MSS SP-97-2019

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

Standard Practice
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The U.S. customary units and SI (metric) 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 non-conformance with this Standard Practice.

> **This Standard Practice has been substantially revised from the previous 2012 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 and previous edition.**

Non-toleranced dimensions in the Standard Practice are nominal unless otherwise specified.

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

1. SCOPE

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

1.1.1 Unless specified otherwise by the manufacturer, conventional integrally reinforced forged branch outlet fittings are intended for the following header by branch combinations: STD x STD, XS x XS, SCH. 160 x SCH 160, XXS x XXS, XS x 3000, SCH 160 x 6000, and XXS x 9000. When the run and branch pipes are of differing or mixed schedules, then the selection of the branch connection shall be determined by contacting the manufacturer. Such selections shall be agreed upon by purchaser and manufacturer at time of order and may involve supplemental marking requirements determined by other standards (e.g., material grade determination, other factors). See Section 1.3. Mixed schedule branch outlet fittings are unique to the design of each system, and thus outside the scope of this Standard Practice. The adequacy of the design for light, intermediate, and heavy wall branch outlet fittings may be established by mathematical analysis as contained in the applicable pressure vessel or piping codes, or by finite element analysis.

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, otherwise conforming to this Standard Practice, may be made to special dimensions, size, shape, tolerances, or other dimensional requirements of other wrought material by agreement between the manufacturer and the purchaser. See Section 4.2 (f) for supplemental marking requirements.

1.4 ***Standard Units*** Tables 2 through 7 show the fitting's dimensional requirements in U.S. 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 U.S. 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 Run/Branch Wall Designation of Pipe for Calculation of Ratings

Class of Fitting	Type	Branch Size		Run Pipe Wall for Ratings Basis[a]	Branch Pipe Wall for Ratings Basis[a]
		NPS	DN		
Standard	Buttwelding	1/8 – 24	6 – 600	Standard	Standard
Extra Strong	Buttwelding	1/8 – 24	6 – 600	Extra Strong	Extra Strong
Schedule 160	Buttwelding	1/2 – 6	15 – 150	Schedule 160	Schedule 160
Double Extra Strong	Buttwelding	1/2 – 6	15 – 150	Double Extra Strong	Double Extra Strong
3000	Threaded	1/8 – 4	6 – 100	Extra Strong	Extra Strong
6000	Threaded	1/8 – 2	6 – 50	Schedule 160	Schedule 160
9000	Threaded	1/8 – 2	6 – 50	Double Extra Strong	Double Extra Strong
3000	Socket Welded	1/8 – 4	6 – 100	Extra Strong	Extra Strong
6000	Socket Welded	1/8 – 2	6 – 50	Schedule 160	Schedule 160
9000	Socket Welded	1/2 – 2	15 – 50	Double Extra Strong	Double Extra Strong

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° 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 in. (1.6 mm). See Figure 1.

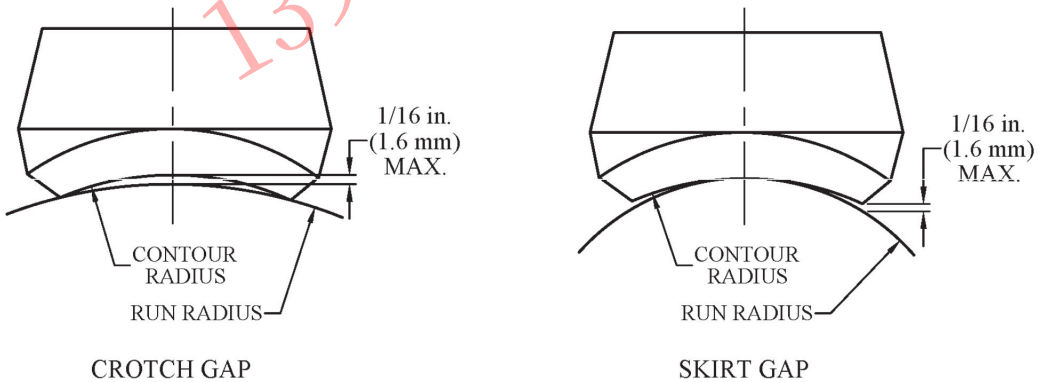


FIGURE 1
Fitting Consolidation Gap Allowance
(Illustrative Only)
Applicable to 90° and 45° Branches

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), "XXS" (Double Extra Strong), "SCH 160" (Schedule 160), "3000", "6000", or "9000". Alternatively, the designation 3M, 6M, or 9M, 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) ***Compliance Marking*** Fittings shall be marked with "SP97" to indicate compliance with MSS SP-97.

f) ***"SPLD" Marking*** This *special fittings* marking shall suffix the "SP97" mark when fittings are manufactured in accordance with Section 1.3. Example: "SP97SPLD".

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, A350/A350M, or A694/A694M.

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, Table 3, or Appendix VII Tables, may be used.

6. DESIGN AND DIMENSIONS

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, Figure 127.4.8(e) and ASME B31.3, Figure 328.5.4(f).

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 National Pipe Thread Taper (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.

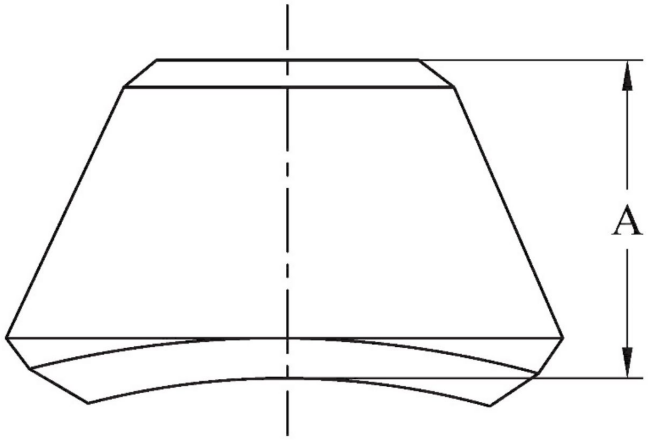
6.5 The contour weld bevel angle on the longitudinal section of the fittings shall be a minimum of 35 degrees (35°). The weld bevel angle on the transverse section of the fitting is based on the manufacturer's specification.

7. TESTING

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

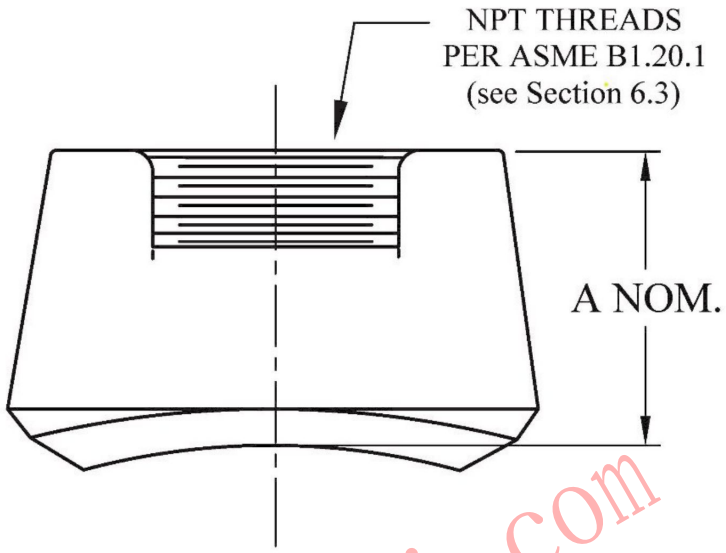


Dimensions in inches

Outlet (NPS)	A (Face of Fitting to Crotch)							
	Standard		Extra Strong		Schedule 160		Double Extra Strong	
	Reducing	Full	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	1.13	1.13	1.13	1.13
3/4	0.88	0.88	0.88	0.88	1.25	1.25	1.25	1.25
1	1.06	1.06	1.06	1.06	1.50	1.50	1.50	1.50
1¼	1.25	1.25	1.25	1.25	1.75	1.75	1.75	1.75
1½	1.31	1.31	1.31	1.31	2.00	2.00	2.00	2.00
2	1.50	1.50	1.50	1.50	2.18	2.18	2.18	2.18
2½	1.62	1.62	1.62	1.62	2.44	2.44	2.44	2.44
3	1.75	1.75	1.75	1.75	2.88	2.88	2.88	2.88
3½	1.88	2.00	1.88	2.00	3.00	3.00	3.00	3.00
4	2.00	2.00	2.00	2.00	3.31	3.31	3.31	3.31
5	2.25	2.25	2.25	2.25	3.69	3.69	3.69	3.69
6	2.38	2.38	3.06	3.06	4.12	4.12	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: NPS 1/8 – 3/4 ±0.03 in.
NPS 1 – 4 ±0.06 in.
NPS 5 – 12 ±0.12 in.
NPS 14 – 24 ±0.19 in.

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

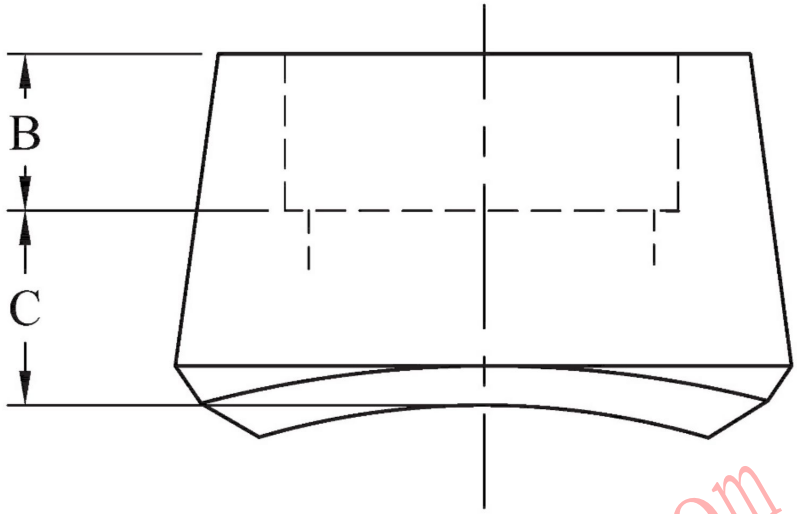


Dimensions in inches

Outlet (NPS)	A Nom. (Face of Fitting to Crotch)		
	Threaded		
	Class 3000	Class 6000	Class 9000
1/8	0.75	1.13	1.13
1/4	0.75	1.13	1.13
3/8	0.81	1.13	1.13
1/2	1.00	1.25	1.25
3/4	1.06	1.44	1.44
1	1.31	1.56	1.56
1¼	1.31	1.62	1.62
1½	1.38	1.69	1.69
2	1.50	2.06	2.06
2½	1.81	–	–
3	2.00	–	–
4	2.25	–	–

Tolerances: NPS 1/8 – 3/4 ±0.03 in.
NPS 1 – 4 ±0.06 in.

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

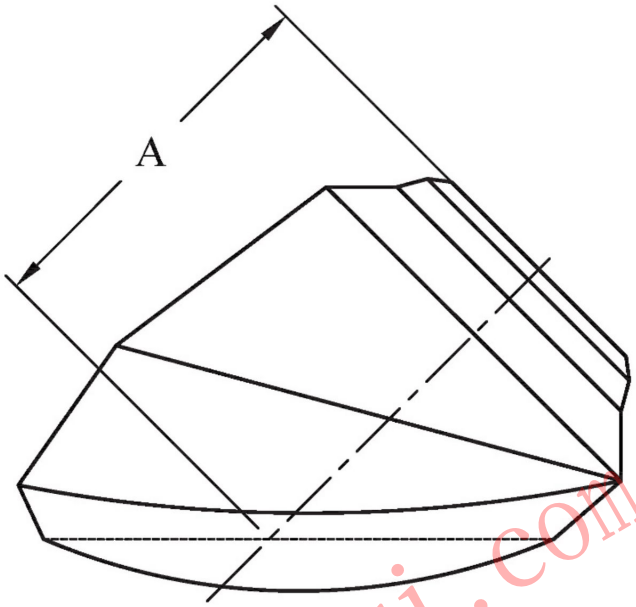


Dimensions in inches

Outlet (NPS)	B Min.[a]	C Max.		
		Class 3000	Class 6000	Class 9000
1/8	0.38	0.41	0.75	–
1/4	0.38	0.41	0.75	–
3/8	0.38	0.50	0.75	–
1/2	0.38	0.63	0.94	0.94
3/4	0.50	0.63	1.00	1.00
1	0.50	0.88	1.13	1.13
1¼	0.50	0.88	1.19	1.19
1½	0.50	0.94	1.25	1.25
2	0.62	0.94	1.44	1.44
2½	0.62	1.00	–	–
3	0.62	1.19	–	–
4	0.75	1.19	–	–

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

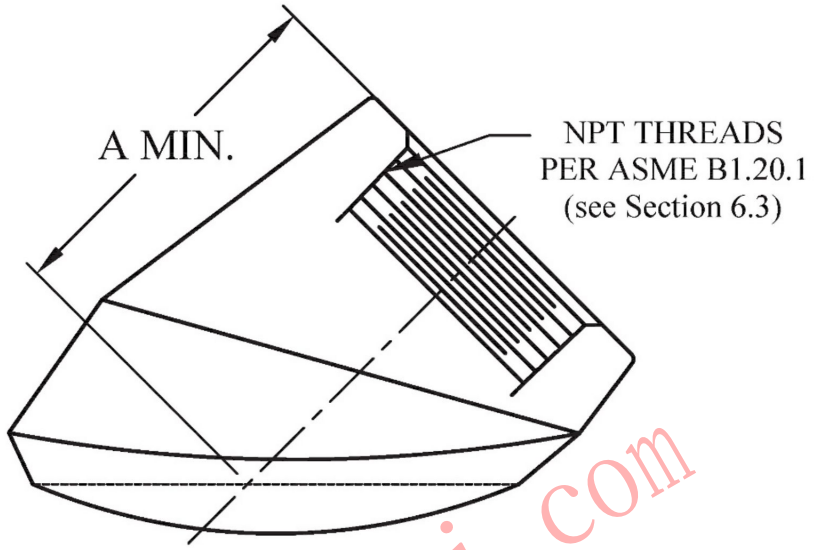
TABLE 5
45° Branch Outlets – Buttwelding, U.S. Customary Units



Dimensions in inches

Outlet (NPS)	A (Top of Fitting to Run Pipe)	
	Standard / Extra Strong	
	A Min.	A Max.
1/4	1.50	1.69
3/8	1.50	1.69
1/2	1.50	1.69
3/4	1.75	2.00
1	2.13	2.56
1¼	2.13	2.56
1½	2.50	2.75
2	2.88	3.50

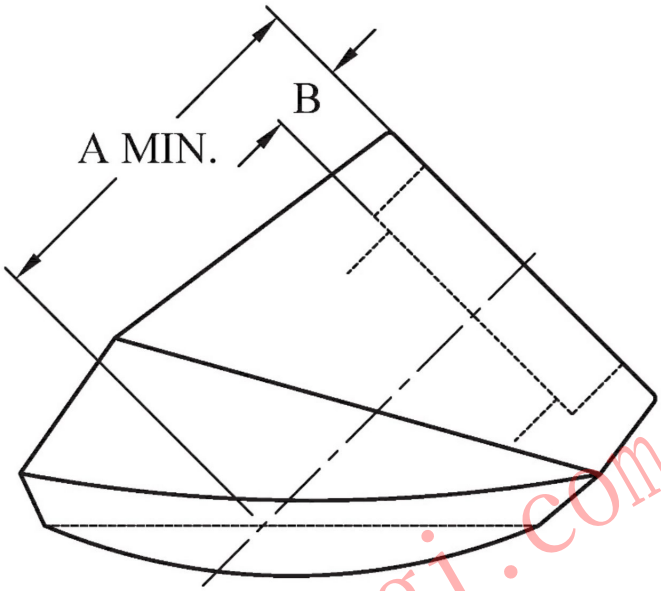
TABLE 6
45° Branch Outlets – Threaded, U.S. Customary Units



Dimensions 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	1.50	1.69	1.53	1.88
3/8	1.50	1.69	1.53	1.88
1/2	1.50	1.75	1.81	2.19
3/4	1.81	2.00	2.13	2.50
1	2.13	2.50	2.41	2.88
1¼	2.41	3.00	2.56	3.06
1½	2.50	3.00	3.09	3.38
2	3.00	3.31	3.09	4.13

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



Dimensions 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	1.50	1.69	1.53	1.88
3/8	0.38	1.50	1.69	1.53	1.88
1/2	0.38	1.50	1.75	1.81	2.19
3/4	0.50	1.81	2.00	2.13	2.50
1	0.50	2.13	2.50	2.41	2.88
1¼	0.50	2.41	3.00	2.56	3.06
1½	0.50	2.50	3.00	3.09	3.38
2	0.62	3.00	3.31	3.09	4.13

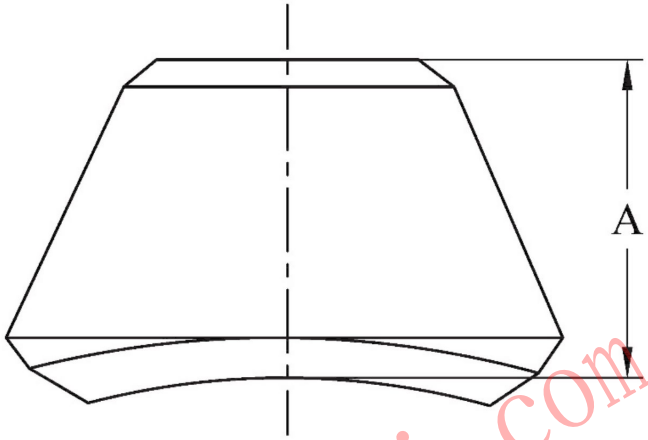
NOTE: (a) "B" Minimum Socket Depth per ASME B16.11

ANNEX A

SI (Metric) Tables A2 through A7

TABLE A2

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



Dimensions in millimeters

Outlet (DN)	A (Face of Fitting to Crotch)							
	Standard		Extra Strong		Schedule 160		Double Extra Strong	
	Reducing	Full	Reducing	Full	Reducing	Full	Reducing	Full
6	15.7	–	15.7	–	–	–	–	–
8	15.7	–	15.7	–	–	–	–	–
10	19.1	–	19.1	–	–	–	–	–
15	19.1	19.1	19.1	19.1	28.4	28.4	28.4	28.4
20	22.4	22.4	22.4	22.4	31.8	31.8	31.8	31.8
25	26.9	26.9	26.9	26.9	38.1	38.1	38.1	38.1
32	31.8	31.8	31.8	31.8	44.4	44.4	44.4	44.4
40	33.3	33.3	33.3	33.3	50.8	50.8	50.8	50.8
50	38.1	38.1	38.1	38.1	55.4	55.4	55.4	55.4
65	41.1	41.1	41.1	41.1	62.0	62.0	62.0	62.0
80	44.4	44.4	44.4	44.4	73.2	73.2	73.2	73.2
90	47.8	50.8	47.8	50.8	76.2	76.2	76.2	76.2
100	50.8	50.8	50.8	50.8	84.1	84.1	84.1	84.1
125	57.2	57.2	57.2	57.2	93.7	93.7	93.7	93.7
150	60.4	60.4	77.7	77.7	104.6	104.6	104.6	104.6
200	69.8	69.8	98.6	98.6	–	–	–	–
250	77.7	77.7	93.7	88.9	–	–	–	–
300	85.9	85.9	103.1	100.1	–	–	–	–
350	88.9	88.9	100.1	104.6	–	–	–	–
400	93.7	93.7	106.2	112.8	–	–	–	–
450	96.8	103.1	111.2	119.1	–	–	–	–
500	101.6	117.3	119.1	127.0	–	–	–	–
600	115.8	136.6	139.7	139.7	–	–	–	–

Tolerances:

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

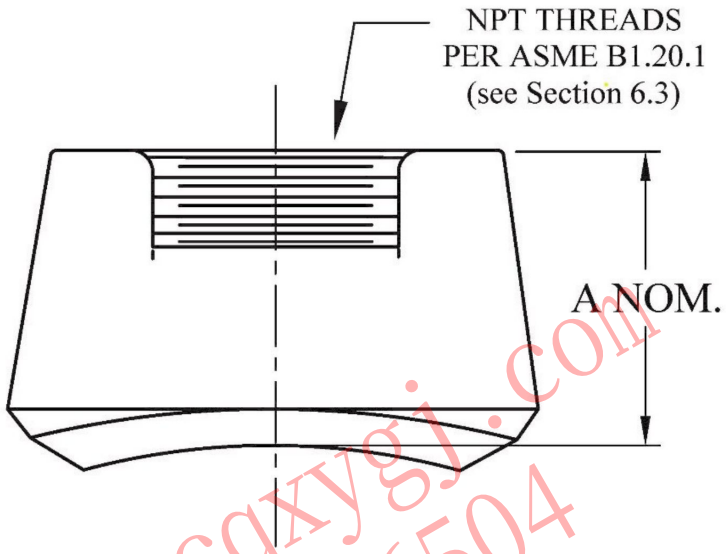
ANNEX A

SI (Metric) Tables A2 through A7

(*continued*)

TABLE A3

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



Dimensions in millimeters

Outlet (DN)	A Nom. (Face of Fitting to Crotch)		
	Threaded		
	Class 3000	Class 6000	Class 9000
6	19.0	28.7	28.7
8	19.0	28.7	28.7
10	20.6	28.7	28.7
15	25.4	31.8	31.8
20	26.9	36.6	36.6
25	33.3	39.6	39.6
32	33.3	41.1	41.1
40	35.0	42.3	42.3
50	38.1	52.3	52.3
65	46.0	–	–
80	50.8	–	–
100	57.2	–	–

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

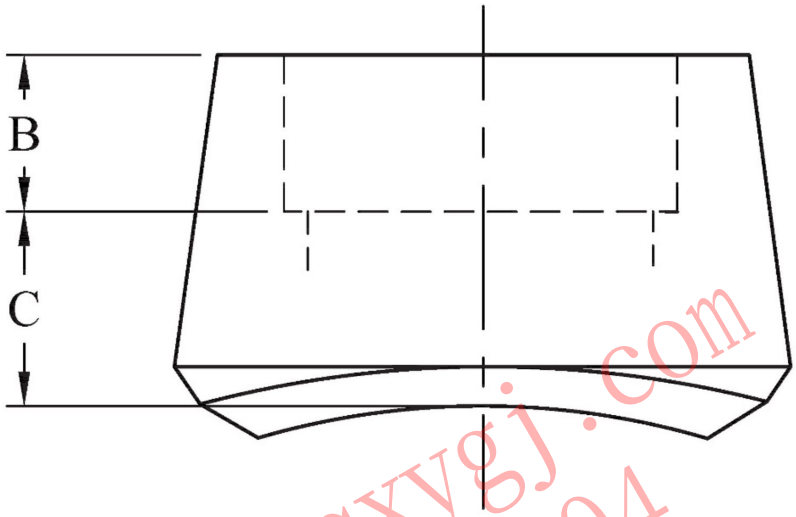
ANNEX A

SI (Metric) Tables A2 through A7

(*continued*)

TABLE A4

90° Branch Outlets – Socket Welding, SI (Metric) Units



Dimensions in millimeters

Outlet (DN)	B Min.[a]	C Max.		
		Class 3000	Class 6000	Class 9000
6	9.5	11	19	–
8	9.5	11	19	–
10	9.5	13	19	–
15	9.5	16	24	24
20	12.5	16	26	26
25	12.5	23	29	29
32	12.5	23	31	31
40	12.5	24	32	32
50	16.0	24	37	37
65	16.0	26	–	–
80	16.0	31	–	–
100	19.0	31	–	–

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

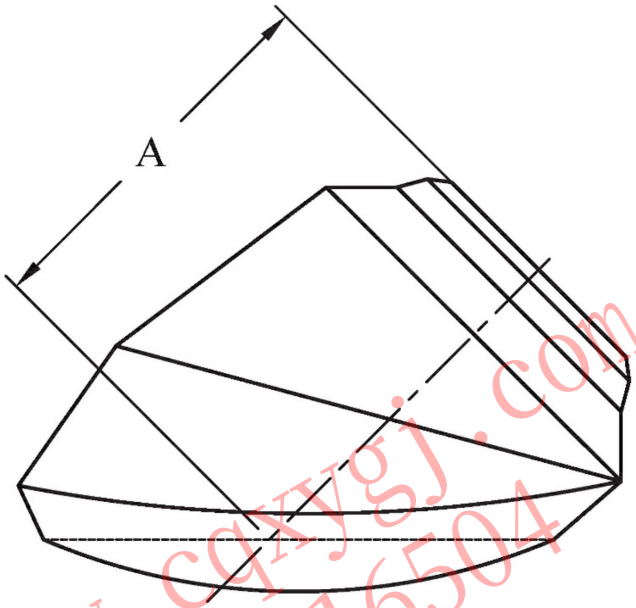
ANNEX A

SI (Metric) Tables A2 through A7

(*continued*)

TABLE A5

45° Branch Outlets – Buttwelding, SI (Metric) Units



Dimensions 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

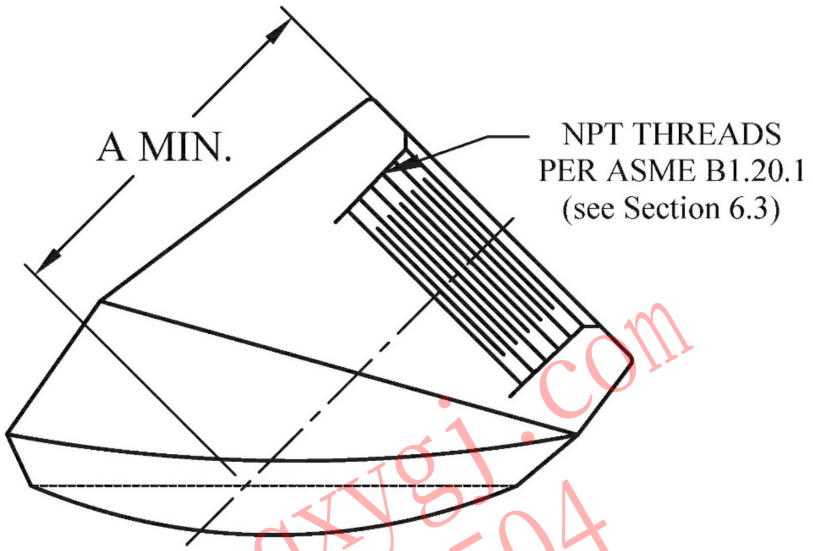
ANNEX A

SI (Metric) Tables A2 through A7

(*continued*)

TABLE A6

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



Dimensions 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

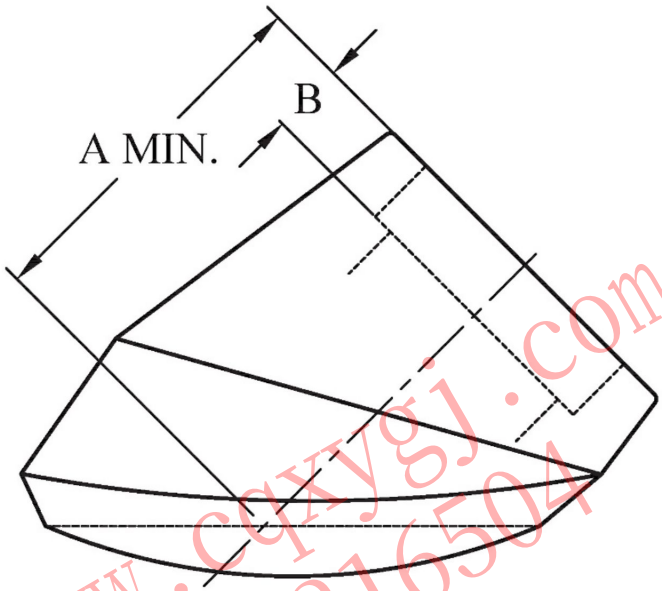
ANNEX A

SI (Metric) Tables A2 through A7

(*continued*)

TABLE A7

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



Dimensions 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:

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

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 if:

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.

ANNEX B

Design Proof Test

(*continued*)

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 the main text for convenience.

Standard Name	Description
ASME; ANSI/ASME	
B1.20.1-2013	Pipe Threads, General Purpose (Inch)
B16.11-2016	Forged Fittings, Socket-Welding and Threaded; includes Errata (2017)
B16.25-2017	Buttwelding Ends
B16.34-2017	Valves – Flanged, Threaded, and Welding End
B31.1-2018	Power Piping
B31.3-2016	Process Piping
B36.10M-2018	Welded and Seamless Wrought Steel Pipe
ASTM	**Standard Specification for:**
A105/A105M-18	Carbon Steel Forgings for Piping Applications
A182/A182M-18a	Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
A234/A234M-18a	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
A350/A350M-18	Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
A403/A403M-18a	Wrought Austenitic Stainless Steel Piping Fittings
A420/A420M-16	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
A694/A694M-16	Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Service
A815/A815M-18	Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings

The following organizations appear in the above list:

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

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MSS Standard Practices (SPs) related to or referenced in this publication:

ANSI/MSS SP-25	***Standard Marking System for Valves, Fittings, Flanges, and Unions***
ANSI/MSS SP-96	***Terminology for Valves, Fittings, and Their Related Components***

American National Standards Published by MSS, an ANSI-accredited Standards Developer:

ANSI/MSS SP-25	***Standard Marking System for Valves, Fittings, Flanges, and Unions***
ANSI/MSS SP-44	***Steel Pipeline Flanges***
ANSI/MSS SP-55	***Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components – Visual Method for Evaluation of Surface Irregularities***
ANSI/MSS SP-58	***Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation***
ANSI/MSS SP-96	***Terminology for Valves, Fittings, and Their Related Components***
ANSI/MSS SP-114	***Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000***
ANSI/MSS SP-122	***Plastic Industrial Ball Valves***
ANSI/MSS SP-134	***Valves for Cryogenic Service, including Requirements for Body/Bonnet Extensions***
ANSI/MSS SP-135	***High Pressure Knife Gate Valves***
ANSI/MSS SP-138	***Quality Standard Practice for Oxygen Cleaning of Valves and Fittings***
ANSI/MSS SP-144	***Pressure Seal Bonnet Valves***

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The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry is a non-profit technical association organized for development and improvement of industry, national and international codes and standards for Valves, Valve Actuators, Valve Modifications, Pipe Fittings, Flanges, Pipe Hangers and Supports, and Associated Seals. Since its establishment in 1924, MSS has been dedicated to developing standards for national and global applications, in cooperation with other standardizing bodies and regulatory authorities.

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