

# Stainless Steel, Bonnetless, Flanged Knife Gate Valves

Standard Practice  
Developed and Approved by the  
Manufacturers Standardization Society of the  
Valve and Fittings Industry, Inc.  
127 Park Street, NE  
Vienna, Virginia 22180  
(703) 281-6613



This MSS Standard Practice was developed under the consensus of the MSS Technical Committee 114 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 A.)

Substantive changes in this 2001 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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Originally Approved August, 1975

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## STAINLESS STEEL, BONNETLESS, FLANGED KNIFE GATE VALVES

### 1. SCOPE AND FIELD OF APPLICATION

This standard covers all stainless steel or stainless steel lined, cast or fabricated bonnetless, flanged knife gate valves in sizes NPS 2 (DN 50) through NPS 36 (DN 900). The valves in this standard are intended for use in applications where shock loadings are not encountered. Applications at conditions other than those specified in Section 3 require special design considerations.

### 2. STANDARD UNITS

The values stated in either U.S. customary units or metric units are to be regarded separately as the standard. Within the text, the metric units are shown in parenthesis. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with this standard.

### 3. PRESSURE RATING

This standard covers valves with a gage pressure rating not exceeding the values in the following table at temperatures between 32° F and 150° F (0° C and 66° C).

U.S. Customary		Metric	
N P S	psi	D N	bar
2 - 24	150	50 - 600	10.3
30, 36	100	750, 900	6.9

### 4. SIZE

The valve size in Tables 1 and 1A is the nominal size of the end connection.

### 5. MARKING

Valves shall be marked in accordance with MSS SP-25 including the following requirements and modifications.

- Manufacturer's name or trademark/logo.
- The body material of construction or code. When more than one material or grade of material is used, each shall be identified. The material in contact with the fluid media shall be listed and identified as "lining" on the name plate. It is not required to repeat the material designation on fabricated bodies.

c) Since these valves are normally manufactured for closure in one direction only, the valve shall be marked showing the "seat side" (downstream side) of the valve in such a manner that the markings can be seen with the valve installed in the pipeline. The user shall be responsible for correct directional installation.

d) A tag is to be attached to the valves for installation purposes indicating:

- Care to be taken in valve installation with respect to direction of closure.
- Care to be taken when installing studs or bolts in the tapped holes of the flange in the area of the chest to prevent chest damage. The chest is the body area between the packing chamber and the flanges.
- Packing nuts may require adjustment to obtain a tight seal.

e) The stem material need not be listed.

### 6. MATERIALS

Materials used for major components of these valves are listed in Table 2. Equivalent stainless steel grades are listed in Table 3.

### 7. DESIGN

7.1 Valves preferably shall be all stainless steel. However, a combination of stainless steel and either carbon steel or cast iron is acceptable. All interior wetted surfaces, including raised faces, shall be stainless steel. Dimensions shall be in accordance with Table 1.

7.2 The design of all valves shall prevent permanent distortion of the body or seats when tested as specified in Section 10. Some permanent distortion of stainless steel parts is acceptable during the shell test of Par. 10.1 provided it can be demonstrated that there will be no further deformation upon subsequent pressure loadings.

7.3 When through bolting is specified, valves shall have flange holes per ASME B16.5 for Class 150 (PN 20) except holes that contact the chest shall be tapped in accordance with Table 1.

7.4 The valve port I.D. shall be not less than 90 percent of the nominal inside diameter of Schedule 40 pipe.

7.5 Because of variations in basic valve design, differential pressure and valve accessibility, it is not possible to standardize the conditions under which a manually operated valve requires mechanical assistance. Consideration should be given to the use of mechanical assistance on all valves over size NPS 8 (DN 200) when the differential pressure, when operating, approaches the valve working pressure. Consideration should be given to the use of mechanical assistance on all size NPS 16 (DN 400) valves and larger, regardless of differential pressure.

## 8. WELDING

All body pressure boundary welds shall be in accordance with the ASME Boiler and Pressure Vessel Code Section IX.

## 9. TOLERANCES

The following tolerances shall be followed:

Face to face,

Sizes NPS 10 (DN 250) and smaller  
 $\pm 0.06$  in ( $\pm 1.6$  mm)

Sizes NPS 12 (DN 300) and larger  
 $\pm 0.12$  in ( $\pm 3.2$  mm)

Flange outside diameter:

$\pm 0.06$  in ( $\pm 1.6$  mm)

Bolt circle diameter drilling:

$\pm 0.06$  in ( $\pm 1.6$  mm)

Center-to-center of adjacent bolt holes:

$\pm 0.03$  in ( $\pm 0.8$  mm)

## 10. PRODUCTION TEST

10.1 *Shell Test (Body)*. Each valve shall be hydrostatically pressure tested at 1.5 times the rated working pressure with no visible leakage allowed. (Leakage through the packing or gate seal shall not be cause for rejection.) The test fluid shall be water (which may contain a corrosion inhibitor), kerosene, or another suitable fluid provided such fluid has a viscosity that is not greater than that of water. The test fluid temperature shall not exceed 125°F (50°C).

10.2 *Seat Test*. After the shell test, each valve shall be hydrostatically pressure tested at 40 psi (2.8 bar) differential pressure in the direction of closure. Maximum permissible leakage shall be 40 ml/min/NPS (1.6 ml/min/DN). Seat test duration shall be in accordance with MSS SP-61.

## 11. SHIPMENT

11.1 Valve packing nuts may be loosened prior to shipment to extend packing life. These nuts may have to be adjusted after installation.

11.2 Unless indicated otherwise, valve shall be shipped with covers to protect the raised face of the flanges.

TABLE 1 Valve Dimensions, Inches

Valve Size NPS	Flanges							Face-to-Face
	Outside Diameter <sup>(a)</sup>	Raised Face Outside Diameter <sup>(a)</sup>	Bolt Circle Diameter <sup>(a)</sup>	Bolting			Thickness minimum (Includes 0.06 Raised Face)	
				Quantity <sup>(a)</sup>	Tap Size UNC	Clearance Hole Diameter <sup>(a)</sup>		
2	6.00	3.62	4.75	4	5/8 - 11	0.75	0.50	1.88
3	7.50	5.00	6.00	4	5/8 - 11	0.75	0.50	2.00
4	9.00	6.19	7.50	8	5/8 - 11	0.75	0.50	2.00
5	10.00	7.31	8.50	8	3/4 - 10	0.88	0.63	2.25
6	11.00	8.50	9.50	8	3/4 - 10	0.88	0.63	2.25
8	13.50	10.62	11.75	8	3/4 - 10	0.88	0.63	2.75
10	16.00	12.75	14.25	12	7/8 - 9	1.00	0.75	2.75
12	19.00	15.00	17.00	12	7/8 - 9	1.00	0.75	3.00
14	21.00	16.25	18.75	12	1 - 8	1.12	0.81	3.00
16	23.50	18.50	21.25	16	1 - 8	1.12	0.88	3.50
18	25.00	21.00	22.75	16	1 - 1/8 - 7	1.25	0.94	3.50
20	27.50	23.00	25.00	20	1 - 1/8 - 7	1.25	1.00	4.50
24	32.00	27.25	29.50	20	1 - 1/4 - 7	1.38	1.00	4.50
30	38.75	33.75	36.00	28	1 - 1/4 - 7	1.38	1.12	4.62
36	46.00	40.25	42.75	32	1 - 1/2 - 6	1.62	1.12	4.62

(a) Note: In conformance with ASME B16.5, Class 150

TABLE 1 A Valve Dimensions, Millimeters

Valve Size DN	Flanges							Face-to-Face
	Outside Diameter <sup>(a)</sup>	Raised Face Outside Diameter <sup>(a)</sup>	Bolt Circle Diameter <sup>(a)</sup>	Bolting			Thickness minimum (Includes 1.5 Raised Face)	
				Quantity <sup>(a)</sup>	Tap Size UNC	Clearance Hole Diameter <sup>(a)</sup>		
50	150.0	92.0	120.5	4	See Table 1	18.0	12.7	48.0
80	190.0	127.0	152.5	4		18.0	12.7	51.0
100	230.0	157.5	190.5	8		18.0	12.7	51.0
125	255.0	186.0	216.0	8		22.0	16.0	57.0
150	280.0	216.0	241.5	8		22.0	16.0	57.0
200	345.0	270.0	298.5	8		22.0	16.0	70.0
250	405.0	324.0	362.0	12		26.0	19.1	70.0
300	485.0	381.0	432.0	12		26.0	19.1	76.0
350	535.0	413.0	476.0	12		29.5	20.6	76.0
400	600.0	470.0	540.0	16		29.5	22.4	89.0
450	635.0	533.5	578.0	16		32.5	23.9	89.0
500	700.0	584.5	635.0	20		32.5	25.4	114.0
600	815.0	692.5	749.5	20		35.5	25.4	114.0
750	985.0	857.0	914.0	28		35.5	28.4	117.0
900	1170.0	1022.0	1086.0	32		42.0	28.4	117.0

**TABLE 2 Materials**

MATERIAL	ASTM NUMBER
STAINLESS STEEL PLATE	A 240
STAINLESS STEEL BAR	A 276
STAINLESS STEEL CASTING	A 743 or A 351
CARBON STEEL PLATE	A 283, A 36 or A 285
CARBON STEEL CASTING	A 216
BRONZE CASTING	B 62
IRON CASTING	A 126, Class B

**TABLE 3 Equivalent Stainless Steel Grades**

WROUGHT	CAST
304	CF-8
316	CF-8M
317	CG-8M
304L	CF-3
316L	CF-3M
317L	CG-3M

**| ANNEX A |**  
**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**

B16.5-1996	Pipe Flanges and Flanged Fittings
Boiler and Pressure Vessel Code-Section IX-1998	Welding and Brazing Qualifications

**ASTM**

A 36-2000	Structural Steel
A 126-1995	Gray Iron Castings for Valves, Flanges and Pipe Fittings
A 216-1993	Carbon Steel Castings Suitable for Fusion Welding for High-Temperature Service
A 240-2001	Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Fusion-Welded Unfired Pressure Vessels
A 276-2000	Stainless and Heat Resisting Steel Bars and Shapes
A 283-2000	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
A 285-1990	Pressure Vessel Plates, Carbon Steel, Low and Intermediate -Tensile Strength
A 351-2000	Austenitic Steel Castings for High-Temperature Service
A 743-1998	Corrosion-Resistant Iron-Chromium, Iron-Chromium-Nickel, and Nickel Base Alloy Castings for General Application
B 62-1993	Composition Bronze or Ounce Metal Castings

**MSS**

SP-25-1998	Standard Marking System for Valves, Fittings, Flanges and Unions
SP-61-1999	Pressure Testing of Steel Valves

Publications of the following organizations appear in the above list:

ANSI	American National Standards Institute, Inc. 25 West 43rd Street New York, NY 10036
ASME	American Society of Mechanical Engineers Three Park Ave. New York, NY 10016-5990
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, PA 19428-2959
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, NE Vienna, VA 22180-4602



## 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 Cast Flanges and Flanged Fittings
SP-53-1999	Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components - Magnetic Particle Examination Method
SP-54-1999	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-67-1995	Butterfly Valves
SP-68-1997	High Pressure Butterfly Valves with Offset Design
SP-69-1996	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 Wrought and Cast Copper Alloy Solder Joint 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-85-1994	Cast Iron Globe & Angle Valves, Flanged and Threaded Ends
SP-86-1997	Guidelines for Metric Data in Standards for Valves, Flanges, Fittings and Actuators
SP-87-1991	(R 96) Factory-Made Butt-Welding Fittings for Class 1 Nuclear Piping Applications
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-100-1997	Qualification Requirements for Elastomer Diaphragms for Nuclear Diaphragm Type 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-108-1996	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 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)
SP-119-1996	Belled End Socket Welding Fittings, Stainless Steel and Copper Nickel
SP-120-1997	Flexible Graphite Packing System for Rising Stem Steel Valves (Design Requirements)
SP-121-1997	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.

**Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.**  
127 Park Street, N.E., Vienna, VA 22180-4620 • (703) 281-6613 Fax # (703) 281-6671