

Gray Iron Globe & Angle Valves Flanged and Threaded Ends

**Standard Practice
Developed and Approved by the
Manufacturers Standardization Society of the
Valve and Fittings Industry, Inc.
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This MSS Standard Practice was developed under the consensus of the MSS Technical Committee 106 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.

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)

In this Standard Practice all notes, annexes, and figures are construed to be essential to the understanding of the message of the standard, and are considered part of the text unless noted as 'supplemental.' All footnotes appearing in this document are construed as 'supplemental' where their information does not modify the text to which they refer.

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".

Substantive changes in this 2002 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.

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FOREWARD

The 2002 edition of MSS SP-85 changed the title and material identification throughout the standard from cast iron to gray iron, added a Forward, added nominal size designation in DN, and deleted construction designations

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GRAY IRON GLOBE & ANGLE VALVES, FLANGED AND THREADED ENDS

1. SCOPE

- 1.1 This standard practice covers gray iron globe and angle valves with flanged and threaded ends.
- 1.2 These valves are suitable within the sizes and pressure-temperature ratings specified herein for general purpose service.
- 1.3 This standard practice also includes, directly or by reference, stipulations or chemical and physical properties of materials, and dimensions of end connections in common use.

2. VALVE TYPES, CLASSES, AND SIZES

2.1 *Valve Types*

- Type I (Figure 1) Globe, Metal-to-Metal Seats
 Type II (Figure 2) Angle, Metal-to-Metal Seats
 Type III (Figure 3) Globe, Composition-to-Metal Seats
 Type IV (Figure 4) Angle, Composition-to-Metal Seats

Note: The valve sketches, Figures 1 through 4 in Annex A, are for the purpose of illustration and nomenclature only. They do not represent any manufacturer's product.

2.2 *Trims*

- a) All Bronze
- b) All Iron
- c) Bronze with Ferrous Stem
- d) Composition Disc

2.3 *Classes*

125
250

2.4 *Nominal Pipe Sizes*

- a) NPS 2-12 (DN50-300) flanged end
- b) NPS 2-6 (DN50-150) threaded end

Note: For definition of DN see ISO 6708 or MSS SP-86.

3. PRESSURE-TEMPERATURE RATINGS

3.1 Pressure-temperature ratings for the various classes of valves are shown in Table 1. Metric units (bar) are shown in Table B1 in Annex B. The ratings specified are for valves with metal-to-metal seating surfaces. Pressure-temperature ratings for valves with non-metallic seat materials must be limited to reflect the physical characteristics of these materials at each temperature, and may be lower, but in no case higher than values shown in Tables 1 and B1.

**TABLE 1 Pressure-Temperature
Ratings, Non-Shock - psi**

Temperature Degrees F	Class 125	Class 250
-20 to 250	200	500
200	190	460
225	180	440
250	175	415
275	170	395
300	165	375
325	155	355
350	150	335
375	145	315
400	140	290
425	130	270
450	125	250

Note: See Table B1 for Metric Units

3.2 The temperature shown for the corresponding rating shall be the metal temperature of the pressure retaining parts. It shall be assumed that the metal temperature will be the temperature of the contained fluid. Use of a pressure rating at a metal temperature other than that of the contained fluid shall be the responsibility of the user.

4. **MATERIALS**

4.1 **General** This Standard Practice is intended to cover minimum physical and chemical requirements. Materials of superior properties may be substituted. Users are cautioned against applications with fluids which may react chemically with any materials used in these valves. Consultation with the manufacturer is advised to determine suitability in cases of doubt.

4.2 **Body and Bonnet** Body and bonnet shall be gray iron in accordance with ASTM A 126, Class B.

4.3 **Seating Material** Metal-to-Metal surfaces shall be brass or bronze for bronze mounted valves; gray iron or other ferrous material for all iron valves. Composition or resilient facing material shall be rubber (synthetic or natural), or suitable polymer. Other seating materials, either metal or composition, suitable for the intended service may be furnished when agreed between purchaser and manufacturer.

4.4 **Stems** Stem material shall be brass or bronze, either cast or wrought, for bronze mounted and composition disc valves, wrought steel for all iron valves.

4.5 **Handwheels** Handwheels may be gray iron, ductile iron, malleable iron or steel at the manufacturer's option.

4.6 **Bolting** Bolts and studs connecting pressure containing parts shall develop physical strengths not less than requirements of ASTM A 307.

4.7 **Glands** Glands shall be made from brass, bronze, gray iron, or other ferrous materials.

5. **DESIGN**

5.1 **General** When under the test pressure specified in Paragraph 7, the design of all valves shall be

such as to provide against any permanent distortion of the body, bonnet, or seats. Valve stems shall be designed to prevent permanent distortion when valve is operated at full rated working pressure.

5.2 **End Flanges**

5.2.1 End flanges shall be integral with the valve body. Dimensions, tolerances and drilling shall be in accordance with ASME B1.1 for each respective pressure class. The flanges shall be fully machined on the gasket face in accordance with MSS SP-6.

5.2.2 Face-to-Face dimensions of flanged end valves shall be in accordance with ASME B16.10.

5.3 **Threaded Ends** Threaded end bodies may have hexagon, octagon or round ends with ribs. Pipe ends shall be threaded with tapered pipe threads in accordance with ANSI/ASME B1.20.1.

5.4 **Body-Bonnet Bolting**

5.4.1 Dimensions of bolts and cap screws shall be in accordance with ASME B18.2.1; nut dimensions in accordance with ASME B18.2.2.

5.4.2 Nuts shall be threaded in accordance with ASME B1.1, Coarse thread series, Class 2B.

5.4.3 Bolts, studs, or cap screws shall be threaded in accordance with ASME B1.1, Coarse thread series, Class 2A.

5.5 **Disc Guides** Discs and disc holders for valves size 4 and larger shall be guided to ensure that the seating surfaces of the disc and body seat are properly aligned at the point of closure.

5.6 *Seating Surfaces*

5.6.1 Disc seating surfaces may be integral or may be separate rings securely fastened to the disc.

5.6.2 Body seats shall be separate rings, threaded into the body either shoulder or bottom seated, except that all iron valve seats may be integral with the body casting at the manufacturer's option.

5.7 *Glands*

5.7.1 Glands may be threaded or bolted type.

5.7.2 Bolted glands may be solid, solid-bushed, or two piece self-aligning design. Use of open bolt slots in glands shall not be permitted unless hinge bolts are used.

5.7.3 Stem seals not requiring a gland but suitable for the service conditions, may be furnished.

5.8 *Gland Bolting* Studs, stud bolts, hinge bolts, or headed bolts through drilled or slotted holes in the stuffing box flange may be used. In all cases gland bolting shall be securely held in place and shall provide adequate adjustment for progressive compression of packing material.

5.9 *Backseat* Valves shall be designed to have a backseat. Repacking under pressure is hazardous and is not recommended.

5.10 *Discs and Disc Holder* Disc or disc holders shall be securely attached to the end of the stems in a manner that permits the disc to swivel relative to the stem.

5.11 *Stems* The upper ends of stems shall be threaded with single or multiple Acme type or 60 degree thread approximating the stub form.

5.12 *Handwheels* Handwheels shall be of the spoke type only. Webbed or disc type are not permitted. Handwheels shall be marked with the direction of movement for opening of the valve. On large size valves to be used at or near maximum rated pressures, the manufacturer should be consulted regarding the use of auxiliary operating means.

5.13 *Bypass and Drain Connections* When specified, bypass and drain connections shall be in accordance with MSS SP-45.

6. WORKMANSHIP

6.1 Valve parts shall be designed and manufacturing tolerances set so as to provide interchangeability in the product of any one manufacturer between units of the same size, class, type, and design, except the individual fit of the disc to seat ring seating surfaces of Type I and II valves.

6.2 *Castings* All castings shall be clean and sound, without defects which will impair their service. No plugging, impregnation, welding, or repairing of such defects will be allowed.

7. TESTS

7.1 *General* Pressure tests shall be made on all completed valves prior to shipment by the manufacturer.

7.2 *Shell Test* Valves in the partially open position with both ends closed shall be subjected to hydrostatic or gas test pressure specified in Table 2. No visible leakage is permitted through the pressure boundary walls or body-bonnet joint. Leakage through the stem packing or stem seals shall not be cause for rejection. Test pressure shall be held for periods specified in Table 3.

Caution: Safety precautions must be taken when gas is used.

TABLE 2 Shell Test Pressure, Minimum

Max. Service Rating 150° F (65° C)		Test Pressure	
psi	bar	psi	bar
200	13.8	350	24.1
500	34.5	875	60.3

7.3 Hydrostatic Seat Test Valves shall be subjected to a hydrostatic seat test pressure at not less than the maximum service pressure for which the valve is rated. The test pressure shall be applied under the closed disc and the opposite side checked for leakage. The maximum permissible leakage rate shall be 10 millilitres per hour, per NPS. Test pressure shall be held for periods specified in Table 3.

7.4 Gas Seat Test At the manufacturer's option a gas seat test of not less than 80 psi (5.5 bar) may be used in lieu of Hydrostatic Seat Test (7.3). This gas pressure is to be applied as specified for hydrostatic seat test. The maximum permissible leakage rate shall be 1/10th of a standard cubic foot (3 litres) of gas per hour, per NPS. Test pressure shall be held for periods specified in Table 3.

TABLE 3 Test Duration, Seconds, Minimum

NPS	Shell Test	Seat Test	DN
2-8	30	30	50-200
10-12	60	60	250-300

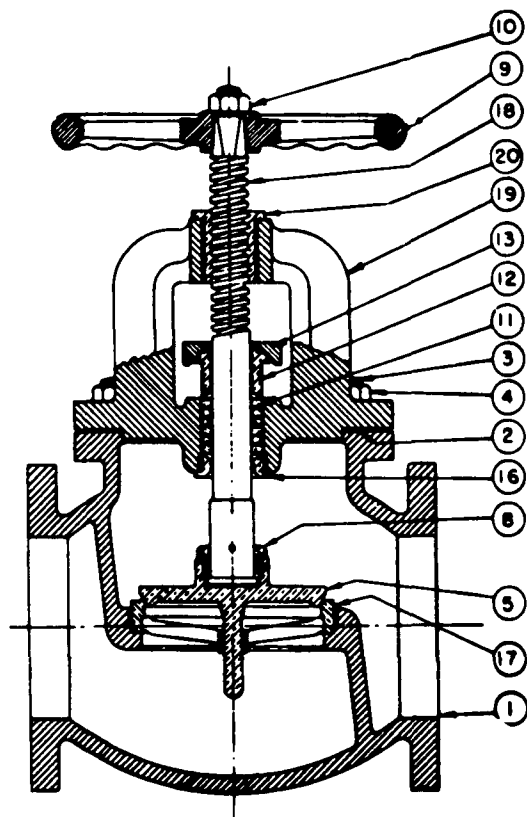
Caution: Safety precautions must be taken when gas is used.

8. MARKING

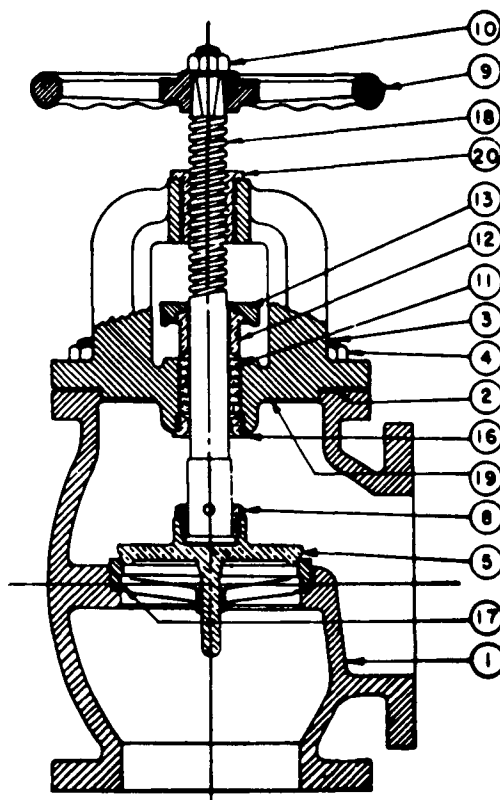
Marking shall conform to MSS SP-25.

9. PAINTING

The painting of finished valves shall be optional with the manufacturer unless otherwise specified.

ANNEX A

Type I Globe, Metal-to-Metal Seats
FIGURE 1

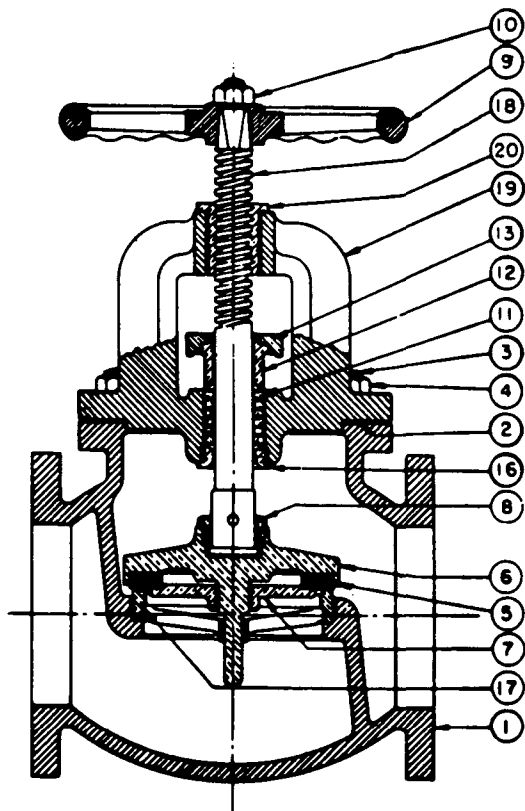


Type II Angle, Metal-to-Metal Seats
FIGURE 2

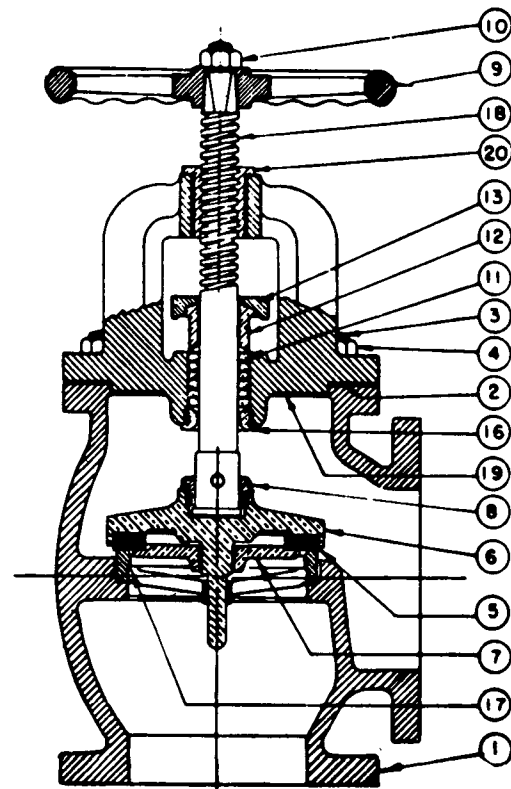
**TYPES I and II
Part Names**

- 1 - Body
- 2 - Bonnet Gasket
- 3 - Bonnet Stud
- 4 - Bonnet Stud Nut
- 5 - Disc
- 8 - Disc Nut
- 9 - Handwheel
- 10 - Handwheel Nut

- 11 - Packing or Stem Seals
- 12 - Gland
- 13 - Gland Flange
- 16 - Backseat Bushing (Manufacturers Option)
- 17 - Seat Ring
- 18 - Stem
- 19 - Bonnet
- 20 - Stem Nut

ANNEX A (continued)

Type III - Globe, Composition-to-Metal Seats
FIGURE 3



Type IV - Angle, Composition-to-Metal Seats
FIGURE 4

TYPES III and IV
Part Names

- 1 - Body
- 2 - Bonnet Gasket
- 3 - Bonnet Stud
- 4 - Bonnet Stud Nut
- 5 - Disc
- 6 - Disc Holder
- 7 - Disc Holder Nut
- 8 - Disc Nut
- 9 - Handwheel
- 10 - Handwheel Nut

- 11 - Packing or Stem Seals
- 12 - Gland
- 13 - Gland Flange
- 16 - Backseat Bushing (Manufacturers Option)
- 17 - Seat Ring
- 18 - Stem
- 19 - Bonnet
- 20 - Stem Nut

ANNEX B**TABLE B1 Pressure -Temperature Ratings, Non-Shock – bar**

Temperature Degrees C	Class 125	Class 250
-29 to 65	13.8	34.5
100	12.8	30.9
125	11.9	28.3
150	11.2	25.7
175	10.4	23.1
200	9.6	20.5
225	8.8	17.9
232	8.6	17.2

| 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 or Description.

ASME, ANSI/ASME, ANSI, ASME/ANSI

B1.1	- 1989 (R 2001)	Unified Inch Screw Threads, (Un and Unr Thread Form)
B1.20.1	- 1983 (R 2001)	Pipe Threads, General Purpose (Inch)
B16.1	- 1998	Cast Iron Pipe Flanges and Flanged Fittings, Classes 25, 125 and 250
B16.10	- 2000	Face-to-Face and End-to-End Dimensions of Valves
B18.2.1	- 1996	Square and Hex Bolts and Screws
B18.2.2	- 1987 (R 1999)	Square and Hex Nuts

ASTM

ASTM A 126-93	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 307-93A	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

MSS

SP-6	- 2001	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
SP-25	- 1998	Standard Marking System for Valves, Fittings, Flanges, and Unions
SP-45	- 1998	Bypass and Drain Connections
SP-86	- 2002	Guidelines for Metric Data in Standards for Valves, Flanges, Fittings, and Actuators

ISO

6708	- 1980	Pipe Components - Definition of nominal pipe size
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Publications of the following organizations appear on the above list.

ANSI	American National Standards Institute 25 West 43 rd Street, Fourth Floor, New York, New York 10036
ASME	The American Society of Mechanical Engineers Three Park Avenue, New York, New York 10016
ASTM	American Society for Testing and Material 100 Bar Harbor Drive, Conshohocken, PA 192428
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, N.E., Vienna, Virginia 22180
ISO	International Organization for Standardization I, rue de Varembe, Case Postale, CH-1211, Geneve 20, Switzerland

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	Spot Facing for Bronze, Iron and Steel Flanges
SP-25-1998	Standard Marking System For Valves, Fittings, Flanges and Unions
SP-42-1999	Class 150 Corrosion Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt Weld Ends
SP-43-1991	(R 01) Wrought Stainless Steel Butt-Welding Fittings
SP-44-1996	(R 01) Steel Pipeline Flanges
SP-45-1998	Bypass and Drain Connections
SP-51-2000	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 Componets - 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, Fittings, and Other Piping Components - Visual Method for Evaluation of Surface Irregularities
SP-58-1993	Pipe Hangers and Supports - Materials, Design and Manufacture
SP-60-1999	Connecting Flange Joint Between Tapping Sleeves and Tapping Valves
SP-61-1999	Pressure Testing of Steel Valves
SP-65-1999	High Pressure Chemical Industry Flanges and Threaded Stubs for Use with Lens Gaskets
SP-67-2002	Butterfly Valves
SP-68-1997	High Pressure Butterfly Valves with Offset Design
SP-69-2002	Pipe Hangers and Supports - Selection and Application
SP-70-1998	Cast Iron Gate Valves, Flanged and Threaded Ends
SP-71-1997	Gray Iron Swing Check Valves, Flanged and Threaded Ends
SP-72-1999	Ball Valves with Flanged or Butt Welding Ends for General Service
SP-73-1991	(R 96) Brazing Joints for Copper and Copper Alloy Pressure Fittings
SP-75-1998	Specification for High Test Wrought Butt Welding Fittings
SP-77-1995	(R 00) Guidelines for Pipe Support Contractual Relationships
SP-78-1998	Cast Iron Plug Valves, Flanged and Threaded Ends
SP-79-1999a	Socket-Welding Reducer Inserts
SP-80-1997	Bronze Gate, Globe, Angle and Check Valves
SP-81-2001	Stainless Steel, Bonnetless, Flanged Knife Gate Valves
SP-82-1992	Valve Pressure Testing Methods
SP-83-2001	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-89-1998	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 Operations of Valves
SP-92-1999	MSS Valve User Guide
SP-93-1999	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components-Liquid Penetrant Examination Method
SP-94-1999	Quality Std for Ferritic and Martensitic Steel Castings for Valves, Flanges, and Fittings and Other Piping Components-Ultrasonic Examination Method
SP-95-2000	Swage(d) Nipples and Bull Plugs
SP-96-2001	Guidelines on Terminology for Valves and Fittings
SP-97-2001	Integrally Reinforced Forged Branch Outlet Fittings-Socket Welding, Threaded, and Buttwelding Ends
SP-98-2001	Protective Coatings for the Interior of Valves, Hydrants, and Fittings
SP-99-1994	(R 01) 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-103-1995	(R 00) Wrought Copper and Copper Alloy Insert Fittings for Polybutylene Systems
SP-104-1995	Wrought Copper Solder Joint Pressure Fittings
SP-105-1996	(R 01) Instrument Valves for Code Applications
SP-106-1990	(R 96) Cast Copper Alloy Flanges and Flanged Fittings, Class 125, 150 and 300
SP-107-1991	(R 00) Transition Union Fittings for Joining Metal and Plastic Products
SP-108-2002	Resilient-Seated Cast-Iron Eccentric Plug Valves
SP-109-1997	Welded Fabricated Copper Solder Joint Pressure Fittings
SP-110-1996	Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
SP-111-2001	Gray-Iron and Ductile-Iron Tapping Sleeves
SP-112-1999	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 at \$25.00 each. Same quantity discounts apply on total order.
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-116-1996	Service Line Valves and Fittings for Drinking Water Systems
SP-117-2002	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-119-1996	Belled End Socket Welding Fittings, Stainless Steel and Copper Nickel
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-122-1997	Plastic Industrial Ball Valves
SP-123-1998	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
(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 Practice in such cases.

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