MSS SP-97-2006

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

Standard Practice
Developed and Approved by the
Manufacturers Standardization Society of the
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This MSS Standard Practice was developed under the consensus of the MSS Technical Committee 105 and the MSS Coordinating Committee. The content of this Standard Practice is the result of the efforts of competent and concerned volunteers to provide an effective, clear, and non-exclusive specification that will benefit the industry as a whole. This MSS Standard Practice is intended as a basis for common practice by the manufacturer, the user, and the general public. The existence of an MSS Standard Practice does not in itself preclude the manufacture, sale, or use of products not conforming to the Standard Practice. Mandatory conformance is established only by reference in a code, specification, sales contract, or public law, as applicable.

U.S. customary units in this SP are the standard; the metric units are for reference only.

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

In this Standard Practice all notes, annexes, tables, and figures are construed to be essential to the understanding of the message of the Standard Practice and are considered part of the text unless noted as “supplemental”.

Unless otherwise specifically noted in this MSS SP, any standard referred to herein is identified by the date of issue that was applicable to the referenced standard(s) at the date of issue of this MSS SP. (See Annex C).

Substantive changes in this 2006 edition are “flagged” by parallel bars as shown on the margins of this paragraph. The specific detail of the change may be determined by comparing the material flagged with that in the previous edition.

Originally Approved June 1987

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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 degree integrally reinforced forged branch outlet fittings of buttwelding, 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.

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 ANSI 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 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	Buttwelding	NPS 1/8 – 24	Standard
Extra Strong	Buttwelding	NPS 1/8 – 24	Extra Strong
Schedule 160	Buttwelding	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

(a) Note: 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 branch outlet sizes considered in this Standard Practice are shown in Table 1. Size on size fittings shall be limited to outlet sizes 1/2 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 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 X Outlet NPS.

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 shall consist of forgings, bars, and seamless tubular products that conform to the melting process requirements, chemical composition requirements, and mechanical property requirements of the forging product form listed in Table 1, found in ASME B16.34, including notes.

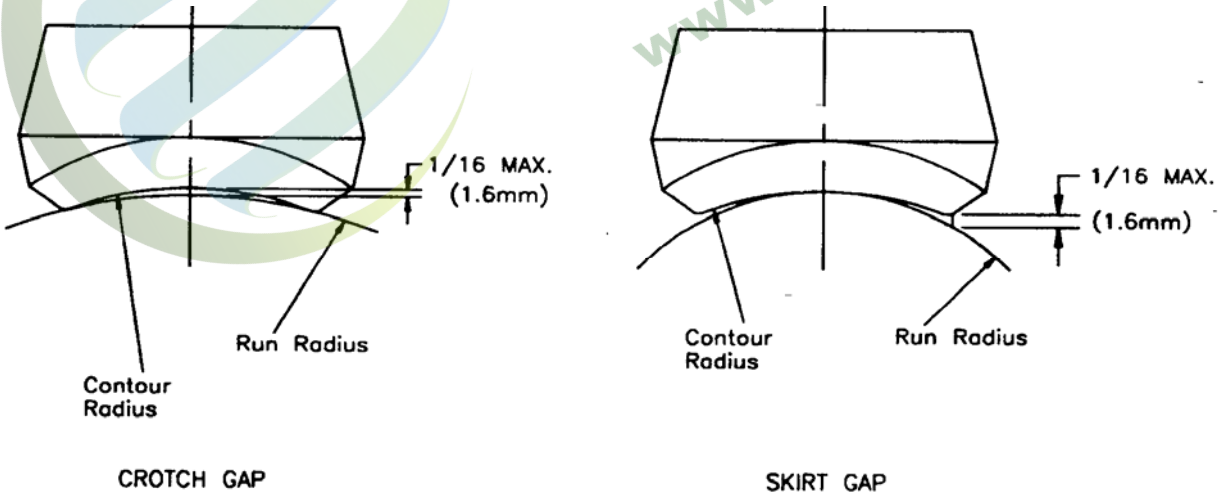


FIGURE 1 Fitting Consolidation Gap Allowance
(Illustrative Only)

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 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 codes 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 finish 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.

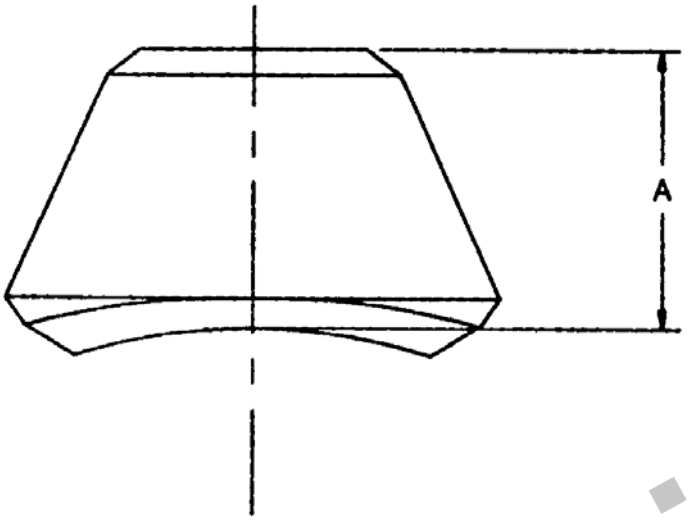
6.5 The contour weld bevel angle on the longitudinal section of the fittings shall be minimum of 35 degrees. The weld bevel angle on the transverse section of the fitting is based on the manufacturer's specification.

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 shall be conducted in accordance with Annex B.

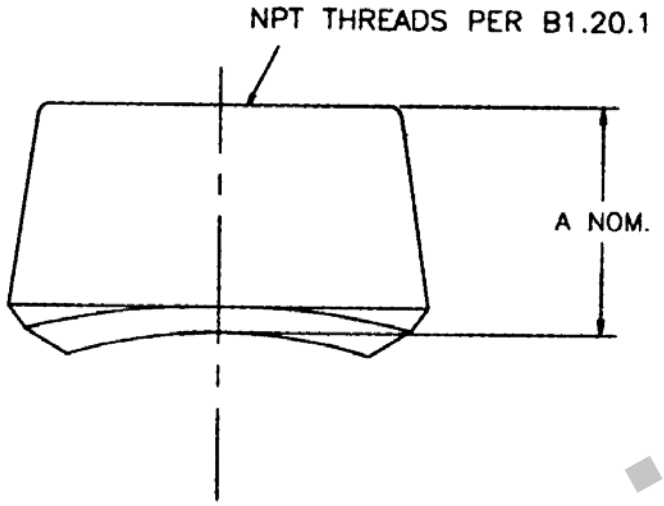
TABLE 2 Branch Outlet Height – Buttwelding, Customary Units



OUTLET NPS	"A" (FACE OF FITTING TO CROTCH)					
	STANDARD		EXTRA STRONG		SCHEDULE 160	
	Reducing	Full	Reducing	Full	Reducing	Full
1/8	.62	-	.62	-	-	-
1/4	.62	-	.62	-	-	-
3/8	.75	-	.75	-	-	-
1/2	.75	.75	.75	.75	1.12	1.12
3/4	.88	.88	.88	.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	-	-

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

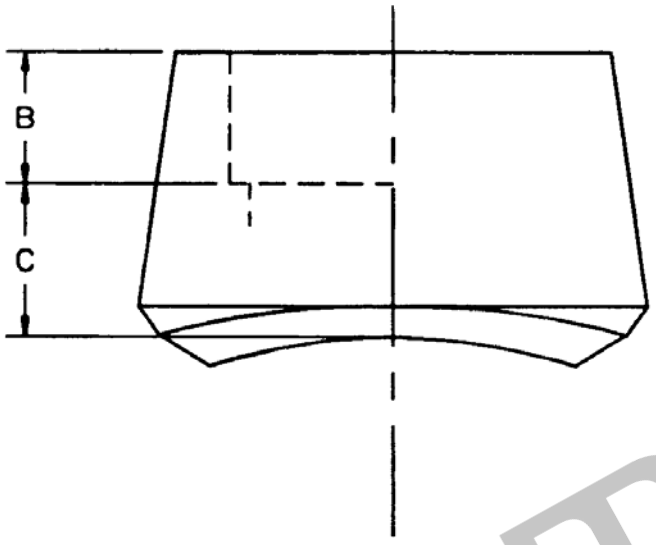
TABLE 3 Branch Outlet Height – Threaded, Customary Units



OUTLET NPS	"A" (FACE OF FITTING TO CROTCH) THREADED	
	3000	6000
1/8	.75	-
1/4	.75	-
3/8	.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	-

Dimensions are in Inches
Tolerances: 1/8 – 1/4 ± .03 in.
1 – 4 ± .06 in.

TABLE 4 Branch Outlets – Socket Welding Customary Units

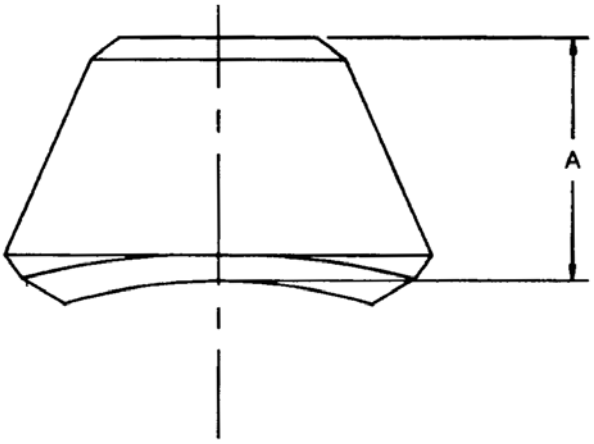


OUTLET NPS	"B" MIN. [a]	"C" MAX.	
		3000	6000
1/8	0.38	0.41	-
1/4	0.38	0.41	-
3/8	0.38	0.50	-
1/2	0.38	0.63	0.94
3/4	0.50	0.63	1.00
1	0.50	0.88	1.13
1-1/4	0.50	0.88	1.19
1-1/2	0.50	0.94	1.25
2	0.62	0.94	1.44
2-1/2	0.62	1.00	-
3	0.62	1.19	-
4	0.75	1.19	-

(a) Note: "B" Minimum Socket Depth per ASME B16.11
Dimensions are in inches

ANNEX A

TABLE A1 Branch Outlet Height – Buttwelding, Metric Units

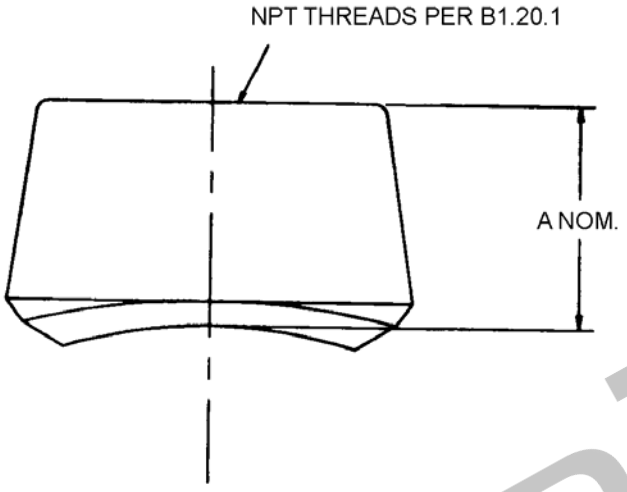


OUTLET DN	OUTLET NPS	"A" (FACE OF FITTING TO CROTCH)					
		STANDARD		EXTRA STRONG		SCHEDULE 160	
		Reducing	Full	Reducing	Full	Reducing	Full
6	1/8	16	-	16	-	-	-
8	1/4	16	-	16	-	-	-
10	3/8	19	-	19	-	-	-
15	1/2	19	19	19	19	28	28
20	3/4	22	22	22	22	32	32
25	1	27	27	27	27	38	38
32	1-1/4	32	32	32	30	44	44
40	1-1/2	33	33	33	32	51	51
50	2	38	38	38	38	55	55
65	2-1/2	41	41	41	41	62	62
80	3	44	44	44	44	73	73
90	3-1/2	48	51	48	51	-	-
100	4	51	51	51	51	84	84
125	5	57	57	57	57	94	94
150	6	60	60	78	78	105	105
200	8	70	70	99	99	-	-
250	10	78	78	94	89	-	-
300	12	86	86	103	100	-	-
350	14	89	89	100	105	-	-
400	16	94	94	106	113	-	-
450	18	97	103	111	119	-	-
500	20	102	117	119	127	-	-
600	24	116	137	140	140	-	-

Dimensions are in Millimeters
Tolerances: 1/8 – 3/4 ± 0.8mm
1 – 4 ± 1.6mm
5 – 12 ± 3.2mm
14 – 24 ± 4.8mm

ANNEX A (Continued)

Table A2 Branch Outlet Height – Threaded, Metric Units

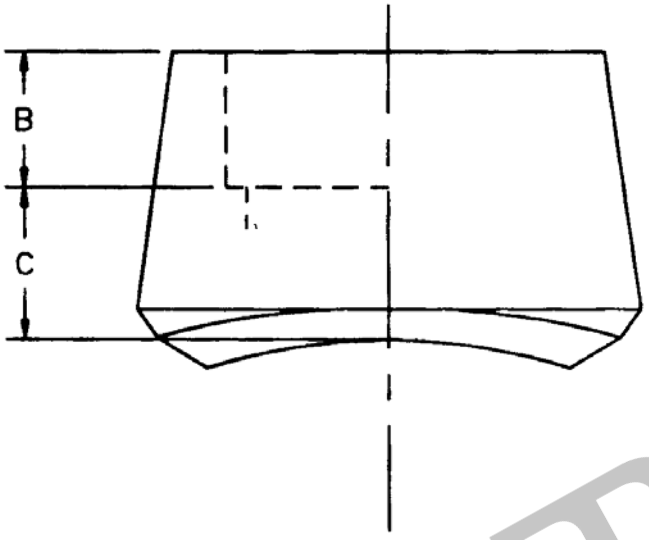


OUTLET DN	OUTLET NPS	"A" (FACE OF FITTING TO CROTCH) THREADED	
		3000	6000
6	1/8	19	-
8	1/4	19	-
10	3/8	21	-
15	1/2	25	32
20	3/4	27	37
25	1	33	40
32	1-1/4	33	41
40	1-1/2	35	43
50	2	38	52
65	2-1/2	46	-
80	3	51	-
100	4	57	-

Dimensions are in Millimeters
Tolerances: 1/8 – 1/4 ± 0.8mm
1 – 4 ± 1.6mm

ANNEX A (Continued)

TABLE A3 Branch Outlets – Socket Welding, Metric Units



OUTLET DN	OUTLET NPS	"B" MIN.[a]	"C" MAX.	
			3000	6000
6	1/8	10	10	-
8	1/4	10	10	-
10	3/8	10	13	-
15	1/2	10	16	24
20	3/4	13	16	25
25	1	13	22	29
32	1-1/4	13	22	30
40	1-1/2	13	24	32
50	2	16	24	37
65	2-1/2	16	25	-
80	3	16	30	-
100	4	19	30	-

(a) Note: "B" Minimum Socket Depths per ASME B16.11
Dimensions are in Millimeters

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 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 should 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 or Description

ASME, ASME/ANSI, ANSI/ASME, ANSI Standards

B1.20.1	-	1983 (R 2001)	Pipe Threads, General Purpose (Inch)
B16.34	-	2004	Valves-Flanged, Threaded and Welding Ends
B36.10M	-	2004	Welded and Seamless Wrought Steel Pipe
B16.11	-	2005	Forged Fittings, Socket-Welding and Threaded
B16.25	-	2003	Buttwelding Ends
B31.1	-	2004	Power Piping
B31.3	-	2004	Process Piping

Publications of the following organizations appear on the above list:

ANSI American National Standards Institute, Inc.
25 W. 43rd Street
4th Floor
New York, NY 10036

ASME ASME International
3 Park Avenue
New York, New York 10016-5990

List of MSS Standard Practices
(Price List Available Upon Request)

Number	
SP-6-2001	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
SP-9-2001	(R 05) Spot Facing for Bronze, Iron and Steel Flanges
SP-25-1998	Standard Marking System for Valves, Fittings, Flanges and Unions
SP-42-2004	Class 150 Corrosion Resistant Gate, Glove, Angle and Check Valves with Flanged and Butt Weld Ends
SP-43-1991	(R 01) Wrought Stainless Steel Butt-Welding Fittings
SP-44-2006	Steel Pipeline Flanges
SP-45-2003	Bypass and Drain Connections
SP-51-2003	Class 150LW Corrosion Resistant Flanges and Cast Flanged Fittings
SP-53-1999	(R 02) Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components - Magnetic Particle Examination Method
SP-54-1999	(R 02) Quality Standard for Steel Castings for Valves, Flanges, and Fittings and Other Piping Components - Radiographic Examination Method
SP-55-2001	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components - Visual Method for Evaluation of Surface Irregularities
SP-58-2002	Pipe Hangers and Supports - Materials, Design and Manufacture
SP-60-2004	Connecting Flange Joint Between Tapping Sleeves and Tapping Valves
SP-61-2003	Pressure Testing of Steel Valves
SP-65-2004	High Pressure Chemical Industry Flanges and Threaded Stubs for Use with Lens Gaskets
SP-67-2002a	Butterfly Valves
SP-68-1997	(R 04) High Pressure Butterfly Valves with Offset Design
SP-69-2003	Pipe Hangers and Supports - Selection and Application (ANSI/MSS Edition)
SP-70-2006	Gray Iron Gate Valves, Flanged and Threaded Ends
SP-71-2005	Gray Iron Swing Check Valves, Flanged and Threaded Ends
SP-72-1999	Ball Valves with Flanged or Butt-welding Ends for General Service
SP-73-2003	Brazing Joints for Copper and Copper Alloy Pressure Fittings
SP-75-2004	Specification for High Test Wrought Butt Welding Fittings
SP-77-1995	(R 00) Guidelines for Pipe Support Contractual Relationships
SP-78-2005	Gray Iron Plug Valves, Flanged and Threaded Ends
SP-79-2004	Socket-Welding Reducer Inserts
SP-80-2003	Bronze Gate, Globe, Angle and Check Valves
SP-81-2006	Stainless Steel, Bonnetless, Flanged, Knife Gate Valves
SP-83-2006	Class 3000 Steel Pipe Unions, Socket-Welding and Threaded
SP-85-2002	Gray Iron Globe & Angle Valves, Flanged and Threaded Ends
SP-86-2002	Guidelines for Metric Data in Standards for Valves, Flanges, Fittings and Actuators
SP-88-1993	(R 01) Diaphragm Valves
SP-89-2003	Pipe Hangers and Supports - Fabrication and Installation Practices
SP-90-2000	Guidelines on Terminology for Pipe Hangers and Supports
SP-91-1992	(R 96) Guidelines for Manual Operation of Valves
SP-92-1999	MSS Valve User Guide
SP-93-1999	(R 04) Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components - Liquid Penetrant Examination Method
SP-94-1999	(R 04) Quality Std for Ferritic and Martensitic Steel Castings for Valves, Flanges, and Fittings and Other Piping Components - Ultrasonic Examination Method
SP-95-2006	Swage(d) Nipples and Bull Plugs
SP-96-2001	(R 05) Guidelines on Terminology for Valves and Fittings
SP-97-2006	Integrally Reinforced Forged Branch Outlet Fittings - Socket Welding,Threaded and Buttwelding Ends
SP-98-2001	(R 05) Protective Coatings for the Interior of Valves, Hydrants, and Fittings
SP-99-1994	(R 05) Instrument Valves
SP-100-2002	Qualification Requirements for Elastomer Diaphragms for Nuclear Service Diaphragm Valves
SP-101-1989	(R 01) Part-Turn Valve Actuator Attachment - Flange and Driving Component Dimensions and Performance Characteristics
SP-102-1989	(R 01) Multi-Turn Valve Actuator Attachment - Flange and Driving Component Dimensions and Performance Characteristics
SP-104-2003	Wrought Copper Solder Joint Pressure Fittings
SP-105-1996	(R 05) Instrument Valves for Code Applications
SP-106-2003	Cast Copper Alloy Flanges and Flanged Fittings, Class 125, 150 and 300
SP-108-2002	Resilient-Seated Cast-Iron Eccentric Plug Valves
SP-109-1997	(R 06) Welded Fabricated Copper Solder Joint Pressure Fittings
SP-110-1996	Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
SP-111-2001	(R 05) Gray-Iron and Ductile-Iron Tapping Sleeves
SP-112-1999	(R 04) Quality Standard for Evaluation of Cast Surface Finishes -Visual and Tactile Method. This SP must be sold with a 10-surface, three dimensional Cast Surface Comparator, which is a necessary part of the Standard. Additional Comparators may be sold separately.
SP-113-2001	Connecting Joint between Tapping Machines and Tapping Valves
SP-114-2001	Corrosion Resistant Pipe Fittings Threaded and Socket Welding, Class 150 and 1000
SP-115-1999	Excess Flow Valves 1 1/4 NPS and Smaller, for Fuel Gas Service
SP-116-2003	Service Line Valves and Fittings for Drinking Water Systems
SP-117-2006	Bellows Seals for Globe and Gate Valves
SP-118-2002	Compact Steel Globe & Check Valves - Flanged, Flangeless,Threaded & Welding Ends (Chemical & Petroleum Refinery Service)
SP-119-2003	Factory-Made Belled End Socket Welding Fittings
SP-120-2002	Flexible Graphite Packing System for Rising Stem Steel Valves (Design Requirements)
SP-121-1997	(R 02) Qualification Testing Methods for Stem Packing for Rising Stem Steel Valves
SP-122-2005	Plastic Industrial Ball Valves
SP-123-1998	(R 06) Non-Ferrous Threaded and Solder-Joint Unions for Use With Copper Water Tube
SP-124-2001	Fabricated Tapping Sleeves
SP-125-2000	Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves
SP-126-2000	Steel In-Line Spring-Assisted Center Guided Check Valves
SP-127-2001	Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application
SP-128-2006	Ductile Iron Gate Valves
SP-129-2003	Copper-Nickel Socket-Welding Fittings and Unions
SP-130-2003	Bellows Seals for Instrument Valves
SP-131-2004	Metallic Manually Operated Gas Distribution Valves
SP-132-2004	Compression Packing Systems for Instrument Valves
SP-133-2005	Excess Flow Valves for Low Pressure Fuel Gas Appliances
SP-134-2006	Valves for Cryogenic Service Including Requirements for Body/Bonnet Extensions
SP-135-2006	High Pressure Steel Knife Gate Valves

(R-YEAR) Indicates year standard reaffirmed without substantive changes

A large number of former MSS Practices have been approved by the ANSI or ANSI Standards, published by others. In order to maintain a single source of authoritative information, the MSS withdraws its Standard Practices in such cases.

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