4	12.5	16	26
25	1	12.5	23	29
32	1 1/4	12.5	23	31
40	1 1/2	12.5	24	32
50	2	16.0	24	37
65	2 1/2	16.0	26	—
80	3	16.0	31	—
100	4	19.0	31	—

Note: (a) "B" Minimum Socket Depths per ASME B16.11

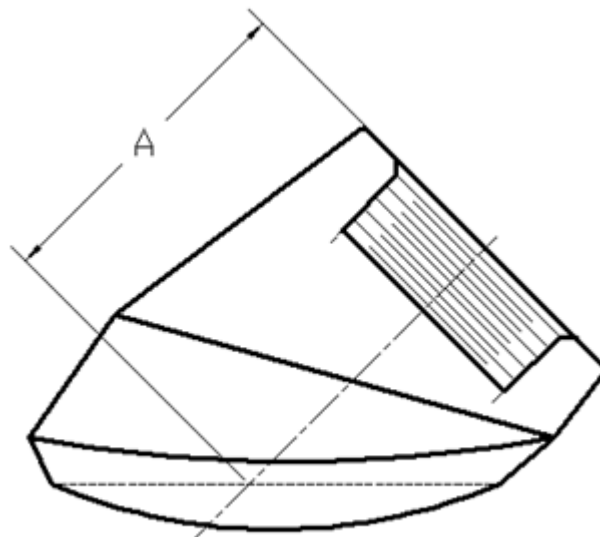
ANNEX A (Continued)**SI (Metric) Tables A2 through A7****TABLE A5****45° Branch Outlets – Buttwelding, SI (Metric) Units**

Dimensions are in millimeters.

Outlet (DN)	A (Top of Fitting to Run Pipe)	
	Standard / Extra Strong	
	A Min.	A Max.
8	38.1	42.9
10	38.1	42.9
15	38.1	42.9
20	44.5	50.8
25	54.0	65.1
32	54.0	65.1
40	63.5	69.9
50	73.0	88.9

ANNEX A (Continued)
SI (Metric) Tables A2 through A7

TABLE A6
45° Branch Outlets – Threaded, SI (Metric) Units



Dimensions are in millimeters.

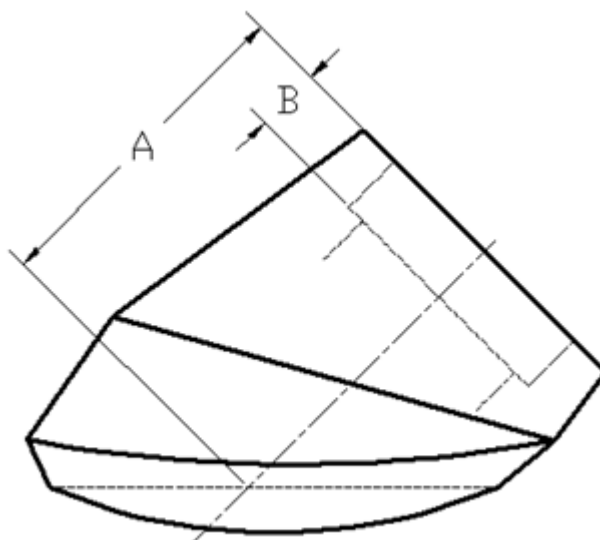
Outlet (DN)	A (Top of Fitting to Run Pipe)			
	Class 3000		Class 6000	
	A Min.	A Max.	A Min.	A Max.
8	38.1	42.9	38.9	47.6
10	38.1	42.9	38.9	47.6
15	38.1	44.5	46.0	55.6
20	46.0	50.8	54.0	63.5
25	54.0	63.5	61.1	73.0
32	61.1	76.2	65.1	77.8
40	63.5	76.2	78.6	85.7
50	76.2	84.1	78.6	104.8

ANNEX A (Continued)

SI (Metric) Tables A2 through A7

TABLE A7

45° Branch Outlets – Socket Welding, SI (Metric) Units



Dimensions are in millimeters.

Outlet (DN)	B Min. ^(a)	A (Top of Fitting to Run Pipe)			
		Class 3000		Class 6000	
		A Min.	A Max.	A Min.	A Max.
8	9.5	38.1	42.9	38.9	47.6
10	9.5	38.1	42.9	38.9	47.6
15	9.5	38.1	44.5	46.0	55.6
20	12.5	46.0	50.8	54.0	63.5
25	12.5	54.0	63.5	61.1	73.0
32	12.5	61.1	76.2	65.1	77.8
40	12.5	63.5	76.2	78.6	85.7
50	16.0	76.2	84.1	78.6	104.8

Note: (a) "B" Minimum Socket Depth per ASME B16.11

ANNEX B

Design Proof Test

B1. *Proof Test Administration*

B1.1 Proof tests shall be made as set forth herein as evidence of the adequacy of branch connections employing these outlet fittings.

B2. *Proof Test Procedure*

B2.1 Fittings selected for testing shall be representative of production fittings, shall be identified as to material, grade, and class, and shall be inspected for compliance with this Standard Practice.

B2.2 Run and branch pipe sections, assembled with a fitting for test, shall be of equivalent material to the fitting and shall have nominal wall thicknesses corresponding to the fitting in accordance with Table 1, and shall meet all requirements of the pipe specification.

B2.3 The test branch outlet fitting shall be welded to the run pipe. The diameter of the branch opening in the run pipe shall not be less than the inside diameter of the branch pipe. The length of run pipe on either side of the weld intersection shall be at least twice the pipe outside diameter or a suitable length to ensure the reinforcing effect of the weld does not affect the proof test. The branch outlet pipe extension shall have a length at least twice its diameter. The run pipe shall have a bursting strength at least as great as the computed proof test pressure as calculated in Section B2.4.

B2.4 Hydrostatic pressure shall be applied to the assembly. The actual test pressure prior to rupture must be at least equal to the computed proof test pressure defined below:

$$P = \frac{2St}{D} \quad \text{where:}$$

P = Proof Test Pressure (psig)

S = The actual tensile strength of the run pipe to be used, psi, (determined on a specimen representative of the pipe)

t = Nominal run pipe wall thickness, inches

D = Specified outside diameter of the run pipe, inches

Alternately, the test is considered successful if the assembly withstands, without rupture, a test pressure of 105 percent (105%) of the computed test pressure defined above.

B3. It is not necessary to conduct an individual test of fittings in all combinations of sizes, wall thickness, and pressure class. A successful proof test on one prototype fitting may represent other similarly proportioned fittings to the extent described herein.

B3.1 A successful test on a full size fitting may be used to qualify other full sized fittings no smaller than one-half nor larger than two-times the size of the test fitting.

B3.2 A successful test on a reducing fitting qualifies:

B3.2.1 All similar fittings of the same branch pipe size which fit larger run pipes than the test fitting.

B3.2.2 All similar fittings with a branch pipe size no smaller than one-half nor larger than two times the test fitting provided the run pipe to branch pipe size ratio is equal to or greater than the test fitting.

B3.3 The untested fitting must have a branch pipe t/D ratio, not less than one-half, nor more than three times the test fitting.

B3.4 The pressure retaining capacity of a fitting made of various grades of material with similar mechanical properties will be essentially directly proportional to the tensile properties of the various grades. Hence it is necessary to test a prototype in only a single grade to prove the geometric design of fittings.

The manufacturer shall be able to demonstrate that fittings produced from materials with significantly different mechanical properties (i.e., carbon vs. stainless steel) are considered essentially proportional to the tested grade, or additional testing may be required.

B3.5 Proof tests which have been conducted prior to the issuance of this Standard Practice, and that are equivalent to the above requirements, shall be considered as fulfilling the requirements of this Standard Practice provided they are adequately documented.

ANNEX C

Referenced Standards and Applicable Dates

This Annex is an integral part of this Standard Practice and is placed after main text for convenience.

Standard Name	Description
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ASME; ANSI/ASME

B1.20.1-1983 (R2006)	Pipe Threads, General Purpose (Inch)
B16.34-2009	Valves Flanged, Threaded and Welding End; including 2010 Supplement
B36.10M-2004 (R2010)	Welded and Seamless Wrought Steel Pipe
B16.11-2011	Forged Fittings, Socket-Welding and Threaded
B16.25-2007	Buttwelding Ends
B31.1-2010	Power Piping
B31.3-2010	Process Piping

ASTM**Standard Specification for:**

A105/A105M-11a	Carbon Steel Forgings for Piping Applications
A182/A182M-11a	Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
A234/A234M-11a	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
A350/A350M-11	Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
A403/A403M-11	Wrought Austenitic Stainless Steel Piping Fittings
A420/A420M-10a	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
A815/A815M-10a	Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings

The following organizations appear on the above list:

ANSI	American National Standards Institute, Inc. 25 West 43 rd Street, Fourth Floor New York, NY 10036-7406
ASME	American Society of Mechanical Engineers (ASME International) Three Park Avenue New York, NY 10016-5990
ASTM	ASTM International 100 Bar Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428-2959

Listing of MSS Standard Practices (as of May, 2012)

TITLE

SP-6-2012	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
SP-9-2008	Spot Facing for Bronze, Iron and Steel Flanges
SP-25-2008	Standard Marking System for Valves, Fittings, Flanges, and Unions
SP-42-2009	Corrosion Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt Weld Ends (Classes 150, 300 & 600)
SP-43-2008	Wrought and Fabricated Butt-Welding Fittings for Low Pressure, Corrosion Resistant Applications (Incl. 2010 Errata Sheet)
SP-44-2010	Steel Pipeline Flanges (incl. 2011 Errata Sheet)
SP-45-2003	(R 2008) Bypass and Drain Connections
SP-51-2012	Class 150LW Corrosion Resistant Flanges and Cast Flanged Fittings
SP-53-1999	(R 2007) Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components – Magnetic Particle Examination Method
SP-54-1999	(R 2007) Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components – Radiographic Examination Method
SP-55-2011	Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components – Visual Method for Evaluation of Surface Irregularities (ANSI-approved American National Standard)
SP-58-2009	Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation (incorporates content of SP-69, 77, 89, and 90) (ANSI-approved American National Standard)
SP-60-2012	Connecting Flange Joints between Tapping Sleeves and Tapping Valves
SP-61-2009	Pressure Testing of Valves
SP-65-2012	High Pressure Chemical Industry Flanges and Threaded Stubs for Use with Lens Gaskets
SP-67-2011	Butterfly Valves
SP-68-2011	High Pressure Butterfly Valves with Offset Design
SP-69-2003	Pipe Hangers and Supports – Selection and Application (ANSI-approved American National Standard)
SP-70-2011	Gray Iron Gate Valves, Flanged and Threaded Ends
SP-71-2011	Gray Iron Swing Check Valves, Flanged and Threaded Ends
SP-72-2010a	Ball Valves with Flanged or Butt-Welding Ends for General Service
SP-75-2008	Specification for High-Test, Wrought, Butt-Welding Fittings
SP-78-2011	Gray Iron Plug Valves, Flanged and Threaded Ends
SP-79-2011	Socket Welding Reducer Inserts
SP-80-2008	Bronze Gate, Globe, Angle, and Check Valves
SP-81-2006a	Stainless Steel, Bonnetless, Flanged Knife Gate Valves
SP-83-2006	Class 3000 Steel Pipe Unions Socket Welding and Threaded
SP-85-2011	Gray Iron Globe & Angle Valves, Flanged and Threaded Ends
SP-86-2009	Guidelines for Metric Data in Standards for Valves, Flanges, Fittings, and Actuators (Incl. 2011 Errata Sheet)
SP-87-1991	(R 1996 – Reinstated 2011) Factory-Made Butt-Welding Fittings for Class I Nuclear Piping Applications
SP-88-2010	Diaphragm Valves
SP-91-2009	Guidelines for Manual Operation of Valves
SP-92-2012	MSS Valve User Guide
SP-93-2008	Quality Standard for Steel Castings and Forgings for Valves, Flanges, Fittings, and Other Piping Components – Liquid Penetrant Examination Method
SP-94-2008	Quality Standard for Ferritic and Martensitic Steel Castings for Valves, Flanges, Fittings, and Other Piping Components – Ultrasonic Examination Method
SP-95-2006	Swage(d) Nipples and Bull Plugs
SP-96-2011	Guidelines on Terminology for Valves and Fittings
SP-97-2012	Integrally Reinforced Forged Branch Outlet Fittings – Socket Welding, Threaded, and Buttwelding Ends
SP-98-2012	Protective Coatings for the Interior of Valves, Hydrants, and Fittings
SP-99-2010	Instrument Valves
SP-100-2009	Qualification Requirements for Elastomer Diaphragms for Nuclear Service Diaphragm Valves
SP-101-1989	(R 2001) Part-Turn Valve Actuator Attachment – Flange and Driving Component Dimensions and Performance Characteristics
SP-102-1989	(R 2001) Multi-Turn Valve Actuator Attachment – Flange and Driving Component Dimensions and Performance Characteristics
SP-104-2012	Wrought Copper Solder-Joint Pressure Fittings
SP-105-2010	Instrument Valves for Code Applications
SP-106-2012	Cast Copper Alloy Flanges and Flanged Fittings: Class 125, 150, and 300
SP-108-2012	Resilient-Seated Cast Iron Eccentric Plug Valves
SP-109-2012	Welded-Fabricated Copper Solder-Joint Pressure Fittings
SP-110-2010	Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends (incl. 2010 Errata Sheet)
SP-111-2012	Gray-Iron and Ductile-Iron Tapping Sleeves
SP-112-2010	Quality Standard for Evaluation of Cast Surface Finishes – Visual and Tactile Method. This SP must be used with a 10-surface, three dimensional Cast Surface Comparator, which is a necessary part of the standard. Additional Comparators available separately.
SP-113-2012	Connecting Joints between Tapping Machines and Tapping Valves
SP-114-2007	Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000 (ANSI-approved American National Standard)
SP-115-2010	Excess Flow Valves, 1¼ NPS and Smaller, for Fuel Gas Service
SP-116-2011	Service-Line Valves and Fittings for Drinking Water Systems
SP-117-2011	Bellows Seals for Globe and Gate Valves
SP-118-2007	Compact Steel Globe & Check Valves – Flanged, Flangeless, Threaded & Welding Ends (Chemical & Petroleum Refinery Service)
SP-119-2010	Factory-Made Wrought Belled End Pipe Fittings for Socket-Welding
SP-120-2011	Flexible Graphite Packing System for Rising Stem Valves – Design Requirements
SP-121-2006	Qualification Testing Methods for Stem Packing for Rising Stem Steel Valves
SP-122-2012	Plastic Industrial Ball Valves
SP-123-1998	(R 2006) Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube
SP-124-2012	Fabricated Tapping Sleeves
SP-125-2010	Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves
SP-126-2007	Steel In-Line Spring-Assisted Center Guided Check Valves
SP-127-2001	Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application
SP-128-2012	Ductile Iron Gate Valves
SP-129-2003	(R 2007) Copper-Nickel Socket-Welding Fittings and Unions
SP-130-2003	Bellows Seals for Instrument Valves
SP-131-2010	Metallic Manually Operated Gas Distribution Valves
SP-132-2010	Compression Packing Systems for Instrument Valves
SP-133-2010	Excess Flow Valves for Low Pressure Fuel Gas Appliances
SP-134-2012	Valves for Cryogenic Service, including Requirements for Body/Bonnet Extensions
SP-135-2010	High Pressure Knife Gate Valves
SP-136-2007	Ductile Iron Swing Check Valves
SP-137-2007	Quality Standard for Positive Material Identification of Metal Valves, Flanges, Fittings, and Other Piping Components
SP-138-2009	Quality Standard Practice for Oxygen Cleaning of Valves & Fittings
SP-139-2010	Copper Alloy Gate, Globe, Angle, and Check Valves for Low Pressure/Low Temperature Plumbing Applications
SP-140-2012	Quality Standard Practice for Preparation of Valves and Fittings for Silicone-Free Service
SP-141-2012	Multi-Turn and Check Valve Modifications
SP-142-2012	Excess Flow Valves for Fuel Gas Service, NPS 1½ through 12
SP-143-2012	Live-Loaded Valve Stem Packing Systems

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