

# Ductile Iron Swing Check Valves

**Standard Practice**  
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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).

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, and are considered part of the text unless noted as "supplemental". All appendices appearing in this document are construed as "supplemental". Supplemental information does not include mandatory requirements.

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## DUCTILE IRON SWING CHECK VALVES

### 1. SCOPE

1.1 This Standard Practice establishes requirements for ductile iron swing check valves with flanged, threaded, mechanical-joint, and push-on ends for general purpose. This Standard Practice covers check valves for installation in pipelines that are horizontal or in pipelines where flow is above horizontal up to vertical with flow upward.

1.2 This Standard Practice describes ductile iron check valves in two categories:

1.2.1 Class rated valves, assigned a pressure and temperature rating as prescribed in an appropriate ASME standard.

1.2.2 Valves limited to Cold Working Pressure (CWP) which are only limited to water service.

1.3 This Standard Practice also includes, directly or by reference, requirements for chemical and physical properties of materials and pressure tests.

### 2. VALVE DESIGNATION, CLASSES AND SIZES

2.1 **Valve Types** Valve types covered herein are illustrated in Figures A1 through A4 in Annex A. The valve sketches herein are for the purpose of illustration and nomenclature only. They are not intended to exclude any design meeting this Standard Practice. Swing check valves are classified in relation to the flow cross-sectional area or waterway as either Full-Waterway or Clear-Waterway and by the seating materials as either metallic or non-metallic. The waterway classifications are defined as:

a) Full-Waterway valves shall have a flow cross-sectional area through the valves that is not less than the cross-sectional area of a circle having a diameter equal to the valve NPS expressed in inches.

b) Clear-Waterway valves shall have an unobstructed cylindrical flow path through the valve. The diameter of the flow path shall be equal to the valve NPS expressed in inches. When the valve is in the open position, the disc shall swing completely clear of the waterway.

c) The combinations of waterway and seating material classifications are designated by type as follows:

Type I (Figure A1) – Full-Waterway Metal to Metal Seats

Type II (Figure A2) – Full-Waterway Composition to Metal Seats

Type III (Figure A3) – Clear-Waterway Metal to Metal Seats

Type IV (Figure A4) – Clear-Waterway Composition to Metal Seats

2.2 **Trim and Trim Combination Designations** Valve seating-surfaces and operating-components shall be one of the following or a combination of the following:

- a) Copper Alloy
- b) Ferrous
- c) Stainless Steel
- d) Composition or Resilient Disc

2.3 **Rating Designation** Valves shall be in accordance with one of the following rating designations:

- a) ASME B16.1 – Class 125
- b) ASME B16.1 – Class 250
- c) ASME B16.42 – Class 150
- d) ASME B16.42 – Class 300
- e) MSS SP-128 – 250 CWP
- f) MSS SP-128 – 350 CWP

**TABLE 1**  
**Pressure-Temperature Ratings,**  
**ASTM A 395, Non-Shock – psi**

| Degrees F  | ASME B16.42<br>Class 150 | ASME B16.42<br>Class 300 |
|------------|--------------------------|--------------------------|
|            | NPS 2 – 24               | NPS 2 – 24               |
| -20 to 100 | 250                      | 640                      |
| 200        | 235                      | 600                      |
| 300        | 215                      | 565                      |
| 400        | 200                      | 525                      |
| 500        | 170                      | 495                      |
| 600        | 140                      | 465                      |
| 650        | 125                      | 450                      |

Note: See Table B1 for metric units

2.4 **Nominal Pipe Sizes** Nominal pipe sizes covered by this Standard Practice are:

- a)  $2 \leq \text{NPS} \leq 48$ , flanged end
- b)  $2 \leq \text{NPS} \leq 6$ , threaded end
- c)  $3 \leq \text{NPS} \leq 48$ , mechanical-joint end
- d)  $2 \leq \text{NPS} \leq 12$ , push-on end

### 3. PRESSURE-TEMPERATURE RATINGS

3.1 Pressure-temperature ratings designations are shown in Tables 1 and 2 in psi and degrees Fahrenheit units. Metric units (bar and degrees Celsius) are shown in Tables B1 and B2 in Annex B. The ratings are for valves with metal seating surfaces. Pressure-temperature ratings for valves with non-metallic seating 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 valves shown in Tables 1 and B1.

3.1.1 Valves with cold working pressures (33 to 150° F) designated as CWP, shall have rated pressures of 250 or 350 psi.

3.2 The pressure-temperature ratings shown in Table 1 shall apply for valves made from material conforming to ASTM A 395 and meeting the applicable requirements of ASME B16.42.

3.3 The pressure-temperature ratings shown in Table 2 shall apply for valves made from material conforming to ASTM A 536 and meeting the applicable requirements of ASME B16.1.

3.4 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 other than that of the contained fluid shall be the responsibility of the user.

### 4. MATERIALS

4.1 **General** This Standard Practice establishes physical and chemical requirements. 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.

4.1.1 **Body and Cover** The body and cover for valves designated as ASME B16.42 Class 150 or Class 300 shall be made of ductile iron in accordance with ASTM A 395. The body and cover for valves designated as 250 or 350 CWP or as ASME B16.1 Class 125 or Class 250 shall be of ductile iron in accordance with either ASTM A 395 or A 536.

#### 4.1.2 **Seating Material**

a) Metal-to-metal seating surfaces shall be copper alloy for bronze trim valves, ductile iron or other ferrous material for all-iron trim valves, or stainless steel for stainless steel-trim valves.

b) Facing material for composition or resilience shall be rubber (synthetic or natural), or suitable polymer.

c) Other seating materials, either metal or composition, which are suitable for the intended service may be furnished when agreed upon by purchaser and manufacturer.

**TABLE 2**  
**Pressure-Temperature Ratings, ASTM A 536, Non-Shock – psi**

| Class                    | 125           |                | 250           |                |
|--------------------------|---------------|----------------|---------------|----------------|
| Temperature<br>Degrees F | NPS<br>2 – 12 | NPS<br>14 – 24 | NPS<br>2 – 12 | NPS<br>14 – 24 |
| -20 to 150               | 200           | 150            | 500           | 300            |
| 200                      | 190           | 135            | 460           | 280            |
| 225                      | 180           | 130            | 440           | 270            |
| 250                      | 175           | 125            | 415           | 260            |
| 275                      | 170           | 120            | 395           | 250            |
| 300                      | 165           | 110            | 375           | 240            |
| 325                      | 155           | 105            | 355           | 230            |
| 350                      | 150           | 100            | 335           | 220            |
| 375                      | 145           | -              | 315           | 210            |
| 400                      | 140           | -              | 290           | 200            |
| 425                      | 130           | -              | 270           | -              |
| 450                      | 125           | -              | 250           | -              |

Note: See Table B2 for Metric Units

**4.1.3 Hinge Pins** Hinge pins shall be wrought brass or stainless steel for bronze trim valves, wrought steel or stainless steel for all-iron valve trim, or wrought stainless steel for stainless steel trim valves.

**4.1.4 Hinge** Non-ferrous hinges shall not be used on all-iron-trim valves.

**4.1.5 Side Plugs** Side plugs, if used, shall be made of gray iron, malleable iron, ductile iron or steel. However, if used to support the hinge pin in bronze trim valves, they shall be of copper alloy or copper alloy bushed.

**4.1.6 Bolting** Bolts and studs connecting pressure containing parts shall have minimum yield and ultimate strength properties not less than requirements of ASTM A 307.

**5.1.1** Valves shall be designed to prevent distortion when subjected to test pressures in Section 7.

**5.1.2** Distortions are not acceptable that prevent the safe operation of valves when valves are under the test pressure specified in Section 7.

**5.2 Wall Thickness** The minimum wall thickness for valve bodies and covers shall be as specified below:

**5.2.1** Pressure rated Class 150 and Class 300 check valves of ASTM A 395 ductile iron bodies shall have a minimum wall thickness as specified in ASME B16.42 for the corresponding Class and NPS fitting. The cover will have a minimum thickness of a blind flange per ASME B16.42 where the bolt circle is equal to or greater than the valve cover bolt circle.

**5.2.2** Pressure rated Class 125 and Class 250 check valves of ASTM A 536 ductile iron bodies shall have a minimum wall thickness as specified in ASME B16.1 for the corresponding Class and NPS fitting. The cover will have a minimum thickness of a blind flange per ASME B16.1 where the bolt circle is equal to or greater than the valve cover bolt circle.

## 5. DESIGN

**5.1 General** The closure assembly shall be designed to assume the closed position by gravity under no flow conditions in a horizontal pipeline. Special arrangements of levers and springs or weights may be necessary to assure proper closure in lines which are inclined or vertical.

5.2.3 Valves with CWP designations shall have body and cover wall thicknesses in accordance with ASME B16.42 Class 150 wall thickness for 250 CWP or Class 300 wall thickness for 350 CWP.

5.2.4 Additional metal thickness needed for assembly loads, shapes other than circular, stress concentrations, or other special circumstances, must be determined by individual manufacturers since these factors vary widely.

### 5.3 *End Connections*

#### 5.3.1 *Flanged Ends*

5.3.1.1 End flanges shall be integral with the valve body. Dimensions, tolerances, and drilling shall be in accordance with ASME/ANSI B16.42 for valves made of ASTM A 395 and ASME B16.1 for valves of ASTM A 536 material, for each respective pressure class. For CWP rated valves, end flanges shall be in accordance with ANSI/AWWA C110/A21.10 or ASME B16.1, at the manufacturer's option.

5.3.1.2 Unless otherwise specified by the applicable ASME B16.1, ASME B16.42, ANSI/AWWA C110/A21.10 or the purchaser, the flanges shall be fully machined on the joint side in accordance with MSS SP-6.

5.3.1.3 Face-to-face dimensions of flanged end valves shall be as follows:

5.3.1.3.1 Class 125, Class 150 (ASTM A 536), or CWP, Full-Waterway, Figures A1 and A2, NPS 2 – 12; in accordance with ASME B16.10.

5.3.1.3.2 Class 150 (ASTM A 395), Full-Waterway, Figures A1 and A2, NPS 2 – 12, in accordance with ASME B16.10.

5.3.1.3.3 Class 125, 150 or CWP, Full-Waterway, Figures A1 and A2, NPS 14 – 48, per manufacturer's specification.

5.3.1.3.4 Class 125, 150 or CWP, Clear-Waterway, Figures A3 and A4, NPS 2 – 24, per manufacturer's specification.

5.3.1.3.5 Class 300 (ASTM A 395), Full-Waterway, Figure A1, NPS 2 – 12, in accordance with ASME B16.10.

5.3.1.3.6 Class 250 or 300 (ASTM A 536), Full-Waterway, Figure A1, NPS 2 – 12, in accordance with ASME B16.10.

5.3.1.3.7 Class 250 or 300, Full-Waterway, Figure A1, NPS 14 – 48, per manufacturer's specification.

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

5.3.3 *Mechanical-Joint Ends* Mechanical-joint bell dimensions shall conform to ANSI/AWWA C111/A21.11.

5.3.4 *Push-On Joint Ends* Push-on joints shall conform to the requirements of ANSI/AWWA C111/A21.11.

### 5.4 *Body-Cover Bolting*

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

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

5.4.3 Bolts, studs or cap screws shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A.

## 5.5 Seating Surfaces

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

5.5.2 Body seats shall be separate rings, either shoulder or bottom seated, except that all-iron valve seats may be integral with the body casting at the manufacturer's option. Driving lugs may protrude into and reduce port area.

5.5.3 Body seating surface for composition seated valves may be integral with the valve body.

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

## 6. WORKMANSHIP

6.1 **Valve Parts** Valve parts shall be designed and manufacturing tolerances set so as to provide inter-changeability in the product of any one manufacturer between units of the same size, class, type, and design.

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

## 7. PRESSURE TESTING

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

7.2 **Shell Test** Each valve shall be given a shell test.

a) The test shall be made with the valve disc in the partially open position.

b) The test shall be a gauge pressure no less than that specified in Table 3.

c) The test shall be made using water, which may have a corrosion inhibitor, with kerosene, or other suitable fluids (gas or liquid), provided such fluid has a viscosity not greater than that of water.

d) The test fluid temperature shall not exceed 125° F (50° C).

e) The shell test duration, the test period of inspection after the valve is fully prepared and is under full pressure, shall be not less than that specified in Table 4.

f) Visually detectable leakage through pressure boundary walls is not acceptable. Leakage through gaskets or threaded plugs is not acceptable.

**Caution: There are hazards involved when a gas is the fluid used for testing. When gas is used, appropriate precautions are required.**

7.3 **Hydrostatic Seat Test** Valves shall be subjected to a hydrostatic seat test at not less than the maximum service pressure for which the valve is rated. The test fluid shall be as in Section 7.2. The pressure shall be applied on the downstream side of the valve and the opposite side checked for leakage. The maximum permissible leakage rate shall be 40 ml/hr/NPS. Test pressures shall be held for periods specified in Table 4.

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 (See Section 7.3). This gas pressure should be applied as specified for hydrostatic seat test. The maximum permissible leakage rate shall be 0.4 std ft<sup>3</sup>/hr/NPS (11.3 l/hr/NPS). Test pressures shall be held for periods specified in Table 4.

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

**8. MARKING**

Marking shall conform to MSS SP-25.

**9. PAINTING**

9.1 Pressure rated Class 150 and 300, ASTM A 395: The non-machined surfaces shall be coated with green paint.

9.2 Class 125, 250, CWP and made from ASTM A 536: The painting of finished valves shall be optional with the manufacturer unless otherwise specified.

**TABLE 3****Shell Test Pressure**

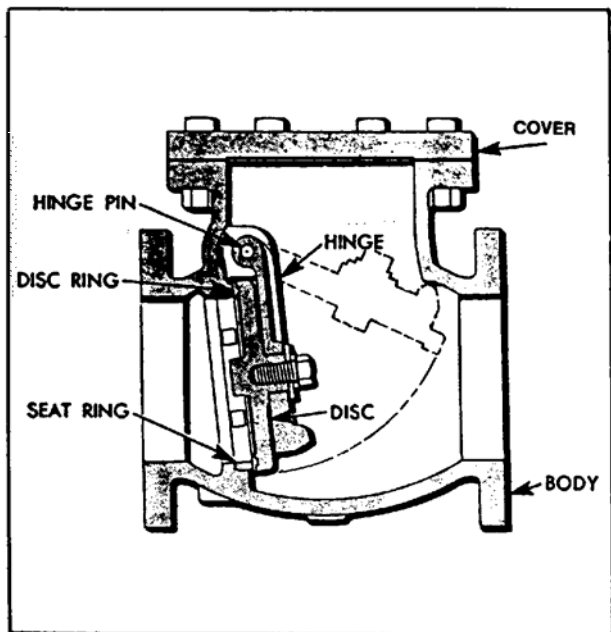
| <b>Max. Service Rating<br/>150° F (65° C)</b> |            | <b>Test Pressure</b> |            |
|-----------------------------------------------|------------|----------------------|------------|
| <b>psi</b>                                    | <b>bar</b> | <b>psi</b>           | <b>bar</b> |
| 150                                           | 10.3       | 265                  | 18.3       |
| 200                                           | 13.8       | 350                  | 24.1       |
| 300                                           | 20.7       | 525                  | 36.2       |
| 500                                           | 34.5       | 875                  | 60.3       |

**TABLE 4****Minimum Duration of Tests**

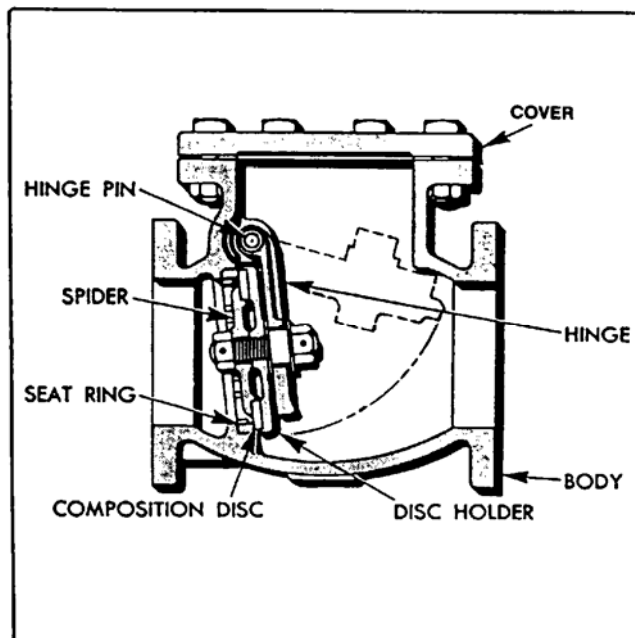
| <b>NPS</b>                   | <b>Shell Test<br/>Seconds</b> | <b>Seat Test<br/>Seconds</b> |
|------------------------------|-------------------------------|------------------------------|
| $2 \leq \text{NPS} \leq 8$   | 30                            | 30                           |
| $10 \leq \text{NPS} \leq 18$ | 60                            | 60                           |
| $20 \leq \text{NPS} \leq 24$ | 180                           | 120                          |

## ANNEX A

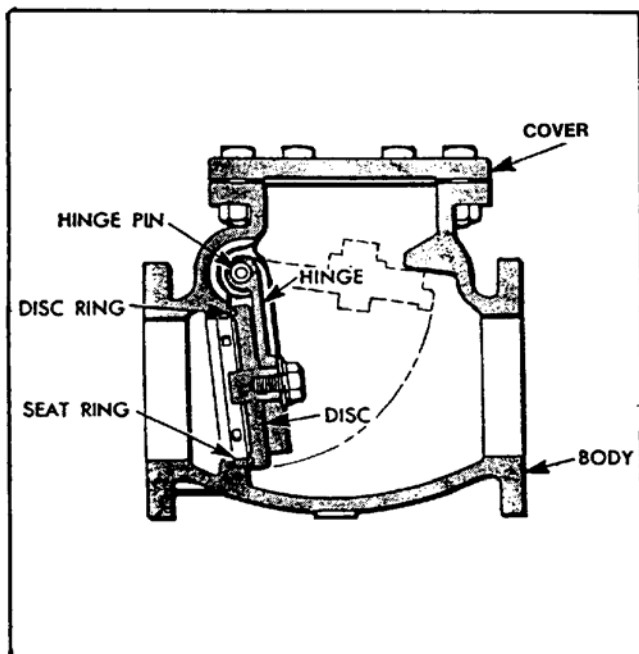
## Valve Types – Figures A1 Through A4



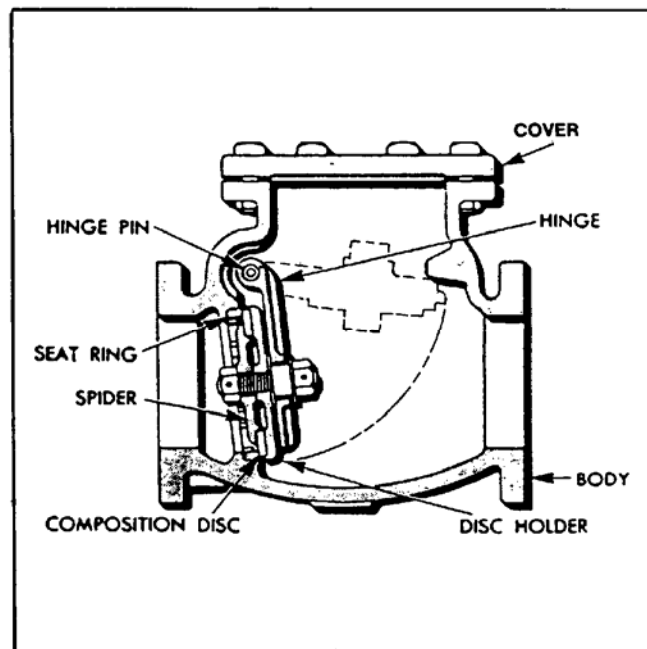
Full-Waterway Metal to Metal Seat  
Type I  
Figure A1



Full-Waterway Composition to Metal Seat  
Type II  
Figure A2



Clear-Waterway Metal to Metal Seat  
Type III  
Figure A3



Clear-Waterway Composition to Metal Seat  
Type IV  
Figure A4

## ANNEX B

## Metric Units

TABLE B1

## Pressure-Temperature Ratings, ASTM A 395, Non-Shock – bar

| Temperature<br>Degrees C | ASME B16.42 – Class 150<br>NPS 2 – 24 | ASME B16.42 – Class 300<br>NPS 2 – 24 |
|--------------------------|---------------------------------------|---------------------------------------|
| -29 to 38                | 17.2                                  | 44.1                                  |
| 93                       | 16.2                                  | 41.4                                  |
| 149                      | 14.8                                  | 39.0                                  |
| 204                      | 13.8                                  | 36.2                                  |
| 260                      | 11.7                                  | 34.1                                  |
| 316                      | 9.7                                   | 32.1                                  |
| 343                      | 8.6                                   | 31.0                                  |

TABLE B2

## Pressure-Temperature Ratings, ASTM A 536, Non-Shock – bar

| Temperature<br>Degrees C | ASME B16.1 – Class 125 |                | ASME B16.1 – Class 250 |                |
|--------------------------|------------------------|----------------|------------------------|----------------|
|                          | NPS<br>2 – 12          | NPS<br>14 – 24 | NPS<br>2 – 12          | NPS<br>14 – 24 |
| -29 to 65                | 13.8                   | 10.3           | 34.5                   | 20.7           |
| 100                      | 12.8                   | 9.2            | 30.9                   | 19.0           |
| 125                      | 11.9                   | 8.5            | 28.3                   | 17.7           |
| 150                      | 11.2                   | 7.7            | 25.7                   | 16.5           |
| 175                      | 10.4                   | 7.0            | 23.1                   | 15.3           |
| 200                      | 9.6                    | -              | 20.5                   | 14.0           |
| 205                      | 9.4                    | -              | -                      | 13.8           |
| 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 – 2003            | Unified Inch Screw Threads (UN and UNR Thread Form)                    |
| B1.20.1 – 1983 (R2001) | Pipe Threads, General Purpose (Inch)                                   |
| B16.1 – 2005           | Cast Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250) |
| B16.10 – 2000 (R2003)  | Face-to-Face and End-to-End Dimensions of Valves                       |
| B16.42 – 1998 (R2006)  | Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300    |
| B18.2.1 – 1996 (R2005) | Square and Hex Bolts and Screws                                        |
| B18.2.2 – 1987 (R2005) | Square and Hex Nuts                                                    |

#### ASTM

#### Standard Specification for:

|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| A 307 – 04        | Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength                          |
| A 395/A 395M – 04 | Ferritic Ductile Iron Pressure-Retaining Castings for use at Elevated Temperatures |
| A 536 – 84 R04    | Ductile Iron Castings                                                              |

#### AWWA

|                  |                                                                                                       |
|------------------|-------------------------------------------------------------------------------------------------------|
| C110/A21.10 – 03 | Ductile Iron and Gray Iron Fittings for Water, 3 in. through 48 in. (76 mm through 1219 mm) for Water |
| C111/A21.11 – 00 | Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings                                      |

#### 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-45-2003  | Bypass and Drain Connections                                                                          |
| SP-128-2006 | Ductile Iron Gate Valves                                                                              |

**ANNEX C****Referenced Standards and Applicable Dates**  
(continued)

Publications of the following organizations appear in the above list:

|      |                                                                                                                                |
|------|--------------------------------------------------------------------------------------------------------------------------------|
| ANSI | American National Standards Institute, Inc.<br>25 West 43 <sup>rd</sup> Street<br>4 <sup>th</sup> Floor<br>New York, NY 10036  |
| ASME | ASME International<br>Three Park Avenue<br>New York, NY 10016-5990                                                             |
| ASTM | ASTM International<br>100 Bar Harbor Drive<br>West Conshohocken, PA 19428-2959                                                 |
| AWWA | American Water Works Association<br>6666 West Quincy Avenue<br>Denver, CO 80235                                                |
| MSS  | Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.<br>127 Park Street, NE<br>Vienna, VA 22180-4602 |

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

| Number       |                                                                                                                                                                                                                                                                          |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SP-6-2007    | 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, Globe, 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-51-2007   | Class 150LW Corrosion Resistant Flanges and Cast Flanged Fittings                                                                                                                                                                                                        |
| SP-53-1999   | (R 07) Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components - Magnetic Particle Examination Method                                                                                                              |
| SP-54-1999   | (R 07) Quality Standard for Steel Castings for Valves, Flanges, and Fittings and Other Piping Components - Radiographic Examination Method                                                                                                                               |
| SP-55-2006   | 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-75-2004   | Specification for High Test Wrought Butt Welding Fittings                                                                                                                                                                                                                |
| SP-77-1995   | (R 00) Guidelines for Pipe Support Contractual Relationships                                                                                                                                                                                                             |
| SP-78-2005a  | 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  | (R 07) Connecting Joint between Tapping Machines and Tapping Valves                                                                                                                                                                                                      |
| SP-114-2007  | Corrosion Resistant Pipe Fittings Threaded and Socket Welding, Class 150 and 1000                                                                                                                                                                                        |
| SP-115-2006  | 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-118-2007  | 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-120-2006  | Flexible Graphite Packing System for Rising Stem Steel Valves (Design Requirements)                                                                                                                                                                                      |
| SP-121-2006  | 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-126-2007  | Steel In-Line Spring-Assisted Center Guided Check Valves                                                                                                                                                                                                                 |
| SP-127-2001  | Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application                                                                                                                                                                                           |
| SP-128-2006  | 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-134-2006a | Valves for Cryogenic Service Including Requirements for Body/Bonnet Extensions                                                                                                                                                                                           |
| SP-135-2006  | High Pressure Steel Knife Gate Valves                                                                                                                                                                                                                                    |
| SP-136-2007  | Ductile Iron Swing Check 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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