Supplement 2
December 1, 1997
Effective Date: June 1, 1998

Specification for Pipeline Valves (Gate, Ball, and Check Valves)

API SPECIFICATION 6D
TWENTY-FIRST EDITION, MARCH 1994

American
Petroleum
Institute

STD·API/PETRO SPEC 6D-ENGL 1994 ■ 0732290 0613923 828 ■

Supplement 2 to Specification for Pipeline Valves (Gate, Plug, Ball, and Check Valves)

This Supplement includes revisions published in a December 1, 1996 Supplement 1, some editorial corrections, and new revisions approved by 1997 letter ballot of the API Subcommittee on Valves and Wellhead Equipment. Changes since Supplement 1 was issued are marked by a vertical bar in the margin. These revisions shall be effective on the effective date shown on the cover, but may be used voluntarily from the date of publication.

Page 6

Revise 1.2 to read as follows:

1.2 Codes, Specifications and Standards. Each code, specification, or standard referenced herein shall be the latest edition or supplement in effect at the time of manufacture of the product, unless otherwise noted in this specification.

Page 7

Revise 2.3, Item c, to read as follows:

c. Reduced opening valves with non-circular openings through the closure member and reduced opening check valves shall be designated as reduced port valves and specified by the nominal valve size corresponding to the end connections followed by the letter "R". (For example, an NPS 16 valve with a 15 x 12 inch rectangular opening through the closure member shall be specified and marked "16R".)

Page 8

Revise 2.6 to read as follows:

2.6 Welding Ends. Welding ends shall conform to the designs shown in Figure 434.8.6(a)-(1) and -(2) in ASME B21.4 and Figure I5 of ASME B31.8. In the case of a heavy wall valve body, the outside profile may run out at 30 degrees and then to 45 degrees as illustrated in Figure 1 of ASME B16.25. The purchaser shall specify the nominal size, wall thickness, and specified minimum yield strength (SMYS) of the matching pipe.

Page 13

Revise 4.1.4 to read as follows:

4.1.4 Check Valves.

a. A check valve shall have a closure member which responds automatically to fluid flow and permits flow in one direction only.

b. Check valves shall be of the flanged-end, weld-end or wafer types, and may be reduced opening or full opening. Typical configurations are shown in Figures 4.5, 4.6, 4.7, 4.8 and 4.9.

Page 14

Remove the word "Regular" from the title of Figure 4.1 to read as follows:

Figure 4.1—Double-Disc, Rising-Stem Gate Valve

Pages 21 and 22

In Table 4.3 (Continued) and Table 4.3 (Concluded), change the heading as follows:

From "Full Bore" to "Full Bore and Reduced Bore"

Page 23

Change the title of Figure 4.5 to read as follows:

Figure 4.5—Reduced Opening Swing-Check Valve

Page 24

Change the title of Table 4.4 and Table 4.4 (Concluded) to read as follows:

Table 4.4—Flanged-End and Welding-End Check Valves
Reduced and Full-Opening

Page 27

In 5.3, replace the opening paragraph with the following (Items a-e remain unchanged):

5.3 Hydrostatic Seat Test. Valves shall be tested as follows. For non metal-to-metal seated valves, there shall be no visible leakage at the test pressure. For metal-to-metal seated valves, the leakage rate at the test pressure shall not exceed 0.15 ml/inch of the nominal bore of the closure member/minute as specified in Table 5.5. (The nominal bore of a closure member with a non-circular opening shall be determined by calculating the diameter of a circle whose area is equal to the area of the non-circular opening.)

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Page 28

Add the new Table 5.5 as follows:

Table 5.5—Maximum Allowable Leak Rates for High-Pressure Hydrostatic Seat Tests (Metal-to-Metal Seats Only)

Valve Size			Max. Leak Rate in
DN	NPS	mm	Milliliters Per Minute
50	2	51	0.31
80	3	76	0.46
100	4	102	0.61
150	6	152	0.91
200	8	203	1.21
250	10	254	1.52
300	12	305	1.83
350	14	356	2.14
400	16	406	2.44
450	18	457	2.74
500	20	508	3.05
550	22	559	3.35
600	24	610	3.66
650	26	660	3.96
700	28	711	4.27
750	30	762	4.57
900	36	914	5.48
1100	42	1067	6.40
1200	48	1219	7.30
1400	54	1372	8.23
1500	60	1524	9.14

Page 28

Add the new Table 5.6 as follows:

Table 5.6—Maximum Allowable Leak Rates for the Optional Air Seat Test Ref. Paragraph C3 (Metal-to-Metal Seats Only)

Valve Sizes			Max. Leak Rate in Milliliters Per Minute	
DN	NPS	mm	All Valves Except Check Valves	Check Valves
50	2	51	9	90
80	3	76	14	135
100	4	102	18	180
150	6	152	27	270
200	8	203	36	360
250	10	254	45	450
300	12	305	54	540
350	14	356	63	630
400	16	406	72	720
450	18	457	81	810
500	20	508	90	900
550	22	559	99	990
600	24	610	108	1080
650	26	660	117	1170
700	28	711	126	1260
750	30	762	135	1350
900	36	914	162	1620
1100	42	1067	189	1890
1200	48	1219	216	2160
1400	54	1372	243	2430
1500	60	1524	270	2700

Page 31

In 7.3, change Items a and b to read as follows:

a. **NDE Personnel.** NDE personnel shall be qualified in accordance with requirements specified in SNT-TC-1A, 1984 Edition or later.

b. **Visual Examination Personnel.** Personnel performing visual examinations shall have an annual eye examination in accordance with SNT-TC-1A, 1984 Edition or later.

Page 32

Change 8.2 to read as follows:

8.2 Draining. After testing and before shipment, valves shall be drained of test fluid and lubricated in accordance with the manufacturer's written procedures.

Page 45

Revise C3 to read as follows:

C3. Air Seat Test. Valves shall be tested as follows. For non metal-to-metal seated valves there shall be no visible leakage at the test pressure. For metal-to-metal seated gate, plug, and ball valves, the leakage rate at the test pressure shall not exceed 4.5 ml/inch of nominal bore size of the closure member/minute. For metal-to-metal seated check valves, the leakage rate at the test pressure shall not exceed 45 ml/inch of nominal bore size of the closure member/minute. Refer to Table 5.6 (The nominal bore of a closure member with a non-circular opening shall be determined by calculating the diameter of a circle whose area is equal to the area of the non-circular opening.)

a. **Test Pressure and Duration.** Seat test pressures and durations shall be as specified in Tables 5.3 and 5.4.

b. **Block Valves**

1. **Unidirectional.** Close the valve and apply pressure to the appropriate end of the valve per C3 and C3a.
2. **Directional.** Close the valve and apply pressure successively to each end of the valve per C3 and C3a.

c. **Double Block and Bleed Valves.** The test sequence is optional, however, both of the following tests shall be performed.

1. Close the valve, open the body vent, and apply seat test pressure to one end of the valve per C3 and C3a. Release pressure and repeat the test for the other end of the valve.
2. Close the valve, open the body vent, and apply seat test pressure simultaneously to both ends of the valve per C3 and C3a.

d. **Check Valves.** Apply test pressure to the appropriate end of the valve per C3 and C3a.

Page 46

In Appendix D, add the following standard to the referenced publications list:

ASNT SNT-TC-1A	Recommended Practice for Personnel Qualification and Certification in Non-Destructive Testing

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Supplement 1
(December 1, 1996)

Specification for Pipeline Valves (Gate, Plug, Ball, and Check Valves)

API SPECIFICATION 6D (SPEC 6D)
TWENTY-FIRST EDITION, MARCH 31, 1994

Supplement 1 (December 1, 1996) to Specification for Pipeline Valves (Gate, Plug, Ball, and Check Valves)

This supplement covers technical changes to API Specification 6D (Twenty-First Edition, March 31, 1994) that the API Subcommittee on Valves and Wellhead Equipment adopted by letter ballot.

Page 6

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> c. Reduced opening valves with non-circular openings through the closure member and reduced opening check valves shall be designated as reduced port valves and specified by the nominal valve size corresponding to the end connections followed by the letter "R". (For example, an NPS 16 valve with a 15x12 inch rectangular opening through the closure member shall be specified and marked "16R".)

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> a. A check valve shall have a closure member which responds automatically to fluid flow and permits flow in one direction only.

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Page 14

Remove the word "Regular" from the title of Figure 4.1 to read as follows:

FIGURE 4.1
DOUBLE-DISC, RISING-STEM GATE VALVE

Pages 21 and 22

In Table 4.3 (Continued) and Table 4.3 (Concluded), change the heading as follows:

From "Full Bore" to "Full Bore and Reduced Bore"

Page 23

Change the title of Figure 4.5 to read as follows:

FIGURE 4.5
REDUCED OPENING SWING-CHECK VALVE

Page 24

Change the title of Table 4.4 and Table 4.4 (Continued) to read as follows:

TABLE 4.4
FLANGED-END AND WELDING-END CHECK VALVES
REDUCED AND FULL-OPENING

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In 5.3, replace the opening paragraph with the following (Items a–e remain unchanged):

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Add the new Table 5.5 as follows:

Table 5.5
Maximum Allowable Leak Rates for High-Pressure Hydrostatic Seat Tests
(Metal-to-Metal Seats Only)

Valves Size DN	NPS	M/M	Max Leak Rate in Cubic Centimeter/Milliliters Per Minute
50	2	51	0.31
80	3	76	0.46
100	4	102	0.61
150	6	152	0.91
200	8	203	1.21
250	10	254	1.52
300	12	305	1.83
350	14	356	2.14
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450	18	457	2.74
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ASNT SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Non-Destructive Testing

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Specification for Pipeline Valves (Gate, Plug, Ball, and Check Valves)

API SPECIFICATION 6D (SPEC 6D)
TWENTY-FIRST EDITION, MARCH 31, 1994

American Petroleum Institute
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TABLE OF CONTENTS

This Standard (supplement) shall become effective on the date printed on the cover but voluntary conformance to the revisions may be used in whole or in part and either in lieu of or in conjunction with the current specification from the date of distribution to constitute conformance with the edition applicable at the date of manufacture.

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This edition of API Spec 6D supersedes the Twentieth Edition dated January 1, 1991, and the July 15, 1993 Supplement 1 to the Twentieth Edition. It includes changes adopted by letter ballot.

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Certain serious adverse health effects are associated with asbestos, among them the serious and often fatal diseases of lung cancer, asbestos is, and mesothelioma (a cancer of the chest and abdominal linings). The degree of exposure to asbestos varies with the product and the work practices involved.

Consult the most recent edition of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Health Standard for Asbestos, 29 *Code of Federal Regulations* Section 1910:1001; the U.S. Environmental Protection Agency's National Emission Standard for Hazardous Air Pollutants concerning Asbestos, 40, *Code of Federal Regulations* Sections 61.140 through 61.156; and the U.S. Environmental Protection Agency (EPA) labeling requirements and phased banning of asbestos products, published at 54 *Federal Register* 29460-29513 (July 12, 1989) 40CFR763.160-179.

There are currently in use and under development a number of substitute materials to replace asbestos in certain applications. Manufacturers and users are encouraged to develop and use effective substitute materials which can meet the specifications for, and operating requirements of, the equipment to which they would apply.

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FOREWORD

This Specification was formulated by the API Production Department Committee on Standardization of Valves and Wellhead Equipment.

Other publications formulated by this committee are:

Spec 6A: Specification for Wellhead and Christmas Tree Equipment.

Bul 6AM: Bulletin on Material Toughness.

Bul 6AF: Bulletin on Capabilities of API Flanges Under Combinations of Load.

Bul 6AF1: Bulletin on Temperature Derating of API Flanges Under Combination of Loading.

Bul 6AF2: Bulletin on Capabilities of API Integral Flanges Under Combination of Loading.

Spec 6FA: Specification for Fire Test for Valves.

Spec 6FB: Specification for Fire Test for End Connections.

Spec 6FC: Specification for Fire Test for Valve With Automatic Backseats.

Bul 6F1: Bulletin on Performance of API and ANSI End Connections in a Fire Test According to API Specification 6FA.

Bul 6F2: Bulletin on Fire Resistance Improvements for API Flanges.

Bul 6J: Bulletin on Testing of Oilfield Elastomers — A Tutorial, First Edition.

Spec 6H: Specification for End Closures, Connectors, and Swivels.

Bul 6RS: Bulletin on Referenced Standards for Committee 6, Standardization of Valves and Wellhead Equipment.

SECTION 1
SCOPE

1.1 Coverage. This specification covers flanged and butt-welding gate, plug, ball, and check valves.

1.2 Codes, Specifications, and Standards. Each code, specification, or standard referenced herein shall be the latest edition or supplement in effect at the time of manufacture of the product.

1.3 Definitions.

Bidirectional Valve: A valve designed for sealing in either direction.

Block Valve: A gate, plug or ball valve that prevents flow or leakage into the downstream conduit when in the closed position. Valves shall be single or double seated, bidirectional or unidirectional. Unidirectional valves shall be marked with a flow direction arrow.

Closure Member: That part of a valve which is positioned in the flow stream to permit, obstruct or regulate flow.

Double Block and Bleed Valve: A valve with two seating surfaces which, in the closed position, provides blockage of flow from both valve ends when the cavity between the seating surface is vented or drained. A means shall be provided for draining or venting the cavity between the seating surfaces.

Extended Operating Gear: An operating means located above its normal position on a valve, to allow above-ground access when the valve is installed below ground.

Handle Extension: A length of bar or pipe used to manually operate a plug or ball valve. The handle extension is sized to fit the head. The handle extension is separable from the head that is attached to the valve stem.

Handwheel: A wheel consisting of a rim connected to a hub by spokes, which is used to manually operate a valve requiring multiple turns.

Locking Device: A part or an arrangement of parts providing a means to secure a valve in the open or closed position.

NPS: Abbreviation for Nominal Pipe Size in inches.

Position Indicator: A device to show whether a valve is in the open or closed position.

Pressure-Containing Parts: Those parts whose failure to function as intended would result in a release of retained fluid to the atmosphere such as bodies, bonnets, and stems.

Pressure-Controlling Parts: Those parts intended to control or regulate the movement of pressurized fluids, such as valve bore sealing mechanisms.

Raised Face: A flange face having a flat surface protruding $^1/_{16}$ or $^1/_4$ inch beyond the outer flange face.

Ring Joint Face: A flange face having a specially shaped groove located between the bolt holes and the flange bore.

Seating Surfaces: The contact surfaces of the closure member and seat which effect valve closure.

Support Ribs or Legs: A metal structure attached to a valve body to provide a stable footing when the valve is to be set on a fixed base.

Unidirectional Valve: A valve designed for sealing in one direction only.

Venturi Plug Valve: A valve with a substantially reduced opening through the plug, in which the transition from each full opening end to the reduced opening is well streamlined.

Wrench: A device for manually operating a plug or ball valve consisting of a length of pipe or bar with one end prepared to fit the valve stem.

SECTION 2
GENERAL

2.1 Valve Classes. Valves covered by this specification shall be furnished in the following classes:

Class 150	Class 900
Class 300	Class 1500
Class 400	Class 2500
Class 600	

NOTE: *The class designations above are the same as the rating designations for ANSI B16.5, and therefore indicate the applicable connecting flanges.*

2.2 Ratings.

a. Standard Flanged End and Standard Weld End Valves. Valves constructed with flange materials listed in Column 3 of Table 3.1, and weld end valves constructed from materials in Table 3.1 shall conform to the pressure/temperature limitations of Table 2.1, where the temperatures or those of the line fluid under operating conditions.

b. Alternate Flanged End Valves. Valves constructed with flange materials listed in Column 4 of Table 3.1 shall have ratings conforming with ratings for flanges and flanged fittings in ANSI B16.5.

c. Alternate Weld End Valves. Valves constructed with materials listed in Column 5 of Table 3.1 shall have ratings conforming with ratings for flanges and flanged fittings in ANSI B16.5 and for valves in ANSI B16.34.

d. Temperatures. Metal seated valves shall conform to the ratings of 2.2a and 2.2b for the temperature range of -20°F to +250°F. Above 250°F, valves shall have ratings conforming with ratings for flanges and flanged fittings in ANSI B16.5 and for valves in ANSI B16.34. Valves having nonmetallic seals shall conform to the ratings of Sections 2.2a and 2.2b for the temperature range of -20°F to +100°F, or other temperature ranges may be used in accordance with manufacturers written specification.

TABLE 2.1
MAXIMUM OPERATING PRESSURE RATINGS FOR STANDARD FLANGED END AND STANDARD WELD END VALVES
(Ref. Metric Table B2.1)

Class	150	300	400	600	900	1500	2500
Temperature °F	Rating, psig						
–20 to 100	275	720	960	1440	2160	3600	6000
150	270	705	940	1415	2120	3540	5895
200	260	675	900	1350	2025	3375	5625
250	245	665	885	1330	1995	3325	5545

NOTE: *For temperatures below –20°F the rating shall be no greater than the rating shown for –20°F.*

2.3 Sizes. All valves furnished to this specification shall be identified by the nominal valve size as given in Column 1 of Tables 4.1 through 4.5.

a. Full bore valves shall be specified by the nominal valve size.

b. Reduced opening valves with circular openings through the closure member shall be designated as reduced bore valves and specified by two numbers. The first number shall be the nominal valve size corresponding to the end connections and determines the end-to-end or face-to-face dimensions of the valve. The second number (except for 2" valves) shall be the nominal valve size corresponding to the minimum bore of the closure member as listed in Table 4.0. For 2" valves the second number shall be the nominal bore of the closure member. (e.g., An NPS 16 valve with a 13.25 inch diameter circular opening through the closure member shall be specified and marked "16×14".)

c. Reduced opening valves with non-circular openings through the closure member shall be designated as reduced port valves and specified by the nominal valve size corresponding to the end connections followed by the letter "R". (e.g., An NPS 16 valve with a 15×12 inch rectangular opening through the closure member shall be specified and marked "16R".)

2.4 Face-to-Face and End-to-End Dimensions. Valves shall be supplied with either the standard face-to-face or end-to-end length conforming to 2.4 a or b, or with face-to-face or end-to-end length marked in accordance with 2.4c.

a. Standard face-to-face and end-to-end dimensions shall be in conformance with the dimensions given in Tables 4.1, 4.2, 4.3, 4.4 or 4.5.

b. The length of valves having one weld end and one flanged end are determined by adding half the length of a flanged-end valve to half the length of a welded-end valve.

c. Valves having face-to-face or end-to-end dimensions not listed or not in conformance with Tables 4.1, 4.2, 4.3, 4.4 or 4.5 shall be marked with the designation 6D4 and the face-to-face or end-to-end dimension on the nameplate.

2.5 End Flanges.

a. End flanges shall be furnished with raised face or ring-joint face. Dimensions, tolerances, and finishes, including drilling templates, flange facing, spot facing, and back facing for flanges for NPS 24 and smaller, but excluding NPS 22 shall conform to ANSI B16.5.

b. Standard end flange dimensions and tolerances for NPS 22 and for NPS 26 and larger shall conform to MSS-SP44.

c. Alternate end flange dimensions and tolerances for NPS 26 and larger shall conform to ASME B16.47, Series B.

d. Ring-joint end flanges shall be furnished either raised or full face.

e. Valve body designs requiring tapped holes on end flanges shall provide full effective thread engagement for a length equal to or greater than the nominal thread diameter.

2.6 Welding Ends. Welding ends shall conform to the designs shown in Fig. 434.8.6 A&B in ANSI B31.4 and Fig. 14 and Fig. 15 in ANSI B31.8. The purchaser shall specify the inside diameter of welding ends.

2.7 Design Control. Design requirements used to control the detailed plan of a product shall be specified and documented.

2.8 Design Verification. Design verification shall be performed according to the manufacturer's written procedure and specification.

2.9 Design Documentation.

a. **General.** Designs shall be documented. Design documentation media shall be clear, legible, reproducible, and retrievable.

b. **Review.** Design documentation shall be reviewed and verified by qualified personnel other than the individual who created the original design.

2.10 Pressure Relief. The manufacturer shall determine and document valve designs which permit pressure to be trapped in the body cavity at any closure position. Valves of this type shall have accessible tappings, NPS ½" or larger. Valves of this type for liquid service shall also be provided with a pressure relief device.

2.11 Drain and Bypass Connections. Drain and bypass connections, if furnished, shall be drilled and tapped, using API line pipe threads or tapered pipe threads conforming to ANSI B1.20.1, with minimum thread length as specified in API Std. 5B, or tapered pipe threads conforming to other national standards. Bypass connection size shall be according to Table 2.2.

TABLE 2.2
BYPASS CONNECTIONS

Valve Size NPS	(DN)	Minimum Pipe-Tap Size, Inches
2 thru 4	(50 thru 100)	½
6 thru 8	(150 thru 200)	¾
10 and larger	(250 and larger)	1

2.12 Handle Extensions. Wrenches for plug and ball valves shall be of integral design, or consist of a head which fits on the plug or ball stem, designed to take an extended handle. The head design shall provide for permanent attachment of the extended section.

2.13 Locking Devices. Locking devices if furnished for ball and plug valves shall be designed for locking the valve in the open or closed position.

2.14 Position Indicators. Each gate, plug and ball valve, whether manually operated or furnished with a power actuator, shall be furnished with a visible indicator to show the open and closed position of the fully assembled valve.

SECTION 3
MATERIAL

3.1 Body, Bonnet, Cover, End Flange, and Welding End. Bodies, including end flanges and welding ends, bonnets, and covers of valves shall be made of materials conforming to one or more of the specifications shown in Table 3.1.

3.2 Bonnet and Cover Bolting. Bonnet and cover bolting shall be of material in accordance with the manufacturers written specification.

3.3 Non-Metallic Parts. Non-metallic parts and elements, which usually include such items as packing, injectable material and lubricants, shall be of material in accordance with the manufacturer's written specifications.

3.4 Other Parts. Metal parts, which usually include such items as yokes, yoke nuts, stems, glands, gland bushings, gates, balls, plugs, discs, handwheels, gearing, pipe plugs, and motor drive attachments, shall be of material in accordance with the manufacturer's written specifications.

3.5 Welding

3.5.1 Qualifications. All fabrication and repair welding of pressure containing and pressure controlling parts shall be conducted in accordance with written procedures qualified in accordance with Section IX of the ASME Boiler and Pressure Vessel Code. Welders and welding operators making such welds shall be qualified in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.

3.5.2 Impact Testing. All fabrication and repair welding of pressure containing parts for metal temperatures below -20°F *(-29°C)* shall be done in accordance with written procedures with a Procedure Qualification Record (PQR) documenting impact test results of the weld and base metal heat affected zone as follows:

a. A set of three (3) weld metal impact specimens shall be taken across the weld with the notch in the weld metal. Each specimen shall be oriented so that the notch is normal to the surface of the material and one face of the specimen shall be within ¼ T from the surface of the material, where T is the thickness of the test weldment. Refer to Figure 3.1.

b. A set of three (3) heat affected zone impact specimens shall be taken across the weld to locate, after etching, the notch in the heat affected zone. The notch shall be cut approximately normal to the material surface in such a manner as to include as much heat affected zone material as possible in the resulting fracture. One face of the specimen shall be within ¼ T from the surface of the material. Refer to Figure 3.2. Where the base materials being joined are of a different P-number and Group-number, or where at least one of the base materials being joined is not listed in an ASME Section IX P-number grouping, heat affected zone impact tests shall be conducted for each of the materials being joined.

c. Impact testing shall be performed in accordance with ASTM A370 using the Charpy V-Notch technique.

d. The test temperature for welds and heat affected zones shall be at or below the minimum design temperature.

e. Impact values from the weld and heat affected zone specimens shall meet the requirements of Table 3.7.

3.5.3 Hardness Testing. All fabrication and repair welding of pressure containing and pressure controlling parts required to meet NACE Standard MR-01-75 shall be done in accordance with written procedures with a Procedure Qualification Record (PQR) documenting hardness test results that are in compliance with NACE MR-01-75. The manufacturer shall specify the hardness testing locations on the weld test specimen. Hardness testing shall be performed on the weld and base metal heat affected zone.

3.6 Components to Resist Sulfide Stress Cracking. Materials shall comply with NACE MR-01-75.

3.7 Special Test Requirements for Pipeline Valves Having a Minimum Design Temperature Below -20°F *(-29°C)*.

a. All materials for the shell or pressure containing structure, such as bodies, bonnets, end flanges, and welding ends as well as all bolting materials for metal temperatures below -20°F *(-29°C)* shall be tested in accordance with the impact test provisions of the latest revision of ASTM A370, Mechanical Testing of Steel Products, using the Charpy V notch technique.

b. A minimum of one impact test (three specimens) shall be conducted on a representative test bar on each heat of the material in the final heat treated condition. This heat qualification test may be performed prior to actual manufacturing provided that the heat treatment is performed in actual production equipment. Except for bolting material, the results of the test shall conform to Table 3.7. Bolting material shall be tested in accordance with ASTM A320 and the results of the test shall be 20 ft-lb (27 J) minimum charpy V notch impact energy value based on the average of three specimens.

c. Test coupons shall be cut from a separate or attached block; taken from the same heat; reduced by forging, where applicable; and given the same heat treatment, including stress-relieving, as the product materials they represent; except that:

(i) pressure-containing parts stress-relieved at or below a previous stress-relieving or tempering temperature need not be retested.

TABLE 3.7
CHARPY V NOTCH IMPACT REQUIREMENTS

Actual Ultimate Strength of the Material KSI (kPa)	Minimum Charpy V Notch Impact Energy (Average of Three Specimens) ft-lb (J)
85 or less (586 or less)	15 (20)
86 - 100 (587-689)	20 (27)
Over 100 (Over 689)	25 (34)

(ii) retesting is not required after stress-relieving if the actual toughness of the part is at least three times the value specified in Table 3.7.

d. The manufacturers written specification for metallic materials shall define the charpy test temperature.

3.8 Alternate Metallic Materials. Alternate metallic materials not listed in Table 3.1 may be used as follows:

3.8.1 Specifications. All alternate metallic materials shall have written specifications. Alternate metallic material specifications shall contain the following minimum information with accept/reject criteria.

a. Mechanical property requirements.

b. Chemical composition requirements.

c. Qualification test requirements.

3.8.2 Composition Limits. All alternate metallic materials shall have compositions with a minimum of 50% by weight of any combination of iron, nickel or cobalt and a maximum of 0.45% by weight of carbon.

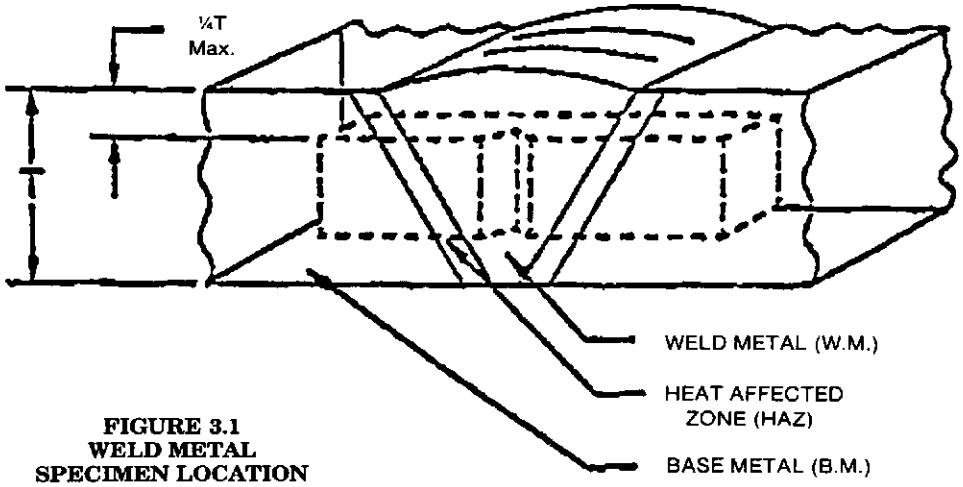

FIGURE 3.1
WELD METAL
SPECIMEN LOCATION

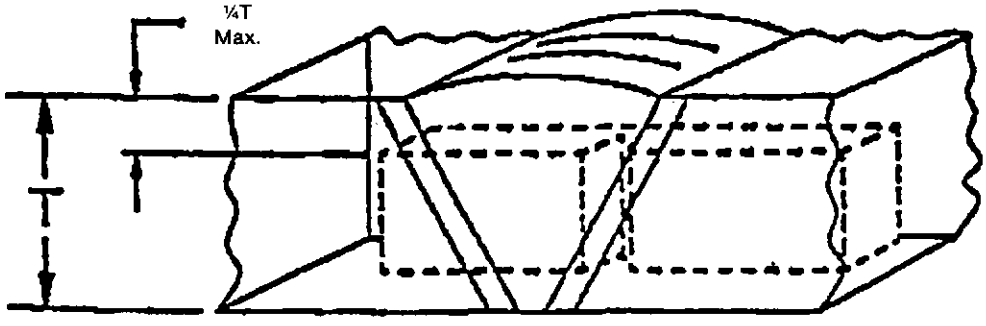

FIGURE 3.2
HAZ SPECIMEN
LOCATION

MATERIAL (continued)

TABLE 3.1
MATERIAL SPECIFICATIONS

1	2	3	4	5
	Applicable Specifications			
General Classification	Bodies, Bonnets and Covers	Standard Valve End Flanges	Alternate Valve End Flanges	All Welding Ends
Castings	ASTM A216 Gr WCB ASTM A216 Gr WCC ASTM A217 Gr Wc1 ASTM A217 Gr CA15 ASTM A351 Gr CF8M ASTM A351 Gr CF8C ASTM A351 Gr CF3N ASTM A352 Gr LCB ASTM A352 Gr LCC ASTM A352 Gr LC1 ASTM A352 Gr LC2 ASTM A352 Gr LC2.1 ASTM A352 Gr LC3 ASTM A487 Gr 1N ASTM A487 Gr 1Q ASTM A487 Gr 2N ASTM A487 Gr 2Q ASTM A487 Gr 4N ASTM A487 Gr 4Q ASTM A487 Gr 4QA ASTM A487 Gr CA6NM ASTM A487 Gr CA15M ASTM A757 Gr A1Q ASTM A757 Gr A2Q ASTM A757 Gr B2N ASTM A757 Gr B2Q ASTM A757 Gr B3N ASTM A757 Gr B4Q ASTM A757 Gr C1Q ASTM A757 Gr D1N1 ASTM A757 Gr D1Q1 ASTM A757 Gr D1N2 ASTM A757 Gr D1Q2 ASTM A757 Gr D1N3 ASTM A757 Gr D1Q3 ASTM A757 Gr E1Q ASTM A757 Gr E2Q1 ASTM A757 Gr E2N1 ASTM A757 Gr E2Q2 ASTM A757 Gr E2N3 ASTM A757 Gr E2Q3 ASTM A757 Gr E3N	ASTM A216 Gr WCB ASTM A216 Gr WCC ASTM A352 Gr LCC ASTM A352 Gr LC2 ASTM A352 Gr LC2.1 ASTM A352 Gr LC3 ASTM A217 Gr CA15 ASTM A487 Gr 1N ASTM A487 Gr 1Q ASTM A487 Gr 2N ASTM A487 Gr 2Q ASTM A487 Gr 4N ASTM A487 Gr 4Q ASTM A487 Gr 4QA ASTM A487 Gr CA6NM ASTM A487 Gr CA15M ASTM A757 Gr A2Q ASTM A757 Gr B2N ASTM A757 Gr B2Q ASTM A757 Gr B3N ASTM A757 Gr B4Q ASTM A757 Gr C1Q ASTM A757 Gr D1N1 ASTM A757 Gr D1Q1 ASTM A757 Gr D1N2 ASTM A757 Gr D1Q2 ASTM A757 Gr D1N3 ASTM A757 Gr D1Q3 ASTM A757 Gr E1Q ASTM A757 Gr E2Q1 ASTM A757 Gr E2N1 ASTM A757 Gr E2Q2 ASTM A757 Gr E2N3 ASTM A757 Gr E2Q3 ASTM A757 Gr E3N	Materials conforming to specifications listed in ANSI B16.5, Table 1A	ASTM A216 Gr WCB ASTM A216 Gr WCC ASTM A217 Gr WC1 ASTM A352 Gr LCB ASTM A352 Gr LCC ASTM A487 Gr 1N ASTM A487 Gr 1Q ASTM A757 Gr A1Q ASTM A757 Gr A2Q
Forgings	ASTM A105 ASTM A181 Gr I & II ASTM A182 Gr F1 ASTM A182 Gr F316 ASTM A182 Gr F316L ASTM A182 Gr F347 ASTM A350 Gr LF1 ASTM A350 Gr LF2 ASTM A350 Gr LF3 ASTM A541 CL1 ASTM A541 CL4 ASTM A182 Gr F11 ASTM A182 Gr F12 ASTM A182 Gr F2 ASTM A182 Gr F6	ASTM A105 ASTM A181 Gr II ASTM A350 Gr LF2 ASTM A350 Gr LF3 ASTM A182 Gr F11 ASTM A182 Gr F12 ASTM A182 Gr F2 ASTM A707	Materials conforming to specifications listed in ANSI B16.5, Table 1A	ASTM A105 ASTM A181 Gr II ASTM A182 Gr F1 ASTM A350 Gr LF1 ASTM A350 Gr LF2

TABLE 3.1 (Continued)
MATERIAL SPECIFICATIONS

1	2	3	4	5
		Applicable Specifications		
General Classification	Bodies, Bonnets and Covers	Standard Valve End Flanges	Alternate Valve End Flanges	All Welding Ends
Rolled Plates and Shapes	ASTM A36 ASTM A203 Gr E ASTM A225 Gr B ASTM A240 Gr 316 ASTM A240 Gr 316L ASTM A240 Gr 347 ASTM A242 for welding ASTM A285 Gr B & C ASTM A441 ASTM A515 ASTM A516 ASTM A537 CL1 and CL2* ASTM A533 Gr A and B ASTM A710 ASTM A633 Gr C ASTM A633 Gr D ASTM A737 Gr B ASTM A737 Gr C	ASTM A293 Gr E ASTM A537 CL1 & CL2 * ASTM A515 GR 70 ASTM A516 Gr 70		ASTM A36 ASTM A255 Gr B ASTM A242 for welding ASTM A441 ASTM A515 ASTM A516 ASTM A537 CL1 * ASTM A533 Gr A and B ASTM A633 Gr C ASTM A737 Gr B ASTM A737 Gr C
Pipe	ASTM A381 ASTM A106 Gr A & B API 5L ** ASTM A333 Gr 1, 3 & 6			ASTM A381 ASTM A106 Gr B only ASTM A333 Gr 1, 3 & 6 API 5L **

* Steel plate thicker than 2½ in. *(63.5 mm)*, but having all other properties indicated in the ASTM specification, is acceptable.

** Only seamless or submerged arc-welded pipe shall be allowed. Cold expanded and/or controlled rolled pipe requiring heat treatment, including stress-relieving, shall have the final mechanical properties of the material determined by testing control coupons from each heat.

NOTE 1: *The grades of steel indicated for welding ends represent materials which are generally suitable for field welding into pipe line systems. These grades do not necessarily possess equal degrees of weldability: therefore, the purchaser should establish for himself a suitable welding procedure.*

SECTION 4
VALVE TYPES AND CATEGORIES

4.1 Valve Types.

4.1.1 Gate Valves.

a. A gate valve shall have a closure member (gate) which moves in a plane perpendicular to the direction of flow. The gate shall be constructed of one piece (i.e., wedge or slab) or constructed of two or more pieces (i.e., double disc).

b. Gate valves shall have dimensions in accordance with Table 4.1.

c. All gate valves shall be provided with a secondary stem sealing capability or back seat in addition to the primary stem seal.

4.1.2 Plug Valves.

a. A plug valve shall have a cylindrical or conical closure member which rotates about an axis which is perpendicular to the direction of flow.

b. Plug valves shall have dimensions in accordance with Table 4.2.

c. Loose wrenches are not considered a part of a plug valve.

4.1.3 Ball Valves.

a. A ball valve shall have a spherical closure member which rotates about an axis which is perpendicular to the direction of flow.

b. Ball valves shall have dimensions in accordance with Table 4.3.

c. Loose wrenches are not considered a part of a ball valve.

4.1.4 Check Valves.

a. A check valve shall have a closure member(s) which rotates about a hinge and responds automatically to the fluid flow permitting fluid to flow in one direction only.

b. Check valves shall be of the flanged-end or welding-end types shown in Figures 4.5 (reduced bore) and 4.6 (full bore), or of the wafer type shown in Figures 4.7 (single plate, long pattern), 4.8 (dual plate, long pattern), and 4.9 (single plate, short pattern).

c. Check valves shall have dimensions in accordance with Tables 4.4 or 4.5.

4.2 Valve Categories.

4.2.1 Full Opening Valves (full bore valves).

a. Full opening valves shall be unobstructed in the fully opened position and capable of passing a sphere no smaller than specified for the applicable nominal size in Table 4.0 (less the tolerance), except that the end preparation of weld-end valves may require a smaller bore at the weld end to mate with the pipe.

b. There is no restriction on the upper limit of valve bore sizes.

4.2.2 Reduced Opening Valves. A reduced opening valve is any valve with an internal opening that is too small to pass a sphere no smaller than specified for the applicable nominal size in Table 4.0 (less tolerance).

4.2.3 Conduit Valves. A conduit valve is a full bore valve with a circular hole in the closure member that will pass a sphere no smaller than specified for the applicable nominal size in Table 4.0 (less the tolerance), except that the end preparation of weld-end valves may require a smaller bore at the weld end to properly mate with the pipe.

TABLE 4.0
NOMINAL BORE SIZES AND SPHERE DIAMETERS
FOR FULL OPENING VALVES
Tolerance = $-1/16$ in. (Ref 4.2.1.b)
(Ref. Metric Table B4.0)

Nominal Valve Size † inches	Pressure Class			
	150 through 600	900	1500	2500
2	2	2	2	1.75
2½	2.5	2.5	2.5	2.125
3	3	3	3	2.5
4	4	4	4	3.5
6	6	6	5.75	5.25
8	8	8	7.625	7.125
10	10	10	9.5	8.875
12	12	12	11.375	10.5
14	13.25	12.75	12.5	—
16	15.25	14.75	14.25	—
18	17.25	16.75	—	—
20	19.25	18.625	—	—
22	21.25	20.625	—	—
24	23.25	22.5	—	—
26	25	24.375	—	—
28	27	26.25	—	—
30	29	28.125	—	—
32	30.75	30	—	—
34	32.75	31.875	—	—
36	34.5	33.75	—	—
38	36.5	—	—	—
40	38.5	—	—	—
42	40.25	—	—	—
48	46	—	—	—
54	51.75	—	—	—
60	57.5	—	—	—

†Valve size is same as nominal pipe size.

VALVE TYPES AND CATEGORIES (continued)

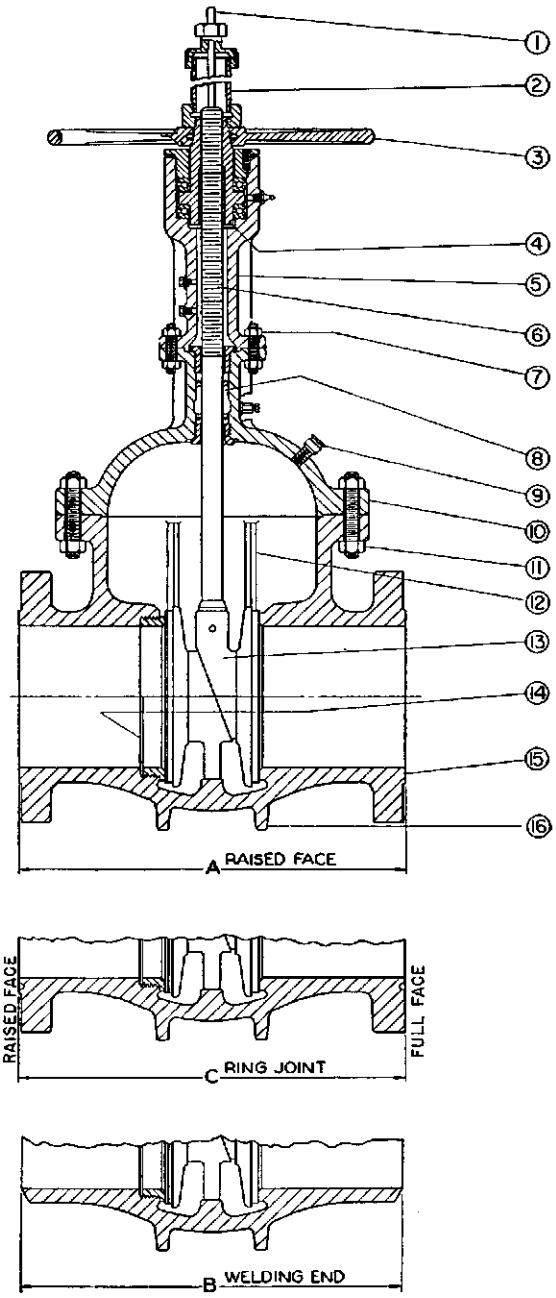

FIGURE 4.1
REGULAR, DOUBLE-DISC, RISING-STEM GATE VALVE
(For illustration purposes only)

PART NAMES

1. Stem indicator
2. Stem enclosure
3. Handwheel
4. Yoke nut
5. Yoke
6. Stem
7. Yoke bolts and nuts
8. Stem packing
9. Relief valve
10. Bonnet
11. Bonnet bolts and nuts
12. Disc guide
13. Disc assembly
14. Seat ring
15. Body
16. Support ribs or legs

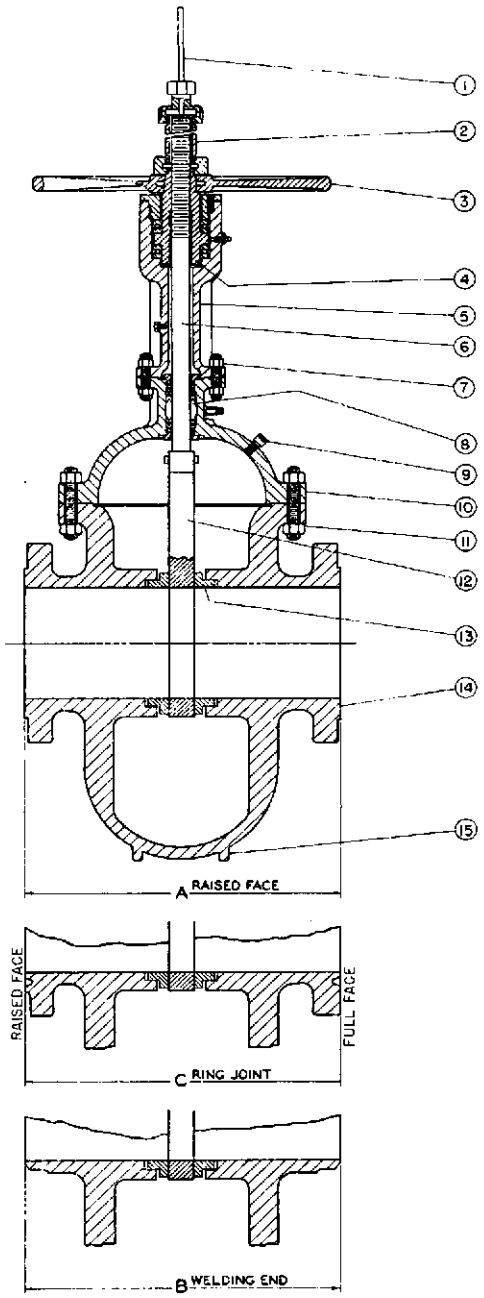

FIGURE 4.2
CONDUIT, RISING-STEM GATE VALVE
(For illustration purposes only)

PART NAMES

1. Stem indicator
2. Stem enclosure
3. Handwheel
4. Yoke nut
5. Yoke
6. Stem
7. Yoke bolts and nuts
8. Stem packing
9. Relief valve
10. Bonnet
11. Bonnet bolts and nuts
12. Gate
13. Seat ring
14. Body
15. Support ribs or legs

VALVE TYPES AND CATEGORIES (continued)

TABLE 4.1
GATE VALVES
Face-to-Face (*A*), and End-to-End (*B* and *C*) Dimensions.
All dimensions in inches.
(Ref. Metric Table B4.1)

1	2	3	4	5	6	7
	Class 150			Class 300		
Nominal Valve Size † Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
2	7	8 1/2	7 1/2	8 1/2	8 1/2	9 1/8
2 1/2	7 1/2	9 1/2	8	9 1/2	9 1/2	10 1/8
3	8	11 1/8	8 1/2	11 1/8	11 1/8	11 3/4
4	9	12	9 1/2	12	12	12 5/8
6	10 1/2	15 7/8	11	15 7/8	15 7/8	16 1/2
8	11 1/2	16 1/2	12	16 1/2	16 1/2	17 1/8
10	13	18	13 1/2	18	18	18 5/8
12	14	19 3/4	14 1/2	19 3/4	19 3/4	20 3/8
14	15	22 1/2	15 1/2	30	30	30 5/8
16	16	24	16 1/2	33	33	33 5/8
18	17	26	17 1/2	36	36	36 5/8
20	18	28	18 1/2	39	39	39 3/4
22	. . .	. . .	. . .	43	43	43 7/8
24	20	32	20 1/2	45	45	45 7/8
26	22	34	. . .	49	49	50
28	24	36	. . .	53	53	54
30	24*	36	. . .	55	55	56
32	28	38	. . .	60	60	61 1/8
34	30	40	. . .	64	64	65 1/8
36	28**	40	. . .	68	68	69 1/8

	Class 400			Class 600		
Nominal Valve Size † Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
2	11 1/2	11 1/2	11 5/8	11 1/2	11 1/2	11 5/8
2 1/2	13	13	13 1/8	13	13	13 1/8
3	14	14	14 1/8	14	14	14 1/8
4	16	16	16 1/8	17	17	17 1/8
6	19 1/2	19 1/2	19 5/8	22	22	22 1/8
8	23 1/2	23 1/2	23 5/8	26	26	26 1/8
10	26 1/2	26 1/2	26 5/8	31	31	31 1/8
12	30	30	30 1/8	33	33	33 1/8
14	32 1/2	32 1/2	32 5/8	35	35	35 1/8
16	35 1/2	35 1/2	35 5/8	39	39	39 1/8
18	38 1/2	38 1/2	38 5/8	43	43	43 1/8
20	41 1/2	41 1/2	41 3/4	47	47	47 1/4
22	45	45	45 3/8	51	51	51 3/8
24	48 1/2	48 1/2	48 7/8	55	55	55 3/8
26	51 1/2	51 1/2	52	57	57	57 1/2
28	55	55	55 1/2	61	61	61 1/2
30	60	60	60 1/2	65	65	65 1/2
32	65	65	65 5/8	70	70	70 5/8
34	70	70	70 5/8	76	76	76 5/8
36	74	74	74 5/8	82	82	82 5/8

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.
†Valve size is same as nominal pipe size.
*Conduit valves shall be 26 inches.
**Conduit valves shall be 32 inches.

TABLE 4.1 (Continued)
GATE VALVES

1	2	3	4	5	6	7
	Class 900			Class 1500		
Nominal Valve Size † Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
2	14 1/2	14 1/2	14 5/8	14 1/2	14 1/2	14 5/8
2 1/2	16 1/2	16 1/2	16 5/8	16 1/2	16 1/2	16 5/8
3	15	15	15 1/8	18 1/2	18 1/2	18 5/8
4	18	18	18 1/8	21 1/2	21 1/2	21 5/8
6	24	24	24 1/8	27 3/4	27 3/4	28
8	29	29	29 1/8	32 3/4	32 3/4	33 1/8
10	33	33	33 1/8	39	39	39 3/8
12	38	38	38 1/8	44 1/2	44 1/2	45 1/8
14	40 1/2	40 1/2	40 7/8	49 1/2	49 1/2	50 1/4
16	44 1/2	44 1/2	44 7/8	54 1/2	54 1/2	55 3/8
18	48	48	48 1/2	60 1/2	60 1/2	61 3/8
20	52	52	52 1/2	65 1/2	65 1/2	66 3/8
22	. . .	. . .	. . .	. . .	. . .	. . .
24	61	61	61 3/4	76 1/2	76 1/2	77 5/8

Nominal Valve Size † Inches	Class 2500		
	Raised Face *A*	Welding End *B*	Ring and Groove *C*
2	17 3/4	17 3/4	17 7/8
2 1/2	20	20	20 1/4
3	22 3/4	22 3/4	23
4	26 1/2	26 1/2	26 7/8
6	36	36	36 1/2
8	40 1/4	40 1/4	40 7/8
10	50	50	50 7/8
12	56	56	56 7/8

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.
†Valve size is same as nominal pipe size.

VALVE TYPES AND CATEGORIES (continued)

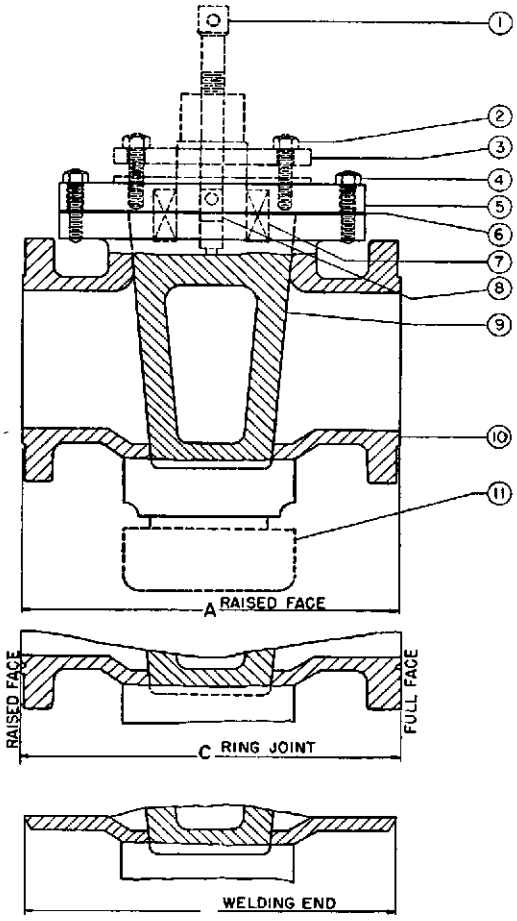

FIGURE 4.3
PLUG VALVE
(For illustration purposes only)

PART NAMES

1. Lubricator screw
2. Gland studs and nuts
3. Gland
4. Cover studs and nuts
5. Cover
6. Cover gasket
7. Stem packing
8. Lubricant check valve
9. Plug
10. Body
11. Stop collar

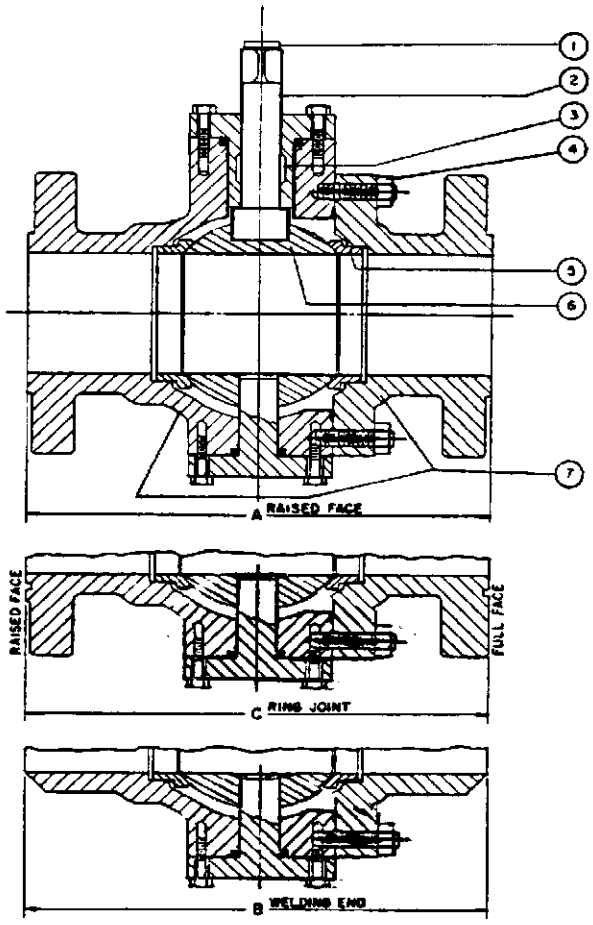

FIGURE 4.4
BALL VALVE
(For illustration purposes only)

PART NAMES

1. Indicator
2. Stem
3. Stem packing
4. Body nuts and bolts
5. Seat ring
6. Ball
7. Body

TABLE 4.2
FLANGED-END AND WELDING-END PLUG VALVES

Face-to-Face (*A*) and End-to-End (*B* and *C*) Dimensions.
All dimensions in inches.
See Figure 4.3.
(Ref. Metric Table B4.2)

1	2	3	4	5	6	7	8	9	10	11	12	13
	Short Pattern			Regular			Venturi			Round-Port, Full-Bore		
Valve Size † Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
Class 150												
2	7	10½	7½	.....	.....	.....	.....	.....	.....	10½	.....	11
2½	7½	12	8	.....	.....	.....	.....	.....	.....	11¾	.....	12¼
3	8	13	8½	.....	.....	.....	.....	.....	.....	13½	.....	14
4	9	14	9½	.....	.....	.....	.....	.....	.....	17	.....	17½
6	10½	18	11	15½	.....	16	.....	.....	.....	21½	.....	22
8	11½	20½	12	18	.....	18½	.....	.....	.....	24½	.....	25
10	13	22	13½	21	.....	21½	21	22	21½	26	.....	26½
12	14	25	14½	24	.....	24½	24	25	24½	30	.....	30½
14	.....	.....	.....	.....	.....	.....	27	27	27½	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	30	30	30½	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	34	34	34½	.....	.....	.....
20	.....	.....	.....	.....	.....	.....	36	36	36½	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	42	42	42½	.....	.....	.....
							.....	.....	.....	.....	.....	.....
Class 300												
2	8½	10½	9⅜	.....	.....	.....	.....	.....	.....	11⅛	11⅛	11¾
2½	9½	12	10⅜	.....	.....	.....	.....	.....	.....	13	13	13⅝
3	11⅛	13	11¾	.....	.....	.....	.....	.....	.....	15¼	15¼	15⅞
4	12	14	12⅝	.....	.....	.....	.....	.....	.....	18	18	18⅝
6	15⅜	18	16½	15⅜	.....	16½	15⅞	18	16½	22	22	22⅝
8	16½	20½	17⅛	19¾	.....	20⅜	16½	20½	17⅛	27	27	27⅝
10	18	22	18⅜	22⅝	.....	23	18	22	18⅜	32½	32½	33⅛
12	19¾	25	20⅜	.....	.....	.....	19¾	25	20⅜	38	38	38⅝
14	.....	.....	.....	.....	.....	.....	30	30	30⅜	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	33	33	33⅜	.....	.....	.....
18	.....	.....	.....	36	.....	36⅝	36	36	36⅜	.....	.....	.....
20	.....	.....	.....	39	.....	39¾	39	39	39¾	.....	.....	.....
22	.....	.....	.....	43	.....	43⅞	43	43	43⅞	.....	.....	.....
24	.....	.....	.....	45	.....	45⅞	45	45	45⅞	.....	.....	.....
26	.....	.....	.....	49	.....	50	49	49	50	.....	.....	.....
28	.....	.....	.....	53	.....	54	53	53	54	.....	.....	.....
30	.....	.....	.....	55	.....	56	55	55	56	.....	.....	.....
32	.....	.....	.....	60	.....	61⅛	60	60	61⅛	.....	.....	.....
34	.....	.....	.....	64	.....	65⅛	64	64	65⅛	.....	.....	.....
36	.....	.....	.....	68	.....	69⅛	68	68	69⅛	.....	.....	.....
Class 400												
2	.....	.....	.....	11½	11½	11⅝	.....	.....	.....	13	.....	13⅛
2½	.....	.....	.....	13	13	13⅛	.....	.....	.....	15	.....	15⅛
3	.....	.....	.....	14	14	14⅛	.....	.....	.....	17½	.....	17⅝
4	.....	.....	.....	16	16	16⅛	.....	.....	.....	19	22	19⅛
6	.....	.....	.....	19½	19½	19⅝	19½	19½	19⅝	24	28	24⅛
8	.....	.....	.....	23½	23½	23⅝	23½	23½	23⅝	29	33¼	29⅛
10	.....	.....	.....	26½	26½	26⅝	26½	26½	26⅝	35	35	35⅛
12	.....	.....	.....	30	30	30⅛	30	30	30⅛	40	40	40⅛
14	.....	.....	.....	.....	.....	.....	32½	32½	32⅝	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	35½	35½	35⅝	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	38½	38½	38⅝	.....	.....	.....
20	.....	.....	.....	.....	.....	.....	41½	41½	41¾	.....	.....	.....
22	.....	.....	.....	.....	.....	.....	45	45	45⅜	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	48½	48½	48⅞	.....	.....	.....
26	.....	.....	.....	.....	.....	.....	51½	51½	52	.....	.....	.....
28	.....	.....	.....	.....	.....	.....	55	55	55½	.....	.....	.....
30	.....	.....	.....	.....	.....	.....	60	60	60½	.....	.....	.....
32	.....	.....	.....	.....	.....	.....	65	65	65⅝	.....	.....	.....
34	.....	.....	.....	.....	.....	.....	70	70	70⅝	.....	.....	.....
36	.....	.....	.....	.....	.....	.....	74	74	74⅝	.....	.....	.....

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.
†Valve size is same as nominal pipe size.

VALVE TYPES AND CATEGORIES (continued)

TABLE 4.2 (Continued)
FLANGED-END AND WELDING-END PLUG VALVES

1	5	6	7	8	9	10	11	12	13
	Regular			Venturi			Round-Port, Full-Bore		
Valve Size † Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
				Class 600					
2	11½	11½	11⅝	.....	.....	.....	13	.....	13⅛
2½	13	13	13⅛	.....	.....	.....	15	.....	15⅛
3	14	14	14⅛	.....	.....	.....	17½	.....	17⅝
4	17	17	17⅛	.....	.....	.....	20	22	20⅛
6	22	22	22⅛	22	22	22⅛	26	28	26⅛
8	26	26	26⅛	26	26	26⅛	31¼	33¼	31⅝
10	31	31	31⅛	31	31	31⅛	37	40	37⅛
12	.....	.....	.....	33	33	33⅛	42	42	42⅛
14	.....	.....	.....	35	35	35⅛	.....	.....	.....
16	.....	.....	.....	39	39	39⅛	.....	.....	.....
18	.....	.....	.....	43	43	43⅛	.....	.....	.....
20	.....	.....	.....	47	47	47¼	.....	.....	.....
22	.....	.....	.....	51	51	51⅛	.....	.....	.....
24	.....	.....	.....	55	55	55⅝	.....	.....	.....
26	.....	.....	.....	57	57	57½	.....	.....	.....
30	.....	.....	.....	65	65	65½	.....	.....	.....
32	.....	.....	.....	70	70	70⅝	.....	.....	.....
34	.....	.....	.....	76	76	76⅝	.....	.....	.....
36	.....	.....	.....	82	82	82⅝	.....	.....	.....
				Class 900					
2	14½	.....	14⅝	.....	.....	.....	15	.....	15⅛
2½	16½	.....	16⅝	.....	.....	.....	17	.....	17⅛
3	15	15	15⅛	.....	.....	.....	18½	.....	18⅝
4	18	18	18⅛	.....	.....	.....	22	.....	22⅛
6	24	24	24⅛	24	24	24⅛	29	.....	29⅛
8	29	29	29⅛	29	29	29⅛	32	.....	32⅛
10	33	33	33⅛	33	33	33⅛	38	.....	38⅛
12	.....	.....	.....	38	38	38⅛	44	.....	44⅛
16	.....	.....	.....	44½	44½	44⅞	.....	.....	.....
				Class 1500					
2	14½	.....	14⅝	.....	.....	.....	15⅝	.....	15½
2½	16½	.....	16⅝	.....	.....	.....	17⅞	.....	18
3	18½	18½	18⅝	.....	.....	.....	20⅝	.....	20¾
4	21½	21½	21⅝	.....	.....	.....	24⅝	.....	24¾
6	27¾	27¾	28	27¾	27¾	28	31	.....	31¼
8	32¾	32¾	33⅛	32¾	32¾	33⅛	35	.....	35⅝
10	39	39	39⅜	39	39	39⅜	42	.....	42⅜
12	44½	44½	45⅛	44½	44½	45⅛	48	.....	48⅜
				Class 2500					
2	17¾	.....	17⅞	.....	.....	.....	.....	.....	.....
2½	20	.....	20¼	.....	.....	.....	.....	.....	.....
3	22¾	.....	23	.....	.....	.....	.....	.....	.....
4	26½	.....	26⅞	.....	.....	.....	.....	.....	.....
6	36	.....	36½	.....	.....	.....	.....	.....	.....
8	40¼	.....	40⅞	.....	.....	.....	.....	.....	.....
10	50	.....	50⅞	.....	.....	.....	.....	.....	.....
12	56	.....	56⅞	.....	.....	.....	.....	.....	.....

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.
†Valve size is same as nominal pipe size.

TABLE 4.3
FLANGED-END AND WELDING-END BALL VALVES

Face-to-Face *(A)*, and End-to-End *(B* and *C)* Dimensions.
All dimensions in inches.
See Figure 4.4.
(Ref. Metric Table B4.3)

1	2	3	4	5	6	7
	Full Bore & Reduced Bore			Short Pattern, Full and Reduced Bore		
Valve Size † Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
			Class 150			
2	7	8½	7½	.....	.....	.....
2½	7½	9½	8	.....	.....	.....
3	8	11⅛	8½	.....	.....	.....
4	9	12	9½	.....	.....	.....
6	15½	18	16	10½	15⅞	11
8	18	20½	18½	11½	16½	12
10	21	22	21½	13	18	13½
12	24	25	24½	14	19¾	14½
14	27	30	27½	.....	.....	.....
16	30	33	30½	.....	.....	.....
18	34	36	34½	.....	.....	.....
20	36	39	36½	.....	.....	.....
22	.....	.....	.....	.....	.....	.....
24	42	45	42½	.....	.....	.....
26	45	49	.....	.....	.....	.....
28	49	53	.....	.....	.....	.....
30	51	55	.....	.....	.....	.....
32	54	60	.....	.....	.....	.....
34	58	64	.....	.....	.....	.....
36	60	68	.....	.....	.....	.....
38	.....	.....	.....	.....	.....	.....
40	.....	.....	.....	.....	.....	.....
42	.....	.....	.....	.....	.....	.....
48	.....	.....	.....	.....	.....	.....
54	.....	.....	.....	.....	.....	.....
60	.....	.....	.....	.....	.....	.....
			Class 300			
2	8½	8½	9⅛	.....	.....	.....
2½	9½	9½	10⅛	.....	.....	.....
3	11⅛	11⅛	11¾	.....	.....	.....
4	12	12	12⅝	.....	.....	.....
6	15⅞	18	16½	.....	.....	.....
8	19¾	20½	20⅝	16½	16½	17⅛
10	22⅜	22	23	18	18	18⅝
12	25½	25	26⅛	19¾	19¾	20⅜
14	30	30	30⅝	.....	.....	.....
16	33	33	33⅝	.....	.....	.....
18	36	36	36⅝	.....	.....	.....
20	39	39	39¾	.....	.....	.....
22	43	43	43⅞	.....	.....	.....
24	45	45	45⅞	.....	.....	.....
26	49	49	50	.....	.....	.....
28	53	53	54	.....	.....	.....
30	55	55	56	.....	.....	.....
32	60	60	61⅛	.....	.....	.....
34	64	64	65⅛	.....	.....	.....
36	68	68	69⅛	.....	.....	.....
38	.....	.....	.....	.....	.....	.....
40	.....	.....	.....	.....	.....	.....
42	.....	.....	.....	.....	.....	.....
48	.....	.....	.....	.....	.....	.....
54	.....	.....	.....	.....	.....	.....
60	.....	.....	.....	.....	.....	.....

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.
†Valve size is same as nominal pipe size.

VALVE TYPES AND CATEGORIES (continued)

TABLE 4.3 (Continued)
FLANGED-END AND WELDING-END BALL VALVES

1	2	3	4
Valve Size † Inches	Full Bore		
	Raised Face *A*	Welding End *B*	Ring and Groove *C*
	Class 400		
2	.....	.....	.....
2½	.....	.....	.....
3	.....	.....	.....
4	16	16	16⅛
6	19½	19½	19⅝
8	23½	23½	23⅝
10	26½	26½	26⅝
12	30	30	30⅛
14	32½	32½	32⅝
16	35½	35½	35⅝
18	38½	38½	38⅝
20	41½	41½	41¾
22	45	45	45⅝
24	48½	48½	48⅞
26	51½	51½	52
28	55	55	55½
30	60	60	60½
32	65	65	65⅝
34	70	70	70⅝
36	74	74	74⅝
38	.....	.....	.....
40	.....	.....	.....
42	.....	.....	.....
48	.....	.....	.....
	Class 600		
2	11½	11½	11⅝
2½	13	13	13⅛
3	14	14	14⅛
4	17	17	17⅛
6	22	22	22⅛
8	26	26	26⅛
10	31	31	31⅛
12	33	33	33⅛
14	35	35	35⅛
16	39	39	39⅛
18	43	43	43⅛
20	47	47	47¼
22	51	51	51⅜
24	55	55	55⅜
26	57	57	57½
28	61	61	61½
30	65	65	65½
32	70	70	70⅝
34	76	76	76⅝
36	82	82	82⅝
38	.....	.....	.....
40	.....	.....	.....
42	.....	.....	.....
48	.....	.....	.....

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.
†Valve size is same as nominal pipe size.

VALVE TYPES AND CATEGORIES (continued)

TABLE 4.3 (Concluded)
FLANGED-END AND WELDING-END BALL VALVES

1	2	3	4
Valve Size † Inches	Full Bore		
	Raised Face *A*	Welding End *B*	Ring and Groove *C*
	Class 900		
2	14½	14½	14⅝
2½	16½	16½	16⅝
3	15	15	15⅛
4	18	18	18⅛
6	24	24	24⅛
8	29	29	29⅛
10	33	33	33⅛
12	38	38	38⅛
14	40½	40½	40⅞
16	44½	44½	44⅞
18	48	48	48½
20	52	52	52½
22	.....	.....	.....
24	61	61	61¾
26	.....	.....	.....
28	.....	.....	.....
30	.....	.....	.....
32	.....	.....	.....
34	.....	.....	.....
36	.....	.....	.....
	Class 1500		
2	14½	14½	14⅝
2½	16½	16½	16⅝
3	18½	18½	18⅝
4	21½	21½	21⅝
6	27¾	27¾	28
8	32¾	32¾	33⅛
10	39	39	39⅜
12	44½	44½	45⅛
14	49½	49½	50¼
16	54½	54½	55⅝
	Class 2500		
2	17¾	17¾	17⅞
2½	20	20	21¼
3	22¾	22¾	23
4	26½	26½	26⅞
6	36	36	36½
8	40¼	40¼	40⅞
10	50	50	50⅞
12	56	56	56⅞

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.
†Valve size is same as nominal pipe size.

VALVE TYPES AND CATEGORIES (continued)

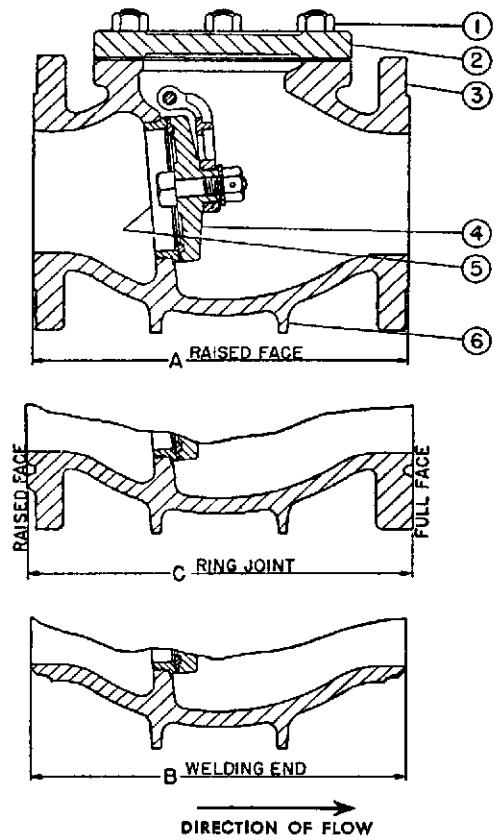

FIGURE 4.5
REGULAR, SWING-CHECK VALVE
(For illustration purposes only)

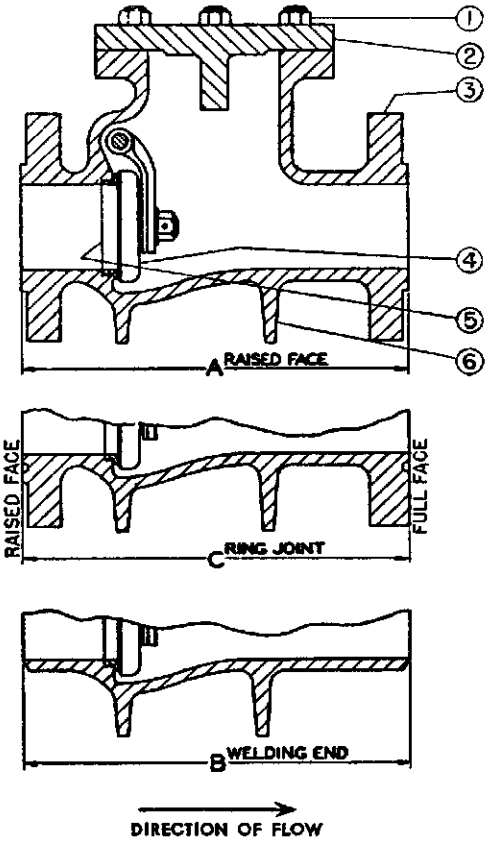

FIGURE 4.6
FULL-OPENING, SWING-CHECK VALVE
(For illustration purposes only)

PART NAMES

1. Cover studs and nuts
2. Cover
3. Body
4. Disc
5. Seat ring
6. Support ribs or legs

TABLE 4.4
FLANGED-END AND WELDING-END, SWING-CHECK VALVES
REGULAR AND FULL-OPENING TYPES
Face-to-Face *(A)*, and End-to-End *(B* and *C)* Dimensions.
All dimensions in inches.
See Figures 4.5 and 4.6.
(Ref. Metric Table B4.4)

1	2	3	4	5	6	7	8	9	10	11	12	13
	Class 150			Class 300			Class 400			Class 600		
Valve Size Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
2	8	8	8½	10½	10½	11⅛	11½	11½	11⅝	11½	11½	11⅝
2½	8½	8½	9	11½	11½	12⅛	13	13	13⅛	13	13	13⅛
3	9½	9½	10	12½	12½	13⅛	14	14	14⅛	14	14	14⅛
4	11½	11½	12	14	14	14⅝	16	16	16⅛	17	17	17⅛
6	14	14	14½	17½	17½	18⅛	19½	19½	19⅝	22	22	22⅛
8	19½	19½	20	21	21	21⅝	23½	23½	23⅝	26	26	26⅛
10	24½	24½	25	24½	24½	25⅛	26½	26½	26⅝	31	31	31⅛
12	27½	27½	28	28	28	28⅝	30	30	30⅛	33	33	33⅛
14	31	31	31½	33	33	33⅝	35	35	35⅛	35	35	35⅛
16	34	34	34½	34	34	34⅝	35½	35½	35⅝	39	39	39⅛
18	38½	38½	39	38½	38½	39⅛	40	40	40⅛	43	43	43⅛
20	38½	38½	39	40	40	40¾	41½	41½	41¾	47	47	47¼
22	42	42	42½	44	44	44⅞	45	45	45⅜	51	51	51⅜
24	51	51	51½	53	53	53⅞	55	55	55⅜	55	55	55⅜
26	51	51	.....	53	53	54	55	55	55½	57	57	57½
28	57	57	.....	59	59	60	63	63	63½	63	63	63½
30	60	60	.....	62¾	62¾	63¾	65	65	65½	65	65	65½
36	77	77	.....	82	82	.....	82	82	.....	82	82	.....
38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 4.4 (Continued)
FLANGED-END AND WELDING-END, SWING-CHECK VALVES
REGULAR AND FULL-OPENING TYPES

1	14	15	16	17	18	19	20	21	22
	Class 900			Class 1500			Class 2500		
Valve Size Inches	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Rind and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
2	14½	14½	14⅝	14½	14½	14⅝	17¾	17¾	17⅞
2½	16½	16½	16⅝	16½	16½	16⅝	20	20	20¼
3	15	15	15⅛	18½	18½	18⅝	22¾	22¾	23
4	18	18	18⅛	21½	21½	21⅝	26½	26½	26⅞
6	24	24	24⅛	27¾	27¾	28	36	36	36½
8	29	29	29¼	32¾	32¾	33⅛	40¼	40¼	40⅞
10	33	33	33⅛	39	39	39⅜	50	50	50⅞
12	38	38	38⅛	44½	44½	45⅛	56	56	56⅞
14	40½	40½	40⅞	49½	49½	50¼	.....	.....	.....
16	44½	44½	44⅞	54½	54½	55⅜	.....	.....	.....
18	48	48	48½	60½	60½	61⅛	.....	.....	.....
20	52	52	52½	65½	65½	66⅜	.....	.....	.....
24	61	61	61¾	76½	76½	77⅞	.....	.....	.....

Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.

VALVE TYPES AND CATEGORIES (continued)

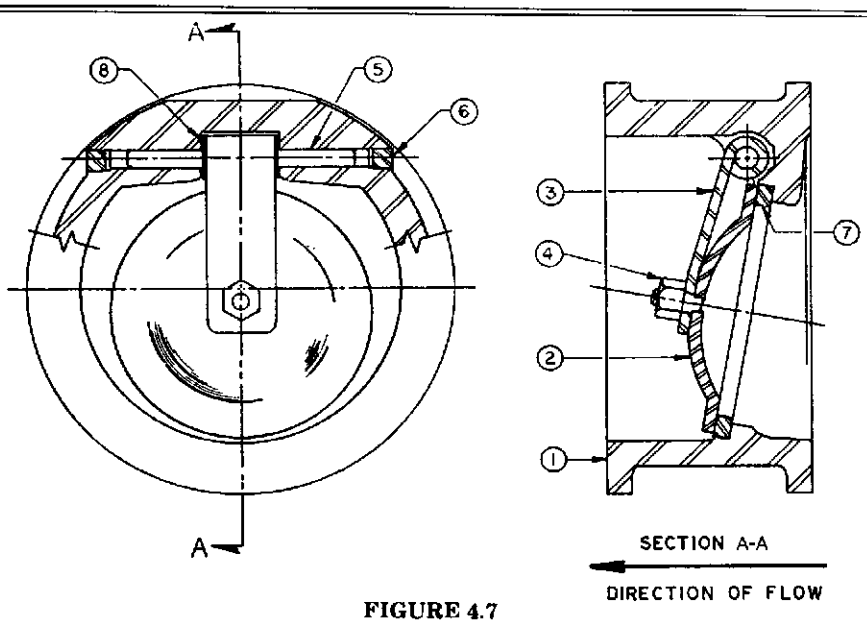

FIGURE 4.7
TYPICAL SINGLE PLATE WAFER TYPE CHECK VALVE—LONG PATTERN
(For illustration purposes only)

PART NAMES

1. Body
2. Closure Plate-Stud Assembly
3. Hinge
4. Nut
5. Hinge Pin
6. Hinge Pin Retainers
7. Seat Ring
8. Bearing Spacers

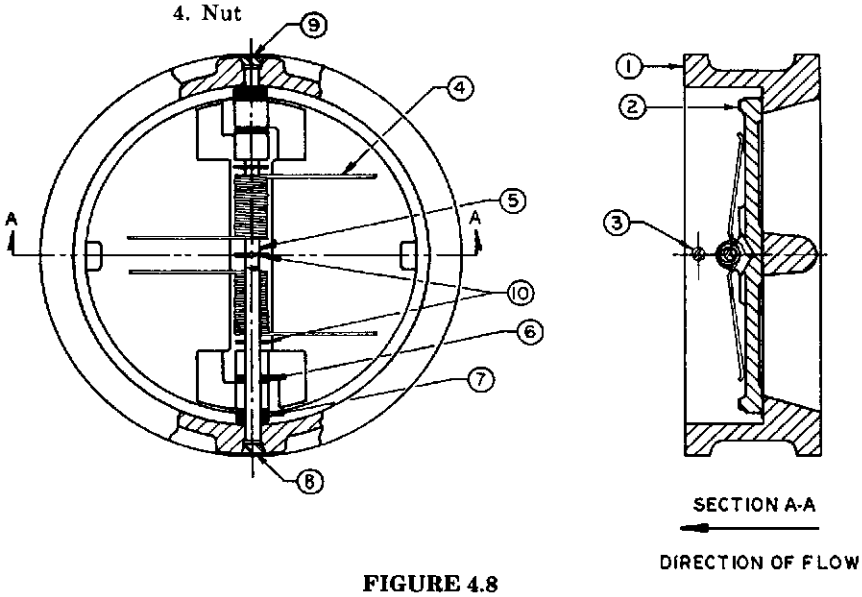

FIGURE 4.8
TYPICAL DUAL PLATE WAFER TYPE CHECK VALVE—LONG PATTERN
(For illustration purposes only)

PART NAMES

1. Body
2. Closure Plate
3. Stop Pin
4. Spring
5. Hinge Pin
6. Plate Lug Bearings
7. Body Lug Bearings
8. Stop Pin Retainers
9. Hinge Pin Retainers
10. Spring Bearings

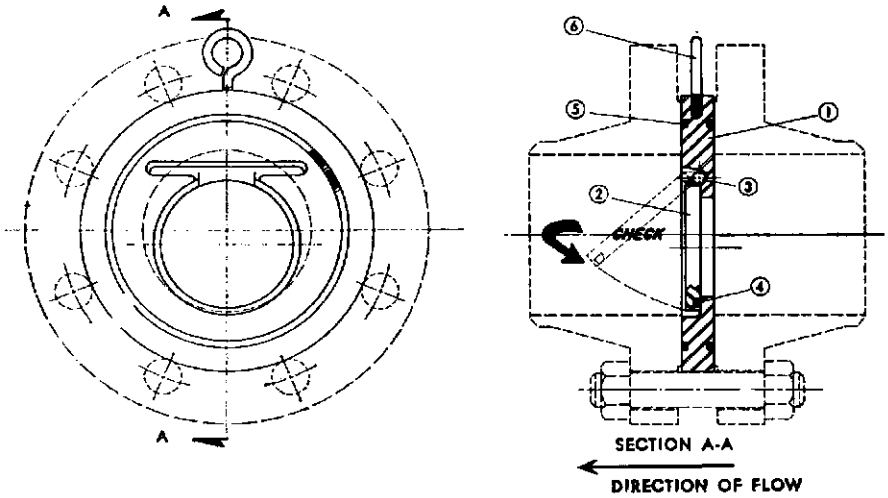

FIGURE 4.9
TYPICAL SINGLE PLATE WAFER TYPE CHECK VALVE—SHORT PATTERN
(For illustration purposes only)

PART NAMES

1. Body
2. Clapper
3. Pin
4. Clapper Seal
5. Body Seal
6. Lifting Eye

TABLE 4.5
SINGLE AND DUAL PLATE, LONG AND SHORT PATTERN, WAFER TYPE CHECK VALVES
Face-to-Face Dimensions.
All dimensions in inches.
See Figures 4.7, 4.8 and 4.9.
(Ref. Metric Table B4.5)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	CLASS													
	150		300		400		600		900		1500		2500	
Valve Size Inches	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.
2	¾	2⅜	¾	2⅜	¾	2⅜	¾	2⅜	¾	2¾	¾	2¾	*	2¾
2½	¾	2⅝	¾	2⅝	¾	2⅝	¾	2⅝	¾	3¼	¾	3¼	*	3¼
3	¾	2⅞	¾	2⅞	¾	2⅞	¾	2⅞	¾	3¼	⅞	3¼	*	3⅜
4	¾	2⅞	¾	2⅞	⅞	3⅛	⅞	3⅛	⅞	4	1¼	4	*	4⅛
6	¾	3⅞	⅞	3⅞	1	5⅝	1⅛	5⅝	1⅜	6¼	1¾	6¼	*	6¼
8	1⅛	5	1⅛	5	1¼	6½	1½	6½	1¾	8⅛	2¼	8⅛	*	8⅛
10	1⅛	5¾	1½	5¾	2	8⅜	2¼	8⅜	2¼	9½	2⅞	9¾	*	10
12	1½	7⅛	2	7⅛	2¼	9	2⅜	9	*	11½	*	12	*	12
14	1¾	7¼	2	8¾	2½	10¾	2⅝	10¾	*	14	*	14	.....	.....
16	2	7½	2	9⅛	2½	12	2⅞	12	*	15⅛	*	15⅛	.....	.....
18	2⅜	8	3	10⅜	3¼	14¼	3¼	14¼	*	17¾	*	18 7/16	.....	.....
20	2½	8⅝	3¼	11½	3½	14½	3⅝	14½	*	17¾	*	21	.....	.....
24	*	8¾	*	12½	*	15½	*	17¼	*	19½	*	22	.....	.....
*30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Dimensions to be established.
Tolerance: ±1/16 in. on sizes 10 in. and smaller. ±1/8 in. on sizes 12 in. and larger.

SECTION 5
TESTS

5.1 Pressure Tests. Each valve shall be tested as set out in this section prior to shipment from the manufacturer's works. These tests shall be performed in accordance with the manufacturer's written procedures. The manufacturer shall complete shell pressure tests before painting the valves. Tests shall be made in the sequence shown in the following paragraphs. Additional tests such as those in Appendix C may be performed by the manufacturer, after the tests in Sections 5.2 and 5.3 below unless otherwise noted in Appendix C.

5.2 Shell Test. Valves shall be subjected to a hydrostatic shell test. There shall be no visible leakage under the test pressure when both ends are blanked and the gate, plug, ball or check element is partially open. For standard flanged end and standard weld end valves, the test pressure shall be no less than that specified in Table 5.1. For alternate valves, the test pressure shall be not less than 1.5 times the 100°F pressure rating as determined in Paragraph 2.2b and 2.2c. The duration of the shell test shall be no less than that specified in Table 5.2.

5.3 Hydrostatic Seat Test. Valves shall be tested as follows and there shall be no visible leakage at the test pressure.

a. Test Pressures. Valves with rated pressure classes listed in Table 5.1 shall be tested at pressures specified in Table 5.1. For alternate valves, the hydrostatic test pressure shall not be less than 1.1 times the 100 degree F pressure rating determined in accordance with Paragraphs 2.2b and 2.2c.

b. Test Durations. Seat test duration times shall be as specified in Table 5.2.

c. Block Valves.

1) **Unidirectional.** Close valve and apply pressure to the appropriate end of the valve per Paragraphs 5.3a and 5.3b.

2) **Directional.** Close valve and apply pressure successively to each end of the valve per Paragraphs 5.3a and 5.3b.

d. Double Block and Bleed Valves. The test sequence is optional, however, both of the following tests shall be performed.

1) Close valve, open body vent, apply seat test pressure to one end of the valve per Paragraphs 5.3a and 5.3b. Release pressure and repeat test for the other end of the valve.

2) Close valve, open body vent, apply seat test pressure simultaneously to both ends of the valve per Paragraphs 5.3a and 5.3b.

e. Check Valves. Apply hydrostatic test pressure to the appropriate end of the valve per Paragraphs 5.3a and 5.3b.

5.4 Backseat Tests. Backseat tests of valves that have this feature shall be made by applying pressure inside the assembled valve with the valve ends closed, the valve in the back seat position (valve open or closed) and the area downstream of the back seat vented to atmosphere to check for leakage.

This test may be performed immediately following the shell test. Test pressures and duration shall be as specified in Table 5.3 and 5.4 respectively. No visible leakage is permitted.

CAUTION! *The successful completion of this backseat test shall not be considered as a recommendation by the valve manufacturer or API that the valve packing gland may be repacked, or the packing replaced, while the valve is pressurized.*

5.5 All pressure tests shall be made with the ball, gate or plug and all seats free of any sealant except where the sealant is the primary means of sealing. If necessary for assembly, a lubricant such as SAE 10W single grade motor oil or similar viscosity industrial oil may be used.

TABLE 5.1
SCHEDULE OF TEST PRESSURES FOR STANDARD FLANGED END AND STANDARD WELD END VALVES
(Ref. Metric Table B5.1)

1	2	3
Valve Pressure Class	Minimum Test Pressures, psig Shell Hydrostatic	Seat Hydrostatic
150	425	300
300	1100	800
400	1450	1060
600	2175	1600
900	3250	2400
1500	5400	4000
2500	9000	6600

The test pressures listed are NOT valve operating pressure ratings.

TABLE 5.2
MINIMUM DURATION OF HYDROSTATIC TESTS

1	2	3
Valve Size NPS (DN)	Shell test duration minutes	Seat Test duration minutes
2 thru 4 (50 thru 100)	2	2
6 thru 10 (150 thru 250)	5	5
12 thru 18 (300 thru 450)	15	5
20 and larger (500 and larger)	30	5

TESTS (continued)

TABLE 5.3
PRESSURES FOR OPTIONAL BACKSEAT AND AIR SEAT TESTS
(Ref. Metric Table B5.3)

Valve Pressure Class	High Pressure Backseat psig min.	Low Pressure Backseat psig ±10	Air Seat psig ±10
150	300	80	80
300	800	80	80
400	1060	80	80
600	1600	80	80
900	2400	80	80
1500	4000	80	80
2500	6000	80	80

TABLE 5.4
MINIMUM DURATION OF OPTIONAL BACKSEAT AND AIR SEAT TESTS

Valve Size NPS (DN)	Duration minutes
2 thru 4 (50 thru 100)	2
6 and larger (150 and larger)	5

SECTION 6
MARKING

6.1 Marking. Valves furnished in conformance to this specification shall be marked as shown in Table 6.1.

TABLE 6.1
VALVE MARKING

1 Marking	2 Application
1. Manufacturer's name or trademark	On both body and name plate.
2. API monogram[1]	On name plate.
3. API class designation — for standard valves give API class number only. For alternate valves, give API class number followed by the letters ALT	On both body and name plate except for alternate valve letters ALT need not appear on body.
4. 6D4	On name plate of valves with lengths in accordance with Paragraph 2.4c.
5. For standard valves, the API maximum operating pressure rating at 100°F followed by the letters MOP. For alternate valves, the maximum operating pressure rating at 100°F followed by the letters MOP and the maximum operating pressure at 250°F followed by 250°F. For valves having a minimum design temperature below minus 20°F (Ref. Par. 3.7) mark the impact test temperature	On name plate.
6. Body material designation:[2]	
1. Material symbol (ASTM, MSS, ASME, AISI or Proprietary Material Designation)	On both body and name plate. Melt identification, if made of alloy steel, on body only.
7. Trim identification: Symbols indicating the material of stem, and sealing faces of the closure members if of different material than the body. (Consult MSS SP-25.)	On name plate.
8. Nominal Valve size	
1. Full Opening Valves, nominal valve size	On body or name plate or both.
2. Reduced Opening Valves shall be marked as specified in Par. 2.3	On body or name plate or both.
9. Ring-joint designation: The letter R and number indicating the size of ring	On valve flange edge.
10. Flow direction	On body of unidirectional valves only.
11. Face-to-face or end-to-end dimension	On name plate of 6D4 valves.
12. Serial numbers[3]	On body and name plate.
13. 16.47B, on Alt. ASME B16.47 Series B Flanges	On flange O.D.
14. Date of manufacture (month and year)	On name plate.
15. Double Block and Bleed Valves shall be marked "DBB"	On name plate.
16. 6D	On name plate.

[1]API Licensees only. *Contact API for information on licensing.*
[2]When body is fabricated of more than one type of steel, end connection material governs marking.
[3]Each valve shall have a unique serial number for accountability and traceability purposes.

6.2 Marking Example. An 8-in. 6D4 carbon-steel gate valve with ring-joint and flanges, 30 in. face-to-face dimension, API maximum operating pressure rating of 1440 psi and 13 per cent chromium steel trim manufactured in September of 1990 should be marked in conformance with Table 6.1 as follows:

1. *On Body*

A B CO	(Item 1:	*manufacturer)*
600	(Item 3:	*API valve class)*
WCB	(Item 6:	*body material)*
8	(Item 8:	*nominal valve size. May be on body or name plate, or both, at the option of the manufacturer.)*
R49	(Item 9:	*ring joint identification on valve edge)*
	(Item 10:	*flow direction, for check valves only)*
Serial No. 12345	(Item 12:	*serial number)*
16.47B	(Item 13:	*on alternate ANSI B16.47 Series B flanges)*

2. *On Name Plate*

A B CO	(Item 1:	*manufacturer)*
API	(Item 2:	*API monogram)*
API 600	(Item 3:	*API valve class)*
6D4	(Item 4:	*For valves with length in accordance with Sect. 2.4c.)*
1440 MOP	(Item 5:	*API maximum operating pressure rating)*
WCB	(Item 6:	*body material)*
Stem CR13 **Disc CR13** **Seat CR13** **or** **CR13 CR13 CR13** **or** **CR13** **CR13** **CR13**	(Item 7:	*trim identification, 13 per cent chromium steel. Symbols may be given in any of the three ways illustrated.)*
	(Item 8:	*nominal valve size.)*
8		*(Full opening valve)*
16 x 12		*(Reduced bore valve)*
16R or 16 R		*(Reduced port valve)*
30	(Item 11:	*face-to-face dimension of valves with lengths in accordance with Sect. 2.4c.)*
Serial No. 12345	(Item 12:	*Serial number)*
9-90 or 9/90	(Item 14:	*date of manufacture)*
DBB	(Item 15:	*Double Block and Bleed Valves)*
6D	(Item 16:	*This spec. #)*

SECTION 7
QUALITY CONTROL REQUIREMENTS

7.1 General. The purpose of this section is to specify the quality control requirements for parts and equipment manufactured to this specification.

7.2 Measuring and Testing Equipment.

a. General. Equipment used to inspect, test or examine material or other equipment shall be identified, controlled, calibrated and adjusted at specified intervals in accordance with documented manufacturer instructions and consistent with referenced industry standards to maintain the accuracy required by this specification.

b. Dimensional Measuring Equipment. Dimensional measuring equipment shall be controlled and calibrated by the methods specified in the manufacturer's written specification or as specified in the applicable sections of MIL-STD-120 to maintain the accuracies specified by API and the manufacturer's specification.

c. Pressure Measuring Devices:

1) **Type and Accuracy.** Test pressure measuring devices shall be either pressure gages or pressure transducers and shall be accurate to at least ±2.0% of full scale rating.

2) **Size and Range.** Pressure measurements shall be made at not less than 25% nor more than 75% of the full pressure span of the gage.

3) **Calibration Procedure.** Pressure measuring devices shall be periodically recalibrated with a master pressure measuring device or a dead weight tester at 25%, 50% and 75% of scale.

4) **Calibration Intervals.** Intervals shall be established for calibrations based on repeatability and degree or usage and be part of the manufacturer's procedures.

d. Temperature Measuring Devices.

1) When temperature charts are used, the temperature range shall be capable of indicating 2°F (1°C) fluctuations.

7.3 Quality Control Personnel Qualifications.

a. NDE Personnel. NDE Personnel shall be qualified in accordance with requirements specified in SNT-TC-1A.

b. Visual Examination Personnel. Personnel performing visual examinations shall have an annual eye examination in accordance with SNT-TC-1A.

c. Welding Inspectors. Personnel performing visual inspection of welding operations and completed welds shall be qualified and certified as follows:

1) AWS certified welding inspector, or
2) AWS certified associate welding inspector, or
3) Welding inspector certified by the manufacturer's documented training program.

d. Other Personnel. All personnel performing other quality control activities directly affecting material and product quality shall be qualified in accordance with manufacturer's documented requirements.

7.4 General Quality Control Requirements.

a. Quality Control Instruction. All quality control instructions shall be documented and shall include appropriate methodology and acceptance criteria.

b. Non-Conforming Material. The manufacturer shall have a documented procedure for controlling materials, parts and products which do not conform with API 6D specifications and manufacturer's written specifications.

c. Repair Welds

1) All repair welds, shall be examined using methods and acceptance criteria in accordance with the manufacturer's written procedures.

7.5 Quality Control for Specific Products and Parts.

a. Closure Bolting

1) Closure Bolting shall conform to the requirements of this specification and the manufacturer's written specification.

b. Other Parts

1) Other parts shall be identified and conform to the requirements of this specification and the manufacturer's written specification.

c. Assembled Equipment

1) **General.** The quality control requirements for assembled equipment include the pressure tests in accordance with Section 5.

2) **Serialization.** Serialization is required on all assembled equipment.

7.6 Records Requirements

a. Records Required

1) Weld Procedure Specification
2) Weld Procedure Qualification Record
3) Welder Qualification Record
4) NDE Personnel Qualification Records
5) Design Documentation

b. Records Control

1) Records required by this specification shall be legible, identifiable, retrievable and protected from damage, deterioration, or loss.

2) Records required by this specification shall be retained by the manufacturer for a minimum of five (5) years following the date of manufacture.

SECTION 8
STORING AND SHIPPING

8.1 Painting. All finished non corrosion resistant valves shall be primed and/or painted.

8.2 Draining. After testing and before shipment, valves shall be drained of test fluid and lubricated.

8.3 Corrosion Prevention. Prior to shipment, parts and equipment shall have exposed bare metallic surfaces protected with a rust preventative which will not become fluid and run at a temperature less than 125°F.

8.4 Sealing Surface Protection. Exposed sealing surfaces shall be protected from mechanical damage for shipping.

APPENDIX A
PURCHASING GUIDELINES

A1. General. This appendix provides recommended guidelines for inquiry and purchase of API 6D valves. The guidelines are intended to assist the purchaser in decisions he must make, as well as assuring that adequate information is communicated to the manufacturer.

A2. Data Sheet. The following pages contain questions and information that can be used to select valves. It is recommended that all the information in the data sheet be given to the manufacturer.

A3. Field Testing. Valve field test pressure should not exceed the maximum operating pressure of the valve by more than 50% when the valve is partially open, or by 10% if the pressure is applied to one side of a closed valve.

A4. Pressure Relief. Certain valve designs will trap pressure in the valve body cavity when the valve is in the full open or closed position. When these valve types are used in liquid service, high internal pressures can result from the thermal expansion of the liquid trapped in these confined areas. Therefore, if the valve has no self-relieving design provisions, pressure relief fittings must be installed in the valve body per Section 2.10 of this specification. These fittings may be specified by the purchaser or the manufacturer.

A5. Scrapers and Spheres. When ordering valves required to pass scrapers, and check valves required to pass spheres, examine the particular valve design to determine that your needs will be met.

A6. Fire Test. The design of fire tested valves shall be qualified by fire testing as specified in API Spec 6FA, *Fire Test for Valves,* or API Standard 607, *Fire Test for Soft Seated Quarter-Turn Valves,* Third Edition.

APPENDIX A (continued)

VALVE DATA SHEET

Specifications required: API 6D _____; Other _____
API Monogram required? Yes _____ No _____
Valve location and function _____
Valve nominal size _____
Maximum operating pressure _____
Maximum field test pressure (see Paragraph A3) _____
Valve pressure class _____
Maximum service temperature _____
Minimum service temperature _____
Liquid or gas service _____
Flow medium composition: _____
_____ _____
_____ _____
Special flow requirements: Blowdown, solids, pigs, etc. (see Paragraph A5): _____

VALVE:

Type of valve: Gate _____ Plug _____ Ball _____ Check _____
Design type(s) — See Section 4 _____
Full round opening required? _____ Min. bore or c_v _____

END CONNECTIONS:

Upstream pipe: OD _____ ID _____ Material _____
Flange? Yes _____ No _____
Plain raised face or ring joint? _____
If ring joint, flat or raised face? _____
Size and pressure class, per ANSI B16.5 _____ or MSS-SP44 _____ or ASME B16.47, Series B _____
Ring gasket or other gasket type and size _____
NOTE: Gaskets are not furnished as a part of the valve.
Weld end? Yes _____ No _____
Attach specifications for weld end configuration.
Downstream pipe: OD _____ ID _____ Material _____
Flange? Yes _____ No _____
Plain raised face or ring joint? _____
If ring joint, flat or raised face? _____
Size and pressure class, per ANSI B16.5 _____ or MSS-SP44 _____ or ASME B16.47, Series B _____
Ring gasket or other gasket type and size _____
NOTE: Gaskets are not furnished as a part of the valve.
Weld end? Yes _____ No _____
Attach specifications for weld end configuration.
Length: Any special requirements for end-to-end or face-to-face dimensions? _____

VALVE OPERATION

Are extended operating gear required? If so, indicate one:
For a handwheel on a horizontal shaft, the distance from the centerline of the valve opening to the centerline of the handwheel: _____ in.
Or, for a handwheel on a vertical shaft, the distance from the centerline of the valve opening to the center of the rim of the handwheel: _____ in.
NOTE: *For plug valves having loose wrenches, wrenches must be ordered separately.*
Wrench required? _____
Locking device required? _____ Type _____

VALVE SUPPORT

Are support ribs or legs required? _____

OTHER REQUIREMENTS

Supplemental tests (Ref. Appendix C) _____
Fire tested design? (Ref. Paragraph A6) Yes _____ No _____
NACE MR01-75 Yes _____ No _____
Pressure relief: If pressure relief devices are required, do you have special requirements for these devices? See Paragraph A4. _____
Drain connections: Any requirements? _____
Bypass connections: Any requirements? _____
Documentation required _____
Third-party witness or processes/tests: _____
Painting or coating required? _____

APPENDIX B
METRIC CONVERSIONS

B1. English units are preferred in all cases and shall be standard in this specification. Tables 2.2, 3.7, 5.2 and 5.4 in the text of this specification include metric conversions in parentheses, e.g., 6 in. (152,4 mm), and all other tables containing English units are reproduced in the metric system in this appendix. The following factors are from API Std 2564:

LENGTH:	1 inch (in)	= 25,4 millimeters (mm)
PRESSURE:	1 pound per square inch (psi)	= 0,06894757 bar*
STRESS:	1 pound per square inch (psi)	= 0,006894757 Megapascals (MPa)
ENERGY:	1 foot-pound (ft-lb)	= 1,355818 Joule (J)
TORQUE:	1 foot-pound (ft-lb)	= 1,355818 Newton-meter (N-m)
MASS:	1 pound mass	= 0,4535924 kilogram (kg)

TEMPERATURE CONVERSION: The following formula may be used to convert degrees Fahrenheit (°F) to degrees Celsius (°C):

$$°C = (5/9)(°F-32)$$

B2. In addition to the above conversions, the designations PN for nominal pressure and DN for nominal diameter are sometimes used in the designation of valves. For the purposes of this specification, the PN designations relate to the pressure classes, and the DN designations relate to NPS, or nominal pipe sizes, as follows:

Class 150	= PN 20	Class 300	= PN 50
Class 400	= PN 64	Class 600	= PN 100
Class 900	= PN 150	Class 1500	= PN 250
Class 2500	= PN 420		
NPS 2	= DN 50	NPS 2½	= DN 65
NPS 3	= DN 80	NPS 4	= DN 100

For NPS 4 and greater listed sizes, multiply the NPS by 25 to obtain the DN.

*1 bar = 100 KN/m² = 100 kPa

METRIC TABLE B2.1
MAXIMUM OPERATING PRESSURE RATINGS FOR STANDARD FLANGED END AND STANDARD WELD END VALVES
(Ref. Table 2.1)

PN	20	50	68	100	150	250	420
Temperature °C	Rating, bar						
−29 to 38	19,0	49,6	66,2	99,3	149	248	414
50	18,8	49,2	65,6	98,5	148	246	411
66	18,6	48,6	64,8	97,6	146	244	407
75	18,4	47,9	63,9	96,0	144	240	400
93	17,9	46,5	62,1	93,1	140	233	388
100	17,7	46,4	61,8	92,7	139	232	387
121	16,9	45,9	61,0	91,7	138	229	382

NOTE: *For temperatures below −29°C the rating shall be no greater than the rating shown for −29°C.*

METRIC TABLE B4.0
NOMINAL BORE SIZES AND SPHERE DIAMETERS
FOR FULL OPENING VALVES
All dimensions in millimeters.
Tolerance = −2mm (Ref 4.2.1b)
(Ref. Table 4.0)

Valve Size † DN	Pressure Class, PN: 20 through 100	150	250	420
50	51	51	51	44
65	64	64	64	54
80	76	76	76	64
100	102	102	102	89
150	152	152	146	133
200	203	203	194	181
250	254	254	241	225
300	305	305	289	267
350	337	324	318	—
400	387	375	362	—
450	438	425	—	—
500	489	473	—	—
550	540	524	—	—
600	591	572	—	—
650	635	619	—	—
700	686	667	—	—
750	737	714	—	—
800	781	762	—	—
850	832	810	—	—
900	876	857	—	—
950	927	—	—	—
1000	978	—	—	—
1050	1022	—	—	—
1200	1168	—	—	—
1400	1314	—	—	—
1500	1461	—	—	—

†Valve size is same as nominal pipe size.

APPENDIX B (continued)

METRIC TABLE B4.1
GATE VALVES

Face-to-Face (*A*), and End-to-End (*B* and *C*) Dimensions.
All dimensions in millimeters.
(Ref. Table 4.1)

1	2	3	4	5	6	7
	PN 20			PN 50		
Nominal Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
50	178	216	191	216	216	232
65	191	241	203	241	241	257
80	203	283	216	283	283	298
100	229	305	241	305	305	321
150	267	403	279	403	403	419
200	292	419	305	419	419	435
250	330	457	343	457	457	473
300	356	502	368	502	502	518
350	381	572	394	762	762	778
400	406	610	419	838	838	854
450	432	660	445	914	914	930
500	457	711	470	991	991	1010
550	. . .	. . .	. . .	1092	1092	1114
600	508	813	521	1143	1143	1165
650	559	864	. . .	1245	1245	1270
700	610	914	. . .	1346	1346	1372
750	610*	914	. . .	1397	1397	1422
800	711	965	. . .	1524	1524	1553
850	762	1016	. . .	1626	1626	1654
900	711**	1016	. . .	1727	1727	1756

	PN 64			PN 100		
Nominal Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
50	292	292	295	292	292	295
65	330	330	333	330	330	333
80	356	356	359	356	356	359
100	406	406	410	432	432	435
150	495	495	498	559	559	562
200	597	597	600	660	660	664
250	673	673	676	787	787	791
300	762	762	765	838	838	841
350	826	826	829	889	889	892
400	902	902	905	991	991	994
450	978	978	981	1092	1092	1095
500	1054	1054	1060	1194	1194	1200
550	1143	1143	1153	1295	1295	1305
600	1232	1232	1241	1397	1397	1407
650	1308	1308	1321	1448	1448	1461
700	1397	1397	1410	1549	1549	1562
750	1524	1524	1537	1651	1651	1664
800	1651	1651	1667	1778	1778	1794
850	1778	1778	1794	1930	1930	1946
900	1880	1880	1895	2083	2083	2099

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.
†Valve size is same as nominal pipe size.
*Conduit valves shall be 660 mm.
**Conduit valves shall be 813 mm.

APPENDIX B (continued)

METRIC TABLE B4.1 (Continued)
GATE VALVES

1	2	3	4	5	6	7
	PN 150			PN 250		
Nominal Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
50	368	368	371	368	368	371
65	419	419	422	419	419	422
80	381	381	384	470	470	473
100	457	457	460	546	546	549
150	610	610	613	705	705	711
200	737	737	740	832	832	841
250	838	838	841	991	991	1000
300	965	965	968	1130	1130	1146
350	1029	1029	1038	1257	1257	1276
400	1130	1130	1140	1384	1384	1407
450	1219	1219	1232	1537	1537	1559
500	1321	1321	1334	1664	1664	1686
550	. . .	. . .	. . .	. . .	. . .	. . .
600	1549	1549	1568	1943	1943	1972

Nominal Valve Size † DN	PN 420 Raised Face *A*	Welding End *B*	Ring and Groove *C*
50	451	451	454
65	508	508	514
80	578	578	584
100	673	673	683
150	914	914	927
200	1022	1022	1038
250	1270	1270	1292
300	1422	1422	1445

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.
†Valve size is same as nominal pipe size.

APPENDIX B (continued)

METRIC TABLE B4.2
FLANGED-END AND WELDING-END PLUG VALVES
Face-to-Face (*A*) and End-to-End (*B* and *C*) Dimensions.
All dimensions in millimeters.
See Figure 4.3.
(Ref. Table 4.2)

1	2	3	4	5	6	7	8	9	10	11	12	13
	Short Pattern			Regular			Venturi			Round-Port, Full-Bore		
Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
PN 20												
50	178	267	191	. . .	. . .	. . .	. . .	. . .	. . .	267	. . .	279
65	191	305	203	. . .	. . .	. . .	. . .	. . .	. . .	298	. . .	311
80	203	330	216	. . .	. . .	. . .	. . .	. . .	. . .	343	. . .	356
100	229	356	241	. . .	. . .	. . .	. . .	. . .	. . .	432	. . .	445
150	267	457	279	394	. . .	406	. . .	. . .	. . .	546	. . .	559
200	292	521	305	457	. . .	470	. . .	. . .	. . .	622	. . .	635
250	330	559	343	533	. . .	546	533	559	546	660	. . .	673
300	356	635	368	610	. . .	622	610	635	622	762	. . .	775
350	. . .	. . .	. . .	. . .	. . .	. . .	686	686	699	. . .	. . .	. . .
400	. . .	. . .	. . .	. . .	. . .	. . .	762	762	775	. . .	. . .	. . .
450	. . .	. . .	. . .	. . .	. . .	. . .	864	864	876	. . .	. . .	. . .
500	. . .	. . .	. . .	. . .	. . .	. . .	914	914	927	. . .	. . .	. . .
600	. . .	. . .	. . .	. . .	. . .	. . .	1067	1067	1080	. . .	. . .	. . .
PN 50												
50	216	267	232	. . .	. . .	. . .	. . .	. . .	. . .	283	283	298
65	241	305	257	. . .	. . .	. . .	. . .	. . .	. . .	330	330	346
80	283	330	298	. . .	. . .	. . .	. . .	. . .	. . .	387	387	403
100	305	356	321	. . .	. . .	. . .	. . .	. . .	. . .	457	457	473
150	403	457	419	403	. . .	419	403	457	419	559	559	575
200	419	521	435	502	. . .	518	419	521	435	686	686	702
250	457	559	473	568	. . .	584	457	559	473	826	826	841
300	502	635	518	. . .	. . .	. . .	502	635	518	965	965	981
350	. . .	. . .	. . .	. . .	. . .	. . .	762	762	778	. . .	. . .	. . .
400	. . .	. . .	. . .	. . .	. . .	. . .	838	838	854	. . .	. . .	. . .
450	. . .	. . .	. . .	914	. . .	930	914	914	930	. . .	. . .	. . .
500	. . .	. . .	. . .	991	. . .	1010	991	991	1010	. . .	. . .	. . .
550	. . .	. . .	. . .	1092	. . .	1114	1092	1092	1114	. . .	. . .	. . .
600	. . .	. . .	. . .	1143	. . .	1165	1143	1143	1165	. . .	. . .	. . .
650	. . .	. . .	. . .	1245	. . .	1270	1245	1245	1270	. . .	. . .	. . .
700	. . .	. . .	. . .	1346	. . .	1372	1346	1346	1372	. . .	. . .	. . .
750	. . .	. . .	. . .	1397	. . .	1422	1397	1397	1422	. . .	. . .	. . .
800	. . .	. . .	. . .	1524	. . .	1553	1524	1524	1553	. . .	. . .	. . .
850	. . .	. . .	. . .	1626	. . .	1654	1626	1626	1654	. . .	. . .	. . .
900	. . .	. . .	. . .	1727	. . .	1756	1727	1727	1756	. . .	. . .	. . .
PN 64												
50	. . .	. . .	. . .	292	292	295	. . .	. . .	. . .	330	. . .	333
65	. . .	. . .	. . .	330	330	333	. . .	. . .	. . .	381	. . .	384
80	. . .	. . .	. . .	356	356	359	. . .	. . .	. . .	445	. . .	448
100	. . .	. . .	. . .	406	406	410	. . .	. . .	. . .	483	559	486
150	. . .	. . .	. . .	495	495	498	495	495	498	610	711	613
200	. . .	. . .	. . .	597	597	600	597	597	600	737	845	740
250	. . .	. . .	. . .	673	673	676	673	673	676	889	889	892
300	. . .	. . .	. . .	762	762	765	762	762	765	1016	1016	1019
350	. . .	. . .	. . .	. . .	. . .	. . .	826	826	829	. . .	. . .	. . .
400	. . .	. . .	. . .	. . .	. . .	. . .	902	902	905	. . .	. . .	. . .
450	. . .	. . .	. . .	. . .	. . .	. . .	978	978	981	. . .	. . .	. . .
500	. . .	. . .	. . .	. . .	. . .	. . .	1054	1054	1060	. . .	. . .	. . .
550	. . .	. . .	. . .	. . .	. . .	. . .	1143	1143	1153	. . .	. . .	. . .
600	. . .	. . .	. . .	. . .	. . .	. . .	1232	1232	1241	. . .	. . .	. . .
650	. . .	. . .	. . .	. . .	. . .	. . .	1308	1308	1321	. . .	. . .	. . .
700	. . .	. . .	. . .	. . .	. . .	. . .	1397	1397	1410	. . .	. . .	. . .
750	. . .	. . .	. . .	. . .	. . .	. . .	1524	1524	1537	. . .	. . .	. . .
800	. . .	. . .	. . .	. . .	. . .	. . .	1651	1651	1667	. . .	. . .	. . .
850	. . .	. . .	. . .	. . .	. . .	. . .	1778	1778	1794	. . .	. . .	. . .
900	. . .	. . .	. . .	. . .	. . .	. . .	1880	1880	1895	. . .	. . .	. . .

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.
†Valve size is same as nominal pipe size.

APPENDIX B (continued)

METRIC TABLE B4.2 (Continued)
FLANGED-END AND WELDING-END PLUG VALVES

1	5	6	7	8	9	10	11	12	13
	Regular			Venturi			Round-Port, Full-Bore		
Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
				PN 100					
50	292	292	295	...	...	...	330	...	333
65	330	330	333	...	...	...	381	...	384
80	356	356	359	...	...	...	445	...	448
100	432	432	435	...	...	...	508	559	511
150	559	559	562	559	559	562	660	711	664
200	660	660	664	660	660	664	794	845	797
250	787	787	791	787	787	791	940	1016	943
300	...	...	...	838	838	841	1067	1067	1070
350	...	...	...	889	889	892	...	...	...
400	...	...	...	991	991	994	...	...	...
450	...	...	...	1092	1092	1095	...	...	...
500	...	...	...	1194	1194	1200	...	...	...
550	...	...	...	1295	1295	1305	...	...	...
600	...	...	...	1397	1397	1407	...	...	...
650	...	...	...	1448	1448	1461	...	...	...
750	...	...	...	1651	1651	1664	...	...	...
800	...	...	...	1778	1778	1794	...	...	...
850	...	...	...	1930	1930	1946	...	...	...
900	...	...	...	2083	2083	2099	...	...	...
				PN 150					
50	368	...	371	...	...	...	381	...	384
65	419	...	422	...	...	...	432	...	435
80	381	381	384	...	...	...	470	...	473
100	457	457	460	...	...	...	559	...	562
150	610	610	613	610	610	613	737	...	740
200	737	737	740	737	737	740	813	...	816
250	838	838	841	838	838	841	965	...	968
300	...	...	...	965	965	968	1118	...	1121
400	...	...	...	1130	1130	1140	...	...	...
				PN 250					
50	368	...	371	...	...	...	391	...	394
65	419	...	422	...	...	...	454	...	457
80	470	470	473	...	...	...	524	...	527
100	546	546	549	...	...	...	625	...	629
150	705	705	711	705	705	711	787	...	794
200	832	832	841	832	832	841	889	...	899
250	991	991	1000	991	991	1000	1067	...	1076
300	1130	1130	1146	1130	1130	1146	1219	...	1235
				PN 420					
50	451	...	454	...	...	...	...	...	...
65	508	...	514	...	...	...	...	...	...
80	578	...	584	...	...	...	...	...	...
100	673	...	683	...	...	...	...	...	...
150	914	...	927	...	...	...	...	...	...
200	1022	...	1038	...	...	...	...	...	...
250	1270	...	1292	...	...	...	...	...	...
300	1422	...	1445	...	...	...	...	...	...

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.
†Valve size is same as nominal pipe size.

APPENDIX B (continued)

METRIC TABLE B4.3
FLANGED-END AND WELDING-END BALL VALVES

Face-to-Face (*A*), and End-to-End (*B* and *C*) Dimensions.
All dimensions in millimeters.
See Figure 4.4.
(Ref. Table 4.3)

1	2	3	4	5	6	7
	Full Bore & Reduced Bore			Short Pattern, Full and Reduced Bore		
Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
			PN 20			
50	178	216	191	...	...	...
65	191	241	203	...	...	...
80	203	283	216	...	...	...
100	229	305	241	...	...	...
150	394	457	406	267	403	279
200	457	521	470	292	419	305
250	533	559	546	330	457	343
300	610	635	622	356	502	368
350	686	762	699	...	...	...
400	762	838	775	...	...	...
450	864	914	876	...	...	...
500	914	991	927	...	...	...
550	...	...	...	...	...	...
600	1067	1143	1080	...	...	...
650	1143	1245	...	...	...	...
700	1245	1346	...	...	...	...
750	1295	1397	...	...	...	...
800	1372	1524	...	...	...	...
850	1473	1626	...	...	...	...
900	1524	1727	...	...	...	...
950	...	...	...	...	...	...
1000	...	...	...	...	...	...
1100	...	...	...	...	...	...
1200	...	...	...	...	...	...
1400	...	...	...	...	...	...
1500	...	...	...	...	...	...
			PN 50			
50	216	216	232	...	...	...
65	241	241	257	...	...	...
80	283	283	298	...	...	...
100	305	305	321	...	...	...
150	403	457	419	...	...	...
200	502	521	518	419	419	435
250	568	559	584	457	457	473
300	648	635	664	502	502	518
350	762	762	778	...	...	...
400	838	838	854	...	...	...
450	914	914	930	...	...	...
500	991	991	1010	...	...	...
550	1092	1092	1114	...	...	...
600	1143	1143	1165	...	...	...
650	1245	1245	1270	...	...	...
700	1346	1346	1372	...	...	...
750	1397	1397	1422	...	...	...
800	1524	1524	1553	...	...	...
850	1626	1626	1654	...	...	...
900	1727	1727	1756	...	...	...
950	...	...	...	...	...	...
1000	...	...	...	...	...	...
1100	...	...	...	...	...	...
1200	...	...	...	...	...	...
1400	...	...	...	...	...	...
1500	...	...	...	...	...	...

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.
†Valve size is same as nominal pipe size.

APPENDIX B (continued)

METRIC TABLE B4.3 (Continued)
FLANGED-END AND WELDING-END BALL VALVES

1	2	3	4
	Full Bore		
Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*
	PN 64		
50	. . .	. . .	. . .
65	. . .	. . .	. . .
80	. . .	. . .	. . .
100	406	406	410
150	495	495	498
200	597	597	600
250	673	673	676
300	762	762	765
350	826	826	829
400	902	902	905
450	978	978	981
500	1054	1054	1060
550	1143	1143	1153
600	1232	1232	1241
650	1308	1308	1321
700	1397	1397	1410
750	1524	1524	1537
800	1651	1651	1667
850	1778	1778	1794
900	1880	1880	1895
950	. . .	. . .	. . .
1000	. . .	. . .	. . .
1100	. . .	. . .	. . .
1200	. . .	. . .	. . .
	PN 100		
50	292	292	295
65	330	330	333
80	356	356	359
100	432	432	435
150	559	559	562
200	660	660	664
250	787	787	791
300	838	838	841
350	889	889	892
400	991	991	994
450	1092	1092	1095
500	1194	1194	1200
550	1295	1295	1305
600	1397	1397	1407
650	1448	1448	1461
700	1549	1549	1562
750	1651	1651	1664
800	1778	1778	1794
850	1930	1930	1946
900	2083	2083	2099
950	. . .	. . .	. . .
1000	. . .	. . .	. . .
1100	. . .	. . .	. . .
1200	. . .	. . .	. . .

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.
†Valve size is same as nominal pipe size.

APPENDIX B (continued)

METRIC TABLE B4.3 (Concluded)
FLANGED-END AND WELDING-END BALL VALVES

1	2	3	4
		Full Bore	
Valve Size † DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*
		PN 150	
50	368	368	371
65	419	419	422
80	381	381	384
100	457	457	460
150	610	610	613
200	737	737	740
250	838	838	841
300	965	965	968
350	1029	1029	1038
400	1130	1130	1140
450	1219	1219	1232
500	1321	1321	1334
550	. . .	. . .	. . .
600	1549	1549	1568
650	. . .	. . .	. . .
700	. . .	. . .	. . .
750	. . .	. . .	. . .
800	. . .	. . .	. . .
850	. . .	. . .	. . .
900	. . .	. . .	. . .
		PN 250	
50	368	368	371
65	419	419	422
80	470	470	473
100	546	546	549
150	705	705	711
200	832	832	841
250	991	991	1000
300	1130	1130	1146
350	1257	1257	1276
400	1384	1384	1407
		PN 420	
50	451	451	454
65	508	508	540
80	578	578	584
100	673	673	683
150	914	914	927
200	1022	1022	1038
250	1270	1270	1292
300	1422	1422	1445

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.
†Valve size is same as nominal pipe size.

APPENDIX B (continued)

METRIC TABLE B4.4
FLANGED-END AND WELDING-END, SWING-CHECK VALVES
REGULAR AND FULL-OPENING TYPES

Face-to-Face (*A*) and End-to-End (*B* and *C*) Dimensions.
All dimensions in millimeters.
See Figures 4.5 and 4.6.
(Ref. Table 4.4)

1	2	3	4	5	6	7	8	9	10	11	12	13
	PN 20			PN 50			PN 64			PN 100		
Valve Size DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
50	203	203	216	267	267	283	292	292	295	292	292	295
65	216	216	229	292	292	308	330	330	333	330	330	333
80	241	241	254	318	318	333	356	356	359	356	356	359
100	292	292	305	356	356	371	406	406	410	432	432	435
150	356	356	368	445	445	460	495	495	498	559	559	562
200	495	495	508	533	533	549	597	597	600	660	660	664
250	622	622	635	622	622	638	673	673	676	787	787	791
300	699	699	711	711	711	727	762	762	765	838	838	841
350	787	787	800	838	838	854	889	889	892	889	889	892
400	864	864	876	864	864	879	902	902	905	991	991	994
450	978	978	991	978	978	994	1016	1016	1019	1092	1092	1095
500	978	978	991	1016	1016	1035	1054	1054	1060	1194	1194	1200
550	1067	1067	1080	1118	1118	1140	1143	1143	1153	1295	1295	1305
600	1295	1295	1308	1346	1346	1368	1397	1397	1407	1397	1397	1407
650	1295	1295	. . .	1346	1346	1372	1397	1397	1410	1448	1448	1461
700	1448	1448	. . .	1499	1499	1524	1600	1600	1613	1600	1600	1613
750	1524	1524	. . .	1594	1594	1619	1651	1651	1664	1651	1651	1664
900	1956	1956	. . .	2083	2083	. . .	2083	2083	. . .	2083	2083	. . .
950	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1000	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1100	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1200	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1400	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1500	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .

METRIC TABLE B4.4 (Continued)
FLANGED-END AND WELDING-END, SWING-CHECK VALVES
REGULAR AND FULL-OPENING TYPES

1	14	15	16	17	18	19	20	21	22
	PN 150			PN 250			PN 420		
Valve Size DN	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*	Raised Face *A*	Welding End *B*	Ring and Groove *C*
50	368	368	371	368	368	371	451	451	454
65	419	419	422	419	419	422	508	508	514
80	381	381	384	470	470	473	578	578	584
100	457	457	460	546	546	549	673	673	683
150	610	610	613	705	705	711	914	914	927
200	737	737	740	832	832	841	1022	1022	1038
250	838	838	841	991	991	1000	1270	1270	1292
300	965	965	968	1130	1130	1146	1422	1422	1445
350	1029	1029	1038	1257	1257	1276	. . .	. . .	. . .
400	1130	1130	1140	1384	1384	1407	. . .	. . .	. . .
450	1219	1219	1232	1537	1537	1559	. . .	. . .	. . .
500	1321	1321	1334	1664	1664	1686	. . .	. . .	. . .
600	1549	1549	1568	1943	1943	1972	. . .	. . .	. . .

Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.

APPENDIX B (continued)

METRIC TABLE B4.5
SINGLE AND DUAL PLATE, LONG AND SHORT PATTERN, WAFER TYPE CHECK VALVES

Face-to-Face Dimensions.
All dimensions in millimeters.
See Figures 4.7, 4.8 and 4.9.
(Ref. Table 4.3)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	PN 20		PN 50		PN 64		PN 100		PN 150		PN 250		PN 420	
Valve Size DN	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.	Short Patt.	Long Patt.
50	19	60	19	60	19	60	19	60	19	70	19	70	*	70
65	19	67	19	67	19	67	19	67	19	83	19	83	*	83
80	19	73	19	73	19	73	19	73	19	83	22	83	*	86
100	19	73	19	73	22	79	22	79	22	102	32	102	*	105
150	19	98	22	98	25	137	29	137	35	159	44	159	*	159
200	29	127	29	127	32	165	38	165	44	206	57	206	*	206
250	29	146	38	146	51	213	57	213	57	241	73	248	*	250
300	38	181	51	181	57	229	60	229	*	292	*	305	*	305
350	44	184	51	222	64	273	67	273	*	356	*	356	. . .	. . .
400	51	191	51	232	64	305	73	305	*	384	*	384	. . .	. . .
450	60	203	76	264	83	362	83	362	*	451	*	468	. . .	. . .
500	64	219	83	292	89	368	92	368	*	451	*	533	. . .	. . .
600	*	222	*	318	*	394	*	438	*	495	*	559	. . .	. . .
*750	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
*900	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
*1100	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
*1200	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
*1400	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
*1500	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .

*Dimensions to be established.
Tolerance: ± 2mm on sizes DN 250 and smaller. ± 3mm on sizes DN 300 and larger.

METRIC TABLE B5.1
SCHEDULE OF TEST PRESSURES FOR STANDARD FLANGED END AND STANDARD WELD END VALVES

(Ref. Table 5.1)

1	2	3
Valve Pressure PN	Minimum Test Pressures, bar Shell Hydrostatic	Seat Hydrostatic
20	29	21
50	76	55
68	100	73
100	150	110
150	224	166
250	372	276
420	621	455

The test pressures listed are NOT valve operating pressure ratings.

METRIC TABLE B5.3
PRESSURES FOR OPTIONAL BACKSEAT AND AIR SEAT TESTS

(Ref. Table 5.3)

Valve Pressure PN	High Pressure Backseat bar min.	Low Pressure Backseat bar ± 1	Air Seat bar ± 1
20	21	6	6
50	55	6	6
68	73	6	6
100	110	6	6
150	166	6	6
250	276	6	6
420	414	6	6

APPENDIX C
SUPPLEMENTAL TEST REQUIREMENTS

C1. General. The requirements in this section are optional and are to be provided by the manufacturer when specifically requested by the purchaser. These tests shall be performed in accordance with the manufacturer's written procedures which shall be made available to the purchaser or his representative upon request.

C2. Hydrostatic Tests. Hydrostatic test at a higher pressure than specified in Sections 5.2 and 5.3 or for longer times than specified in Table 5.2 shall be performed in accordance with the manufacturer's written procedures. No visible leakage or harmful inelastic deformation are permissible.

C3. Air Seat Tests. Valves subjected to an air seat test shall show no signs of leakage. Test pressures shall be applied successively on each side of the gate, plug, or ball and on the downstream side of the check. Test pressure and duration shall be as specified in Table 5.3 and 5.4 respectively.

C4. Operational Torque Test. The torque required to open a ball, gate, or plug valve shall be measured by the manufacturer. Torque shall be measured at the full rated pressure differential at normal ambient temperature conditions, or at other pressure and/or temperature conditions specified by the user. Torque values shall be obtained with the ball, gate or plug and seats free of any sealant except where the sealant is the primary means of sealing. If necessary for assembly, a lubricant may be used provided that viscosity does not exceed that of SAE 10W motor oil or equivalent. The torque test shall be performed subsequent to the hydrostatic shell test and prior to any hydrostatic seat test or air seat test.

APPENDIX D
REFERENCE SPECIFICATIONS AND STANDARDS

ANSI B1.20.1	Pipe Threads, General Purpose
ANSI B16.5	Pipe Flanges and Flange Fittings
ANSI B16.34	Valves — Flanged and Butt Welding Ends
ANSI B18.3	Socket Cap, Shoulder and Set Screws
ANSI B31.4	Liquid Petroleum Transportation Piping Systems
ANSI B31.8	Gas Transmission and Distribution Piping Systems
ASTM A 36	Spec. for Structural Steel
ASTM A 105	Spec. for Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 106	Spec. for Seamless Carton Steel Pipe for High-Temperature Service
ASTM A 181	Spec. for Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for General Service
ASTM A 182	Spec. for Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 193	Alloy Steel Bolting Material for High Temperature Service
ASTM A 194	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A 203	Spec. for Nickel Alloy Steel Plates for Pressure Vessels
ASTM A 216	Spec. for Carbon-Steel Castings Suitable for Fusion Welding for High-Temperature Service
ASTM A 217	Spec. for Alloy Steel Castings for Pressure-Containing Parts Suitable for High-Temperature Service
ASTM A 225	Spec. for Manganese-Vanadium Alloy-Steel Plates for Pressure Vessels
ASTM A 240	Spec. for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Fusion-Welded Unfired Pressure Vessels
ASTM A 242	Spec. for High Strength Low Alloy Structural Steel
ASTM A 285	Spec. for Low and Intermediate Tensile Strength Carbon-Steel Plates of Flange and Firebox Qualities for Pressure Vessels
ASTM A 320	Alloy Steel Bolting Materials for Low Temperature Service
ASTM A 333	Spec. for Seamless and Welded Steel Pipe for Low-Temperature Service
ASTM A 350	Spec. for Forged or Rolled Carbon and Alloy Steel Flanges, Forged Fittings, and Valves and Parts for Low-Temperature Service
ASTM A 351	Spec. for Austenitic Steel Castings for High Temperature Service
ASTM A 352	Spec. for Ferritic Steel Castings for Pressure Containing Parts Suitable for Low-Temperature Service
ASTM A 354	Quenched and Tempered Alloy Steel Bolts and Studs with Suitable Nuts
ASTM A 381	Spec. for Metal-Arc-Welded Steel Pipe for Use with High-Pressure Transmission Systems
ASTM A 441	Spec. for High Strength Low-Alloy Structural Manganese Vanadium Steel
ASTM A 487	Spec. for Low-Alloy Steel Castings Suitable for Pressure Service
ASTM A 515	Spec. for Carbon Steel Plates for Pressure Vessels for Intermediate and Higher Temperature Service
ASTM A 516	Spec. for Carbon Steel Plates for Pressure Vessels for Moderate and Lower Temperature Service
ASTM A 537	Spec. for Carbon-Manganese-Silicon Steel Plates, Heat Treated, for Pressure Vessels
ASTM A 541	Spec. for Quenched and Tempered Carbon and Alloy Steel Forgings for Pressure Vessel Components
ASTM A 633	Spec. for Normalized High-Strength Low-Alloy Structural Steel
ASTM A 707	Spec. for Flanges, Forged, Carbon and Alloy Steel for Low-Temperature Service
ASTM A 710	Spec. for Low Carbon Age Hardening Nickel-Copper-Chromium-Molybdenum-Columbium and Nickel-Copper-Columbium Alloy Steels
ASTM A 757	Spec. for Ferritic and Martensitic Steel Castings for Pressure Containing and Other Applications for Low-Temperature Service
API Spec 5L	Spec. for Line Pipe
API Std 5B	Threading Gaging and Thread Inspection of Casing and Line Pipe Threads
MSS-25	Standard Marking System for Valves, Fittings, Flanges and Unions
MSS-44	Steel Pipe Line Flanges

APPENDIX B (continued)

NACE MR-01-75 Sulfide Stress Cracking Resistant Metallic Materials for Oil Field Equipment

ASME B16.47 Large Diameter Steel Flanges

ASME BOILER AND PRESSURE VESSEL CODE SECT. IX — Welding and Brazing Qualifications

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