



STANDARD PRACTICE **SP-118**

**COMPACT STEEL GLOBE & CHECK VALVES  
FLANGED, FLANGELESS, THREADED &  
WELDING ENDS  
(CHEMICAL & PETROLEUM REFINERY SERVICE)**

Developed and Approved  
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## COMPACT STEEL GLOBE & CHECK VALVES - FLANGED, FLANGELESS, THREADED & WELDING ENDS (CHEMICAL & PETROLEUM REFINERY SERVICE)

### 1. SCOPE<sup>(1)</sup>

1.1 This MSS Standard Practice covers flanged end, flangeless end, threaded end, socket welding end, and butt-welding end compact steel globe and check valves. The term "Compact" is used to identify the valves covered by this Standard Practice as reduced seat port<sup>(2)</sup> valves. Valve sizes correspond to nominal pipe sizes listed in ASME/ANSI B36.10M and B36.19M. Flanged, flangeless, and butt weld end valves are limited to sizes NPS 4 and smaller; threaded and socket-welding end valves are limited to sizes NPS 2½ and smaller. Valves covered under this Standard Practice shall meet the requirements of ASME B16.34, "Standard Class". The following valves are covered by this Standard Practice:

- a) Class 800 valve with threaded, socket-welding, or butt-welding ends; an inside screw with rising stem (ISRS) and threaded packing nut or an outside screw and yoke (OS&Y) with rising stem and bolted packing-gland flange; and a bolted, union, welded or threaded and seal welded bonnet joint.
- b) Class 1500 valve with threaded, socket-welding, butt-welding, or flanged ends; an OS&Y with rising stem and bolted packing-gland flange; and a bolted, union, welded or threaded and seal welded bonnet joint.
- c) Classes 150, 300, and 600 flanged-end, flangeless end, threaded, socket-welding, or butt-welding-end OS&Y valves with rising stem, bolted packing-gland flange, threaded gland, and a bolted, union, welded or threaded and seal welded bonnet joint.

d) Piston, ball, spring controlled piston, inline, or ball and swing check valves, in all classes, bonnet designs and end connections in a), b), and c), above.

1.2 Typical illustrations for an ISRS globe valve and an OS&Y globe valve with bolted bonnets are presented in Figure 1 and Figure 2. Figures 3 and 4 illustrate ISRS and OS&Y globe valves with union and threaded and seal welded bonnet design, respectively. Figures 5, 6, 7, 8, and 9 illustrate typical check valves. The illustrations are provided to clarify certain design features. They are not intended to require products conforming in any detail to the valves shown.

### 2. MARKING

2.1 Valves shall be marked in accordance with the requirements of ASME B16.34 and shall include, but not be limited to the requirements of 2.2 and 2.3.

2.2 Valve bodies shall be marked as follows:

- a) Threaded-end or socket-welding-end — 150, 300, 600, 800, or 1500.
- b) Flanged-end or flangeless valves — 150, 300, 600, or 1500.
- c) Buttwelding-end valves — 150, 300, 600, 800, or 1500.

2.3 Each valve shall have a corrosion-resistant metal identification plate, securely attached, giving the following information if not included on body marking (See 2.2.)

- a) Manufacturer
- b) Manufacturer's model, type, figure number, dwg., etc.
- c) Size
- d) Applicable pressure rating of 100°F
- e) Body material
- f) Trim material
- g) MSS SP-118 may be included

<sup>(1)</sup> This standard is not intended for valves developed for and predominantly used in instrument piping systems. See MSS SP-99, 1994 "Instrument Valves" or MSS SP-105, 1996 "Instrument Valves for Code Applications".

<sup>(2)</sup> The term "reduced port" is defined by comparison to a full port as identified in Annex A of ASME B16.34 for the appropriate pressure class.

2.4 For valves with welded on flange or butt-welding stub ends, the material grade, along with the post-weld treatment conditions, shall be indicated on the identification plate, stamped on the body, or both.

2.5 The body of the globe valve may include an arrow marking to indicate preferred direction of flow. Check valves require a flow direction arrow. This directional marking shall be integral with the body, forged-in, cast-in, or permanently etched or stamped on.

### 3. DESIGN AND MATERIALS

#### 3.1 Pressure-Temperature Ratings

3.1.1 The pressure-temperature ratings for Class 800 valves shall be as shown in Table 1. The pressure-temperature ratings in Table 1 are an interpolation between Standard Class 600 and Standard Class 900 pressure-temperature ratings listed in ASME B16.34 for the appropriate valve material.

3.1.2 The pressure-temperature ratings for Class 150, 300, 600, and 1500 valves shall conform to the corresponding Standard Class pressure-temperature ratings listed in ASME B16.34 for the appropriate valve material.

#### 3.2 End Connections

3.2.1 Threaded-end valves shall be internally taper-threaded as specified in ANSI/ASME B1.20.1. All internal threads shall be countersunk a distance of approximately one-half the pitch of the thread at an angle of approximately 45 degrees with the axis of the thread. Countersinking shall be concentric with the threads. The valve ends shall meet Table 4, B16.34 requirements for the appropriate pressure class.

3.2.2 Socket-welding-end preparation shall conform to ASME B16.11. The bottom of the socket shall be square and flat. The minimum wall thickness of socket welding end valves shall be in accordance with requirements of Table 4, ASME B16.34.

3.2.3 End flanges shall conform to ASME B16.5.

3.2.4 Flanged-end valves may have the flanges integral with or welded to the body. The requirements of Paragraph 2.1.5, ASME B16.34 shall apply to valves with welded flanged ends.

3.2.5 Flanged-end valves shall have face-to-face dimensions conforming to ASME B16.10.

3.2.6 Unless otherwise specified in the purchase order, the facing finish of end flanges and flangeless end valves shall be in accordance with the requirements of ASME B16.5.

3.2.7 The end-to-end dimensions for Classes 150, 300, 600, and 1500 butt-welding-end valves shall conform to ASME B16.10. Butt-welding-end valves may have stub ends integral with or welded to the body. Welded ends shall be welded on to the body in accordance with the requirements of 3.2.4.

3.2.8 The end-to-end dimensions for socket-welding-end, threaded-end valves, Class 800 butt-welding-end valves and flangeless valves shall be the manufacturer's standard.

3.2.9 Unless otherwise specified in the purchase order, butt-welding ends shall conform to ASME B16.25 for the bore specified in the purchase order for use without backing rings.

3.2.10 For all austenitic stainless steel valves, welded on flange or butt welding stub end valves shall be solution annealed after welding unless both the body and the flanges or butt welding stub ends are solution annealed L (low carbon) grades or stabilized grades of stainless steel. Post weld heat treatment shall be in accordance with Paragraph 2.1.5, ASME B16.34.

#### 3.3 Body and Bonnet

3.3.1 The valve body, bonnet, check valve covers, and union nuts shall be made from a material specified in the purchase order using one of the product form materials listed in Table 1, ASME B16.34.

3.3.2 The minimum body wall thickness at any point (except at end connections — See 3.2.1 and 3.2.2) shall be in accordance with ASME B16.34.

3.3.3 The minimum bonnet wall thickness at any point below the bottom ring of packing shall not be less than the values required by ASME B16.34. Class 800 values are given in Table 3 for convenience.

### 3.4 Body-Bonnet Joint

3.4.1 The body-bonnet joint design shall be either bolted, union, welded or threaded and seal welded.

3.4.2 The bolted body-bonnet joint design shall have a minimum of four cap screws, studs, or stud bolts. Cap screws shall be external wrenching type.

3.4.3 Bolting material shall conform to Table 2 except that other bolting combinations (not listed in Table 2) may be used by agreement between the purchaser and the manufacturer provided they are in accordance with ASME B16.34.

3.4.4 Unless otherwise specified in the purchase order, bolted and union body-bonnet joints shall be designed to confine the gasket and prevent overcompression.

3.4.5 The body-bonnet joint, including the gasket, shall be suitable for the pressure-temperature rating of the valve. Any temperature limitation of the body-bonnet joint, including the gasket, shall be shown on the identification plate. The metallic portion of the gasket shall have a corrosion resistance at least equal to the corrosion resistance of the shell material.

3.4.6 Where the bonnet is welded to the body, the welding, examination, and post weld heat treatment shall be in accordance with the requirements of Paragraph 2.1.5, ASME B16.34.

### 3.5 Trim

3.5.1 The valve trim for globe valves shall consist of stem, disc seating surface, seat ring, seating

surface or weld deposited body seating surface. The valve trim for check valves shall consist of the seating surface of the piston, ball or disc and body seat.

3.5.2 If an overlay weld-deposit is used for the disc or piston seat and/or body seating surface, the base material for the disc/piston and/or body seat shall have a corrosion resistance at least equal to the material of the valve body.

3.5.3 Table 4 lists the nominal seating surface materials categorized by trim numbers.

3.5.4 Except as provided in Items a) through c) below, the standard trim number shall be specified in Table 2. When a trim other than standard is desired, it shall be specified on the purchase order by a trim number from Tables 4 and 5. The typical specifications included in Tables 4 and 5 are listed to illustrate generally accepted material compositions and are not intended to be exact material requirements.

a) If a specified trim number listed below is required by either Table 2 or the purchase order, the manufacturer may at his option furnish an alternative trim number as follows:

<u>Specified Trim No.</u>	<u>Alternative Trim No.</u>
1	8 or 8A
101	108 or 18A
2	10
5A	5
105A	105
6	8
106	108
8A	8
108A	108

b) When trim number 1, 101, 2, 3, 4, 104, 5, 105, 5A, 105A, 9, 10, or 13 is furnished, both the body seating surface and the disc or piston check seating surface shall be of the material shown in Table 4.

c) When trim number 6, 106, 7, 107, 8, 108, 8A, 108A, 11, 12, or 14 is furnished, the body seating surface shall be one of the material type listed but different than the disc or piston check seating surface.

d) Nominally, the stem trim number shall correspond to the nominal seating surface trim number and shall be of the material type and hardness listed in Table 5. The stem shall be of a wrought or cast material. At the option of the valve manufacturer, the stem material may be substituted with another material if its corrosion resistance and strength are equal or greater than that of the listed stem material.

3.5.5 Trims not listed in Tables 4 and 5 may be used by agreement between the purchaser and the manufacturer.

### 3.6 Disc/Piston/Ball/Covers

3.6.1 The disc of globe valves shall be of either (a) flat-faced type, (b) plug type, or as specified by purchaser (e.g., needle-point type).

3.6.2 The check mechanism of check valves shall be either of the piston type, ball type, inline type, or swing check type.

3.6.3 The covers of check valves shall be of the bolted, welded, or union nut design.

3.6.4 The check mechanism of check valves shall be designed to close by gravity when installed in a horizontal position. Inline check valves shall use a spring to close the check mechanism. At the manufacturer's option, a spring may be installed in the piston, ball or inline designs to preload the closure mechanism. Swing check valves may be used in vertical lines where the normal flow is in the upward direction.

### 3.7 Stem

3.7.1 Globe valve stem or disc nut shall have a shoulder that will backseat against the bonnet in the fully open position. The stem-to-disc connection on globe valves shall be designed to

prevent the disc from becoming detached in service. The stem, including the stem head, shall be one piece. Stems formed by welding two or more pieces are not permitted.

3.7.2 The stem diameter (measured at the section that passes through the packing) shall not be less than that shown in Table 6 for Class 800 and 1500 valves. Stem sizes for Class 150, 300, and 600 valves shall be manufacturer's standard.

3.7.3 The threads of the stem and stem nut shall be Acme type conforming to ASME/ANSI B1.5 or stub threads conforming to ASME/ANSI B1.8 (minor modifications are permitted for either thread). The Acme thread major diameter may be undersized by a maximum of 1/16 inch from the diameter of the stem shown in Table 6.

3.7.4 The stem shall have a surface finished Ra of 32 microinch or smoother in the area of contact with the packing.

### 3.8 Disc/Piston/Ball Guiding

3.8.1 Globe valve discs shall be accurately guided by a stem or body guide throughout the travel distance to its seat. Check valve piston, balls or discs shall be accurately guided to the seat by the body, bonnet, or separate cage.

### 3.9 Seats

3.9.1 The body seats shall be threaded, with or without welded overlays, welded or brazed-in type, or integral with the body.

### 3.10 Port Opening

3.10.1 The bore of the body seats for globe and check valves shall not be less than that shown in Table 7, except inline check valve bores shall be the manufacturer's standard.

### 3.11 Threaded Packing-Gland Assembly

3.11.1 The packing-gland assembly shall include a steel gland located under the packing nut. A separate packing ring or washer at the base of

the packing is permissible and shall be of a material whose nominal composition is equal to valve bonnet or trim.

3.11.2 Packing nuts shall be made of a material whose corrosion resistance is at least equal to the bonnet.

### 3.12 Bolted Packing-Gland Assembly

3.12.1 The packing gland shall be retained by bolting and shall be of the one-piece type or of the two-piece self-aligning type consisting of a gland flange and a gland.

3.12.2 Gland flanges shall be made of steel and shall be provided with holes for gland bolts. Open slots are not acceptable.

3.12.3 Gland bolts shall be Type 302, 304, 316, 410, 416, or 420 stainless steel in a stud-bolt, headed bolt, or swinging-eyebolt design. Gland bolt nuts shall be hex head and shall conform to ASTM A194, Grade 2H, or Type 302, 303, 304, 316, 410, 416, or 420 stainless steel.

3.12.4 Swinging eyebolts should be of either the hinge-pin or trunnion type.

### 3.13 Packing Material

3.13.1 Unless otherwise specified in the purchase order, the packing shall be suitable for the pressure temperature rating of the valve within a design temperature range of -20°F to 1000°F. The packing shall contain a corrosion inhibitor.

3.13.2 The minimum depth of packing material furnished shall be as listed in Table 8 for Class 800 and 1500 valves. For Class 150, 300, and 600 globe valves minimum depth of packing shall be manufacturer's standard. Packing-gland adjustment length remaining after testing with the gland tight shall be greater than 10 percent of the minimum packing depth listed in Table 8.

### 3.14 Stuffing Box

3.14.1 The stuffing box finish shall be Ra of 125 microinch or smoother unless otherwise specified in the purchase order.

### 3.15 Stem Nut

3.15.1 Stem nuts of OS&Y globe valves shall be made of a material resistant to galling and corrosion and have a minimum melting point of 1750°F. Gray cast iron is prohibited.

### 3.16 Handwheel

3.16.1 Handwheels shall be of a spoked design; shall be made of carbon steel, ductile iron, or malleable iron; and shall be of ample size for easy opening and closing. Clockwise rotation of the handwheel shall close the valve. Cast iron or nonferrous materials shall not be used.

## 4. EXAMINATION AND TEST

### 4.1 Examination

4.1.1 A visual examination shall be performed by the valve manufacturer of all bodies, bonnets, covers, and closure elements to assure conformance with material specs and ASME B16.34.

4.1.2 All nondestructive examinations shall be performed in accordance with written procedures.

4.1.3 Supplementary examinations are required only if specified in the purchase order and only to the extent specified. Magnetic particle, radiographic, liquid penetrant, and ultrasonic examination of steel forgings and castings shall be in accordance with MSS SP-53, SP-54, SP-93, and SP-94 or with the purchaser's own acceptance criteria.



#### 4.2 Pressure Test

4.2.1 Each valve shall be pressure tested by the manufacturer as specified in MSS SP-61 and ASME B16.34.

#### 4.3 Repair of Defects

4.3.1 Defects in the shell of a cast or forged valve, revealed by inspection or test, shall be repaired as permitted by the applicable material specification or ASME B16.34.

#### 5. SHIPMENT

##### 5.1 End Protection for Female Threaded and Socket-Welding Ends

5.1.1 Except for individually packaged valves, the female ends of threaded and socket-welding ends shall be protected with metal, wood, or plastic plugs.

##### 5.2 End Protection of End Flanges and Butt-Welding Ends

5.2.1 End flanges and butt-welding ends shall be covered to protect gasket surfaces, welding ends and valve internals. Covers shall be wood fiber, wood, plastic, or metal.

TABLE 1 — PRESSURE-TEMPERATURE RATINGS FOR CLASS 800 GLOBE &amp; CHECK VALVES

Service Temperature (degrees) (a)	Material Group Number (see Table 1, ASME B16.34)					
	1.1	1.2	1.3	1.9	1.10	1.13
	A 105 (b) A 350-LF2 (c) A 216-WCB (b)	A 350-LF3 (c) A 352-LC2 (c) A 352-LC3 (c)	A 352-LCB (c)	A 182-F11 (d) A 217-WC6 (e)	A 182-F22 (d) A 217-WC9 (e)	A 182-F5 A 182-F5a A 217-C5
F	psig	psig	psig	psig	psig	psig
-20 to 100	1975	2000	1855	2000	2000	2000
200	1800	2000	1750	1900	1910	2000
300	1750	1940	1700	1795	1805	1940
400	1690	1880	1645	1755	1730	1880
500	1595	1775	1550	1710	1705	1775
600	1460	1615	1420	1615	1615	1615
650	1430	1570	1395	1570	1570	1570
700	1420	—	—	1515	1515	1515
750	1345	—	—	1420	1420	1420
800	1100	—	—	1355	1355	1325
850	715	—	—	1300	1300	1170
900	460	—	—	1200	1200	940
950	275	—	—	1005	1005	695
1000	140	—	—	595	715	510
1050	—	—	—	365	530	375
1100	—	—	—	255	300	275
1150	—	—	—	140	275	185
1200	—	—	—	95	145	120

## NOTES:

(a) For a material shown in Table 1 that is acceptable for low temperature service, the pressure rating for a service at any temperature below -20F shall be no greater than the rating shown in Table 1 for -20F to 100F.

(b) Permissible but not recommended for prolonged use above about 800F.

(c) Not to be used over 650F.

(d) Permissible but not recommended for prolonged use above about 1100F.

(e) Not to be used over 1100F.

(f) Not to be used over 800F.

(g) Not to be used over 850F.

**TABLE 1 — PRESSURE-TEMPERATURE RATINGS FOR CLASS 800 GLOBE & CHECK VALVES**  
(continued)

Service Temperature (degrees) <sup>(a)</sup>	Material Group Number (see Table 1, ASME B16.34)				
	1.14	2.1	2.2	2.3	2.5
	A 187-F9 A 217-C12	A 182-F304 A 351-CF3 <sup>(f)</sup> A 351-CF8	A 182-F316 A 351-CF3M <sup>(g)</sup> A 351-CF8M	A 182-F304L A 182-F316L	A 182-F147H A 351-CF8C
F	psig	psig	psig	psig	psig
-20 to 100	2000	1920	1920	1600	1920
200	2000	1600	1655	1350	1695
300	1940	1410	1495	1210	1570
400	1880	1255	1370	1100	1480
500	1775	1165	1275	1020	1380
600	1615	1105	1205	960	1310
650	1570	1090	1185	935	1280
700	1515	1075	1150	915	1250
750	1420	1060	1130	895	1230
800	1355	1050	1105	875	1215
850	1300	1035	1080	860	1185
900	1200	1025	1050	—	1150
950	985	1000	1030	—	1030
1000	780	860	970	—	970
1050	505	825	960	—	960
1100	300	685	860	—	860
1150	200	520	735	—	735
1200	140	415	550	—	460
1250	—	295	485	—	330
1300	—	220	365	—	250
1350	—	165	275	—	180
1400	—	130	200	—	140
1450	—	95	155	—	110
1500	—	65	110	—	95
See Notes to Table 1, preceding page.					

**TABLE 2 — TYPICAL MATERIAL SPECIFICATIONS AND APPLICABLE ASTM SPECIFICATIONS**  
(See Paragraph 3.3.1 and ASME B16.34, Table 1 for Other Product Forms)

Material Group No.	Nominal Designation Steel	Forgings Specification	Casting Specification	Standard Trim No. (from Table 4)	Standard Bonnet Bolting <sup>1</sup> A 193/A 194 (a)
1.1	Carbon	A 105 (b,c) A 350-LF2	A 216-WCB (b) —	101 101	B7/2H B8M-CL2/8M (d,e,f)
1.2	2½Ni 3½Ni	— A 350-LF3	A 352-LC2 A 352-LC3	10 10	B8M-CL2/8M (d,e,f) B8M-CL2/8M (d,e,f)
1.3	Carbon	—	A 352-LCB	101	B8M-CL2/8M (d,e,f)
1.9	1¼Cr-½Mo	A 182-F11 (g)	A 217-WC6 (g)	108	B16/8M (h)
1.10	2¼Cr-1Mo	A 182-F22	A 217-WC9 (g)	108	B16/8M (h)
1.13	5Cr-½Mo 5Cr-½Mo	A 182-F5 A 182-F5a	A 217-C5 (g) —	108 —	B16/8M (h) —
1.14	9Cr-1Mo	A 182-F9	A 217-C12 (g)	108	B16/8M (h)
2.1	18Cr-8Ni	A 182-F304 (i)	A 351-CF3 A 351-CF8 (i)	2	B8M-CL2/8M (e,f)
2.2	16Cr-12Ni-2Mo 18Cr-9Ni-2Mo	A 182-F316 (i) —	— A 351-CF3M A 351-CF8M (i)	10 10	B8M-CL2/8M (e,f) B8M-CL2/8M (e,f)
2.3	18Cr-8Ni 16Cr-12Ni-2Mo	A 182-F304L A 182-F316L	— —	10 —	B8M-CL2/8M (e,f) —
2.5	18Cr-10Ni-Cb	A 182-F347 (i)	A 351-CF8C (i)	10	B8M-CL2/8M (e,f)

Source: This table and the following notes are extracted from ASME/ANSI B16.34, Table 1, except for standard trim and bolting columns and notes a, d, e, f and h. Reprinted by courtesy of the American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017.

**NOTES:**

(a) Temperature limitations on bolting are as follows: Gr B7, 1000F; Gr L7, 1000F; Gr B16, 1100F; Gr B8-CL 1, 1500F; Gr B8M-CL 1, 1500F; Gr B8-CL 2, 1000F; and Gr B8M-CL 2, 1000F.

(b) Upon prolonged exposures to temperatures above 800F, the carbide phase of carbon steel may be converted to graphite.

(c) Only killed steel shall be used above 850F.

(d) ASTM A 320, Gr L7 bolts, and ASTM A 194, Gr 4 nuts are also acceptable.

(e) ASTM A 193, Gr B8-CL 1 and Gr B8M-CL 1 bolting may be substituted, provided that the requirements of 3.4 are met.

(f) ASTM A 193, Gr B8-CL 2 bolts are also acceptable.

(g) Use normalized and tempered material only.

(h) ASTM A 194, Gr 7 nuts are also acceptable.

(i) At temperatures over 1000F, use only when the carbon is 0.04 percent or higher.

TABLE 3 — BODY AND BONNET WALL THICKNESS

Minimum Wall Thickness <sup>(a)</sup>	
Class 800	
Valve Size NPS	inches
1/4	0.12
3/8	0.13
1/2	0.16
3/4	0.19
1	0.22
1 1/4	0.23
1 1/2	0.24
2	0.28
2 1/2	0.33
3	0.38
4	0.47
<sup>(a)</sup> See Paragraphs 3.3.2 and 3.3.3.	

TABLE 4 — NOMINAL SEATING SURFACE MATERIALS

Trim Number	Nominal Trim	Seat Hardness <sup>(a)</sup> (HB Min.)	Material Type	Typical Specification (Grade)		
				Cast	Forged	Welded
1; 101(b)	F6	(c)	13Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410
2	304	(d)	18Cr-8Ni	ASTM A 351 (CF8)	ASTM A 182 (F304)	AWS A5.9 ER308
3	F310	(d)	25Cr-20Ni		ASTM A 182 (F310)	AWS A5.9 ER310
4; 104(b)	Hard F6	750(e)	Hard 13Cr		(h)	
5; 105(b)	Hardfaced	350(e)	Co Cr-A(g)			AWS A5.13 ERCoCr-A
5A; 105A(b)	Hardfaced	350(e)	Ni-Cr			(j)
6; 106(b)	F6 and	250(f)	13Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410
	Cu-Ni	175(f)	Cu-Ni		(i)	
7; 107(b)	F6 and	250(f)	13Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410
	Hard F6	750(f)	Hard 13Cr		(h)	
8; 108(b)	F6 and	250(f)	13Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410
	Hardfaced	350(f)	Co Cr-A(g)			AWS A5.13 ERCoCr-A
8A; 108A(b)	F6 and	250(f)	13Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410
	Hardfaced	350(f)	Ni-Cr			(j)
9	Monel	(d)	Ni-Cu alloy		Mfg.'s standard	
10	316	(d)	18Cr-8Ni	ASTM A 351 (CF8M)	ASTM A 182 (F316)	AWS A5.9 ER316
11	Monel and	(d)	Ni-Cu alloy		Mfg.'s standard	
	Hardfaced	350(f)	Trim 5 or 5A			See Trim 5 or 5A
12	316 and	(d)	18Cr-8Ni	ASTM A 351 (CF8M)	ASTM A 182 (F316)	AWS A5.9 ER316
	Hardfaced	350(f)	Trim 5 or 5A			See Trim 5 or 5A
13	Alloy 20	(d)	19Cr-29Ni	ASTM A 351 (CN7M)	ASTM B 473	AWS A5.9 ER320
14	Alloy 20 and	(d)	19Cr-29Ni	ASTM A 351 (CN7M)	ASTM B 473	AWS A5.9 ER320
	Hardfaced	350(f)	Trim 5 or 5A			See Trim 5 or 5A

## NOTES:

(a) HB is Brinell hardness number symbol per ASTM E 10 (formerly BHN).

(b) Trims 101, 104, 105, 105A, 106, 107, 108 and 108A denote trims that permit the use of free-machining grades of 13 percent Cr material. Specify Trims 1, 4, 5, 5A, 6, 7, 8 and 8A when the use of free-machining grades of 13 percent Cr materials is not desired.

(c) Seat ring and disc/piston/swing check seat surfaces 250 HB minimum, with 50 HB minimum differential between seat ring and disc/piston/swing check seat surfaces.

(d) Manufacturer's standard hardness.

(e) Differential hardness between seat ring and disc/piston/swing check seat surfaces not required.

(f) Hardness differential between body seat ring and disc/piston/swing check seat surfaces shall be the manufacturer's standard.

(g) This classification includes such trademarked material as Stellite 6, Stoddy 6 and Wallex 6.

(h) Case hardened by nitriding to thickness of 0.005 inch minimum.

(i) Manufacturer's standard, with 30 percent Ni minimum.

(j) Manufacturer's standard hardfacing, with 25 percent Fe maximum.

TABLE 5 — STEM MATERIAL

Trim Number (Note)	Material Type	Hardness (HB)	Typical Specification (Type)
1	13Cr	200	ASTM A 276-T410 or T420
101	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
2	18Cr-8Ni	Manufacturer's standard	ASTM A 276-T304
3	25Cr-20Ni	Manufacturer's standard	ASTM A 276-T310
4 through 8A	13Cr	200	ASTM A 276-T410 or T420
104	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
105			
105A			
106			
107			
108	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
108A			
9 and 11	Ni-Cu alloy	Manufacturer's standard	Manufacturer's standard
10 and 12	18Cr-8Ni	Manufacturer's standard	ASTM A 276-T316
13 and 14	19Cr-29Ni	Manufacturer's standard	ASTM B 473
Note: Trims 1 and 4 through 8A denote trims that prohibit free-machining grades of 13 percent Cr material.			

TABLE 6 — MINIMUM STEM DIAMETER<sup>(a)</sup>

Valve Size NPS	Class 800	Class 1500
	inches	inches
1/4	9/32	13/32
3/8	9/32	13/32
1/2	11/32	13/32
3/4	3/8	7/16
1	7/16	9/16
1 1/4	1/2	5/8
1 1/2	9/16	5/8
2	5/8	21/32
2 1/2	11/16	3/4
3	3/4	1
4	7/8	1 1/8

<sup>(a)</sup> See Paragraph 3.7.2. A finish machining tolerance of 0.005" is permitted.

TABLE 7 — VALVE SEAT PORT OPENING

Valve Size NPS	Minimum Seat Bore <sup>(a)</sup>	
	Class 800	Class 1500
	inches	inches
1/4	1/4	1/4
3/8	1/4	1/4
1/2	3/8	3/8
3/4	1/2	1/2
1	11/16	5/8
1 1/4	15/16	7/8
1 1/2	1 1/8	1 1/16
2	1 7/16	1 3/8
2 1/2	1 3/4	1 1/2
3	2	1 7/8
4	2 3/4	2 1/2

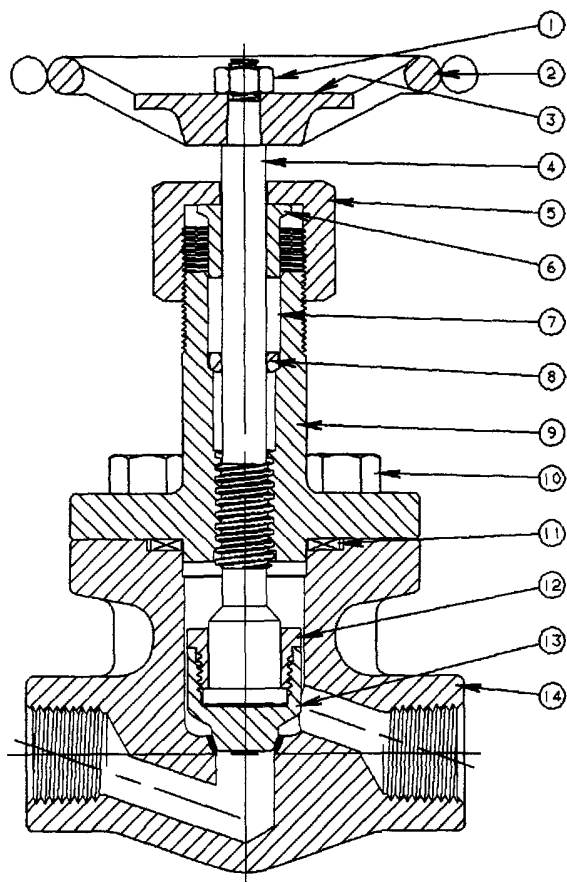
<sup>(a)</sup> In-line check valves minimum bore diameters shall be manufacturer's standard.



TABLE 8 — MINIMUM DEPTH OF PACKING <sup>(a)</sup>

Valve Size (NPS)	Class 800		Class 1500
	Outside Screw and Yoke Valves	Inside Screw with Rising Stem Valves	Outside Screw and Yoke Valves
	inches	inches	inches
1/4	1/2	1/2	7/8
3/8	1/2	1/2	7/8
1/2	5/8	5/8	7/8
3/4	5/8	5/8	1
1	1	7/8	1 3/16
1 1/4	1	15/16	1 1/2
1 1/2	1 1/8	15/16	1 1/2
2	1 1/8	1 1/8	1 1/2
2 1/2	1 1/4	—	1 3/4
3	1 1/2	—	1 7/8
4	1 3/4	—	2

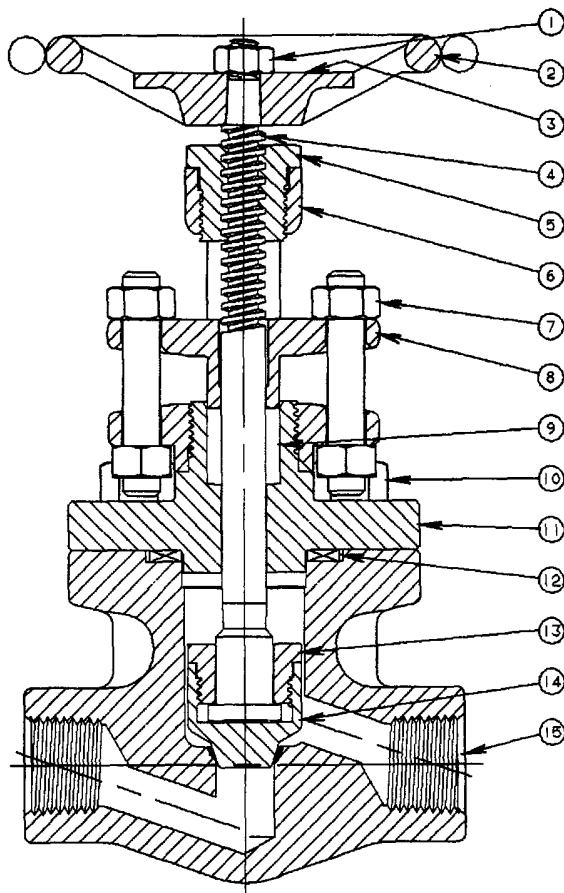
<sup>(a)</sup> See Paragraph 3.13.2.

PART NAMES

1. Handwheel Nut
2. Handwheel
3. Identification Plate
4. Stem
5. Packing Nut
6. Gland
7. Packing
8. Packing Ring (when used)
9. Bonnet
10. Bonnet Bolting
11. Gasket
12. Disc Nut
13. Disc
14. Body

FIGURE 1

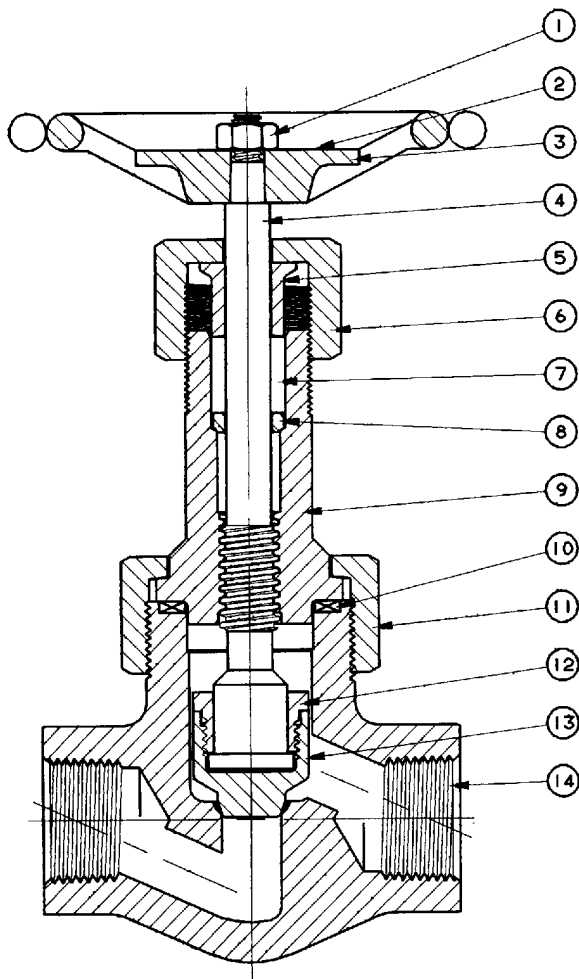
TYPICAL INSIDE SCREW WITH RISING  
STEM (ISRS) GLOBE VALVE

PART NAMES

1. Handwheel Nut
2. Handwheel
3. Identification Plate
4. Stem
5. Stem Nut
6. Yoke
7. Gland Bolting
8. Gland
9. Packing
10. Bonnet Bolting
11. Bonnet
12. Gasket
13. Disc Nut
14. Disc
15. Body

FIGURE 2

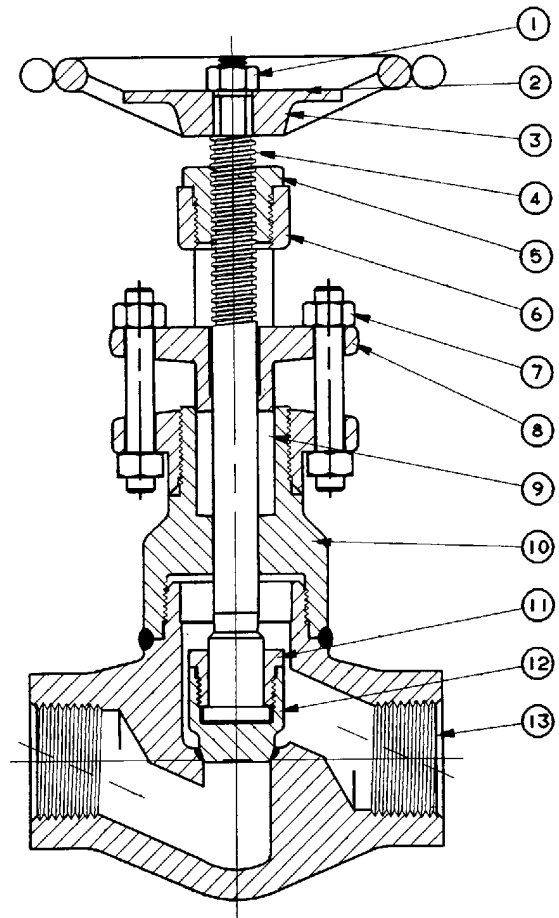
TYPICAL OUTSIDE SCREW AND YOKE  
(OS&Y) GLOBE VALVE

PART NAMES

1. Handwheel Nut
2. Identification Plate
3. Handwheel
4. Stem
5. Gland
6. Packing Nut
7. Packing
8. Packing Ring (when used)
9. Bonnet
10. Gasket
11. Bonnet Nut
12. Disc Nut
13. Disc
14. Body

FIGURE 3

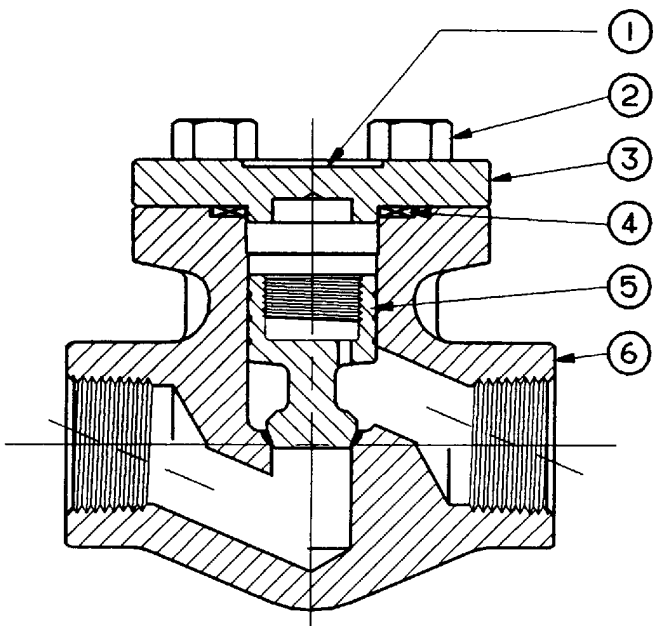
TYPICAL UNION BONNET INSIDE SCREW  
(ISRS) GLOBE VALVE

PART NAMES

1. Handwheel Nut
2. Identification Plate
3. Handwheel
4. Stem
5. Stem Nut
6. Yoke
7. Gland Bolting
8. Gland
9. Packing
10. Bonnet
11. Disc Nut
12. Disc
13. Body

FIGURE 4

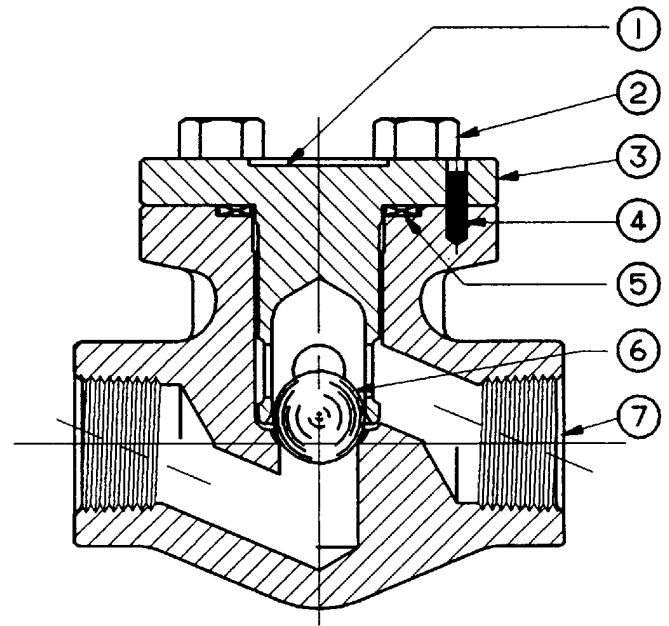
TYPICAL SEAL WELD BONNET OUTSIDE  
SCREW AND YOKE (OS&Y) GLOBE VALVE

PART NAMES

1. Identification Plate
2. Bonnet Bolting
3. Bonnet/ Cover
4. Gasket
5. Piston
6. Body

FIGURE 5

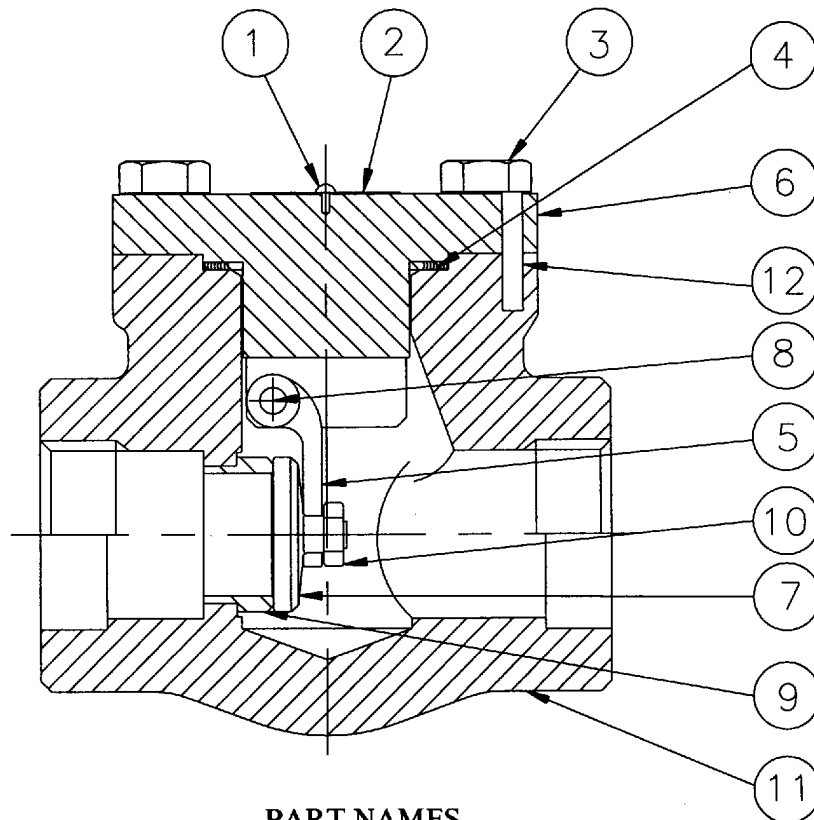
TYPICAL PISTON CHECK VALVE

PART NAMES

1. Identification Plate
2. Bonnet Bolting
3. Bonnet/ Cover
4. Alignment Pin
5. Gasket
6. Ball
7. Body

FIGURE 6

TYPICAL BALL CHECK VALVE

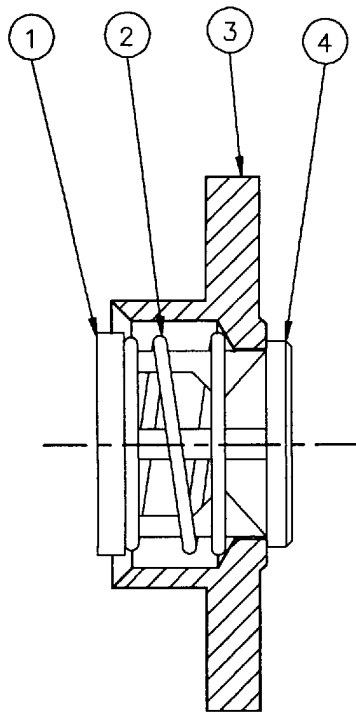


PART NAMES

1. Fastener
2. Identification Plate
3. Bonnet Bolting
4. Gasket
5. Hinge
6. Bonnet/Cover
7. Disc
8. Hinge Pin
9. Seat Ring
10. Disc Nut
11. Body
12. Alignment Pin

FIGURE 7

**TYPICAL SWING CHECK VALVE**



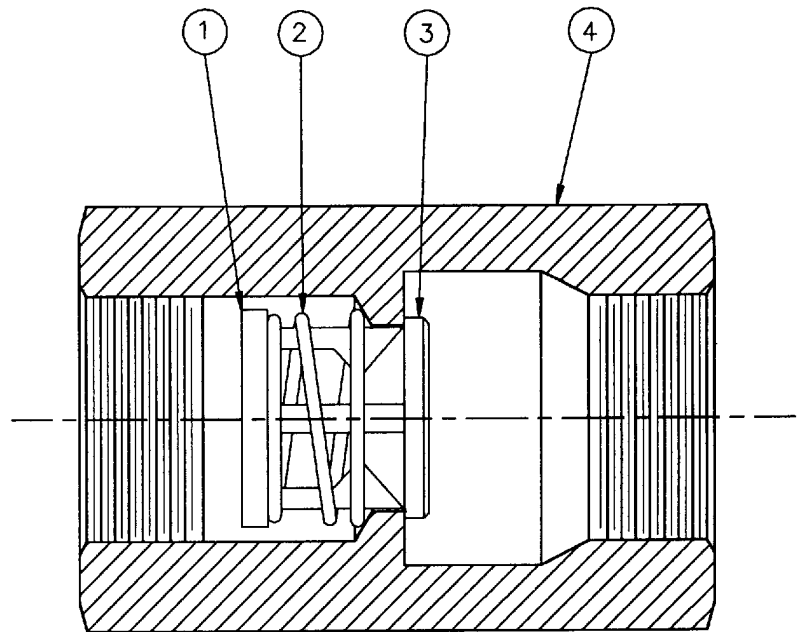
FLOW

PART NAMES

1. Yoke
2. Spring
3. Body
4. Cap (Disc)

FIGURE 8

TYPICAL IN-LINE CHECK VALVE  
FLANGELESS OR INSERT TYPE



FLOW

PART NAMES

1. Yoke
2. Spring
3. Cap (Disc)
4. Body

FIGURE 9

TYPICAL IN-LINE CHECK VALVE  
THREADED TYPE

## ANNEX A REFERENCED STANDARDS

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

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

### ANSI, ANSI/ASME, ASME/ANSI, ASME

B1.5 (R 1994)	Acme Screw Threads
B1.8 (R 1994)	Stub Acme Screw Threads
B1.20.1 (R 1992)	Pipe Threads, General Purpose (inch)
B16.5-1988	Flanges and Flanged Fittings
B16.10-1992	Face-to-Face and End-to-End Dimensions of Ferrous Valves
B16.11-1991	Forged Steel Fittings, Socket-Welding and Threaded
B16.25-1992	Butt-Welding Ends
B16.34-1988	Valves — Flanged, Threaded, and Welding-End
B31.3-1996	Chemical Plant and Petroleum Refinery Piping
B36.10M-1995	Welded and Seamless Wrought Steel Pipe
B36.19M-1985	Stainless Steel Pipe

### ASTM

A 105/ A 105M-95b	Forgings, Carbon Steel, for Piping Components
A 182/ A 182M-95b	Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings and Valves and Parts for High-Temperature Service
A 193/ A 193M-95	Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
A 194/ A 194M-95	Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
A 216/ A 216M-93	Carbon-Steel Castings Suitable for Fusion Welding for High-Temperature Service
A 217/ A 217M-93	Martensitic Stainless Steel and Alloy Steel Castings for Pressure-Containing Parts Suitable for High-Temperature Service
A 276-96	Stainless and Heat-Resisting Steel Bars and Shapes
A 320/ A 320M-94a	Alloy-Steel Bolting Materials for Low-Temperature Service
A 350/ A 350M-95b	Carbon and Low-Alloy Steel Forgings Requiring Notch Toughness Testing for Piping Components
A 351/ A 351M-94a	Austenitic Steel Castings for High-Temperature Service
A 352/ A 352M-93	Ferritic and Martensitic Steel Castings for Pressure-Containing Parts Suitable for Low-Temperature Service
A 582/ A 582M-93	Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished
B 473-95	Chromium-Nickel-Iron-Molybdenum-Copper-Columbium Stabilized Alloy (UNS N08020) Bar and Wire
E 10-93	Test Method for Brinell Hardness of Metallic Materials

### AWS

A5.9-93	Corrosion-Resisting Chromium and Chromium-Nickel Steel Bare and Composite Metal Cored and Stranded Welding Electrodes and Welding Rods
A5.13-80	Solid Surfacing Welding Rods and Electrodes

MSS

SP-53-1995	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components — Magnetic Particle Examination Method
SP-54-1995	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components — Radiographic Examination Method
SP-55-1996	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components — Visual Method
SP-61-1992	Pressure Testing of Steel Valves
SP-93-1987 (R 1992)	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components — Liquid Penetrant Examination Method
SP-94-1992	Quality Standard for Ferritic and Martensitic Steel Castings for Valves, Flanges, and Fittings and Other Piping Components — Ultrasonic Examination Method



**LIST OF MSS STANDARD PRACTICES****NUMBER**

SP- 6-1996	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
SP- 9-1992	Spot Facing for Bronze, Iron and Steel Flanges
SP-25-1993	Standard Marking System for Valves, Fittings, Flanges and Unions
SP-42-1990 (R 1995)	Class 150 Corrosion Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt Weld Ends
SP-43-1991 (R 1996)	Wrought Stainless Steel Butt-Welding Fittings
SP-44-1996	Steel Pipeline Flanges
SP-45-1992	Bypass and Drain Connections
SP-51-1991 (R 1995)	Class 150 LW Corrosion Resistant Cast Flanges and Flanged Fittings
SP-53-1995	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components — Magnetic Particle Examination Method
SP-54-1995	Quality Standard for Steel Castings for Valves, Flanges, and Fittings and Other Piping Components — Radiographic Examination Method
SP-55-1996	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components — Visual Method for Evaluation of Surface Irregularities
SP-58-1993	Pipe Hangers and Supports — Materials, Design and Manufacture
SP-60-1991	Connecting Flange Joint Between Tapping Sleeves and Tapping Valves
SP-61-1992	Pressure Testing of Steel Valves
SP-65-1994	High Pressure Chemical Industry Flanges and Threaded Stubs for Use with Lens Gaskets
SP-67-1995	Butterfly Valves
SP-68-1988	High Pressure-Offset Seat Butterfly Valves
SP-69-1991	Pipe Hangers and Supports — Selection and Application
SP-70-1990	Cast Iron Gate Valves, Flanged and Threaded Ends
SP-71-1990	Cast Iron Swing Check Valves, Flanged and Threaded Ends
SP-72-1992	Ball Valves with Flanged or Butt-Welding Ends for General Service
SP-73-1991	Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings
SP-75-1993	Specifications for High Test Wrought Butt Welding Fittings
SP-77-1995	Guidelines for Pipe Support Contractual Relationships
SP-78-1987 (R 1992)	Cast Iron Plug Valves, Flanged and Threaded Ends
SP-79-1992	Socket-Welding Reducer Inserts
SP-80-1987	Bronze Gate, Globe, Angle and Check Valves
SP-81-1995	Stainless Steel, Bonnetless, Flanged Knife Gate Valves
SP-82-1992	Valve Pressure Testing Methods
SP-83-1995	Class 3000 Steel Pipe Unions, Socket-Welding and Threaded
SP-85-1994	Cast Iron Globe & Angle Valves, Flanged and Threaded Ends
SP-86-1987 (R 1992)	Guidelines for Metric Data in Standards for Valves, Flanges, Fittings and Actuators
SP-87-1991 (R 1996)	Factory-Made Butt-Welding Fittings for Class I Nuclear Piping Applications
SP-88-1993	Diaphragm Type Valves
SP-89-1991	Pipe Hangers and Supports — Fabrication and Installation Practices
SP-90-1986 (R 1991)	Guidelines on Terminology for Pipe Hangers and Supports
SP-91-1992 (R 1996)	Guidelines for Manual Operation of Valves
SP-92-1987 (R 1992)	MSS Valve User Guide
SP-93-1987 (R 1992)	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components — Liquid Penetrant Examination Method
SP-94-1992	Quality Standard for Ferritic and Martensitic Steel Castings for Valves, Flanges, and Fittings and Other Piping Components — Ultrasonic Examination Method
SP-95-1986 (R 1991)	Swage(d) Nipples and Bull Plugs
SP-96-1996	Guidelines on Terminology for Valves and Fittings
SP-97-1995	Integrally Reinforced Forged Branch Outlet Fittings — Socket Welding, Threaded and Buttwelding Ends
SP-98-1996	Protective Coatings for the Interior of Valves, Hydrants, and Fittings
SP-99-1994	Instrument Valves
SP-100-1988	Qualification Requirements for Elastomer Diaphragms for Nuclear Service Diaphragm Type Valves
SP-101-1989	Part-Turn Valve Actuator Attachment — Flange and Driving Component Dimensions and Performance Characteristics
SP-102-1989	Multi-Turn Valve Actuator Attachment — Flange and Driving Component Dimensions and Performance Characteristics
SP-103-1995	Wrought Copper and Copper Alloy Insert Fittings for Polybutylene Systems
SP-104-1995	Wrought Copper Solder Joint Pressure Fittings
SP-105-1996	Instrument Valves for Code Applications
SP-106-1990 (R 1996)	Cast Copper Alloy Flanges and Flanged Fittings, Class 125, 150 and 300
SP-107-1991	Transition Union Fittings for Joining Metal and Plastic Products
SP-108-1996	Resilient-Seated Cast Iron-Eccentric Plug Valves
SP-109-1991	Welded Fabricated Copper Solder Joint Pressure Fittings
SP-110-1996	Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
SP-111-1996	Gray-Iron and Ductile-Iron Tapping Sleeves
SP-112-1993	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-113-1994	Connecting Joint between Tapping Machines and Tapping Valves
SP-114-1995	Corrosion Resistant Pipe Fittings, Threaded and Socket Welding, Class 150 and 1000
SP-115-1995	Excess Flow Valves for Natural Gas Service
SP-116-1996	Service Line Valves and Fittings for Drinking Water Systems
SP-117-1996	Bellows Seals for Globe and Gate Valves
SP-118-1996	Compact Steel Globe & Check Valves — Flanged, Flangeless, Threaded & Welding Ends (Chemical & Petroleum Refinery Service)

R-Year — Indicates year standard reaffirmed without substantive change.

Prices available upon request

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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