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Compact Steel Gate Valves—Flanged, Threaded, Welding, and Extended-Body Ends

API STANDARD 602
SIXTH EDITION, JUNE 1993

American Petroleum Institute
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Manufacturing, Distribution and Marketing Department

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FOREWORD

This standard covers flanged-end, threaded-end, socket-welding-end, and butt-welding-end compact steel gate valves, including extended-body type, corresponding to nominal pipe sizes in ASME B36.10M or ASME B36.19M.

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NOTES TO PURCHASER

1. If the purchaser needs a valve that deviates from this standard, the purchaser is responsible for clearly defining such deviation and furnishing sufficient information to permit the manufacturer to complete the order.

2. If no exceptions to this standard are to be taken, the purchase order need only make reference to API Standard 602 and specify the items marked with an asterisk (*) in the list below. Items listed below not marked with an asterisk are options that may also be specified.

* a. Valve size (see 1.1.1).
* b. Class (see 1.1.1).
* c. Materials (see 2.6.1 and Table 3).
* d. End connections, including bore for butt-welding ends (see 2.2).
* e. Extension length for extended body (see 2.3).
* f. Male connection style and optional integral backing ring for extended-body valve (see 2.3, Table 5, and Table 6).
* g. Body type [inside screw with rising stem (ISRS) or outside screw and yoke (OS&Y) (see 1.1.1)].
* h. Body-bonnet joint (bolted, union, welded, or threaded-and-seal-welded; see 1.1.1 and 2.7.1).
  i. Integral flanges or flanges welded to body (see 2.2.4 and Note 3 below).
  j. Flange facing finish (see 2.2.6).
  k. Bolting materials other than standard (see 2.7.3 and Table 3).
  l. Body-bonnet joint gasket (see 2.7.5 and 2.7.6).
* m. Trim number (other than standard), nominal trim material, and any required exceptions to options permitted by the manufacturer (see 2.8.1; 2.8.2; and Tables 3, 10, and 11).
  n. Packing, including any special stem and/or packing-chamber finish requirements (see 2.10.4 and 2.18).
  o. Inspection by purchaser (see 3.1 and Note 4).
  p. Integral extension or extension welded to body (see 2.4.1, 2.4.2, and Note 3).
  q. Postweld heat treatment of extension-to-body attachment welds, flange attachment welds, butt-welding stub-end attachment welds, and bonnet welds of P1 and P9 materials whose nominal wall thickness is less than or equal to ¾ inch (see 2.2.4.2, 2.4.3, 2.7.8, and Note 3).

3. It is the purchaser's responsibility to specify supplementary requirements for the welds, such as the need for special heat treatment and supplementary nondestructive examination of the welds.

4. See API Standard 598 for additional items that may need to be specified, including supplementary examination, the extent of inspection by the purchaser, the inspector's address, and the optional high-pressure closure test.

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* b. Class (see 1.1.1).
* c. Materials (see 2.6.1 and Table 3).
* d. End connections, including bore for butt-welding ends (see 2.2).
* e. Extension length for extended body (see 2.3).
* f. Male connection style and optional integral backing ring for extended-body valve (see 2.3, Table 5, and Table 6).
* g. Body type [inside screw with rising stem (ISRS) or outside screw and yoke (OS&Y) (see 1.1.1)].
* h. Body-bonnet joint (bolted, union, welded, or threaded-and-seal-welded; see 1.1.1 and 2.7.1).
  i. Integral flanges or flanges welded to body (see 2.2.4 and Note 3 below).
  j. Flange facing finish (see 2.2.6).
  k. Bolting materials other than standard (see 2.7.3 and Table 3).
  l. Body-bonnet joint gasket (see 2.7.5 and 2.7.6).
* m. Trim number (other than standard), nominal trim material, and any required exceptions to options permitted by the manufacturer (see 2.8.1; 2.8.2; and Tables 3, 10, and 11).
  n. Packing, including any special stem and/or packing-chamber finish requirements (see 2.10.4 and 2.18).
  o. Inspection by purchaser (see 3.1 and Note 4).
  p. Integral extension or extension welded to body (see 2.4.1, 2.4.2, and Note 3).
  q. Postweld heat treatment of extension-to-body attachment welds, flange attachment welds, butt-welding stub-end attachment welds, and bonnet welds of P1 and P9 materials whose nominal wall thickness is less than or equal to ¼ inch (see 2.2.4.2, 2.4.3, 2.7.8, and Note 3).

3. It is the purchaser's responsibility to specify supplementary requirements for the welds, such as the need for special heat treatment and supplementary nondestructive examination of the welds.

4. See API Standard 598 for additional items that may need to be specified, including supplementary examination, the extent of inspection by the purchaser, the inspector's address, and the optional high-pressure closure test.

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Compact Steel Gate Valves—Flanged, Threaded, Welding, and Extended-Body Ends

SECTION 1—GENERAL

1.1 Scope

1.1.1 This standard covers flanged-end, threaded-end, socket-welding-end, and butt-welding-end compact steel gate valves, including extended-body type, corresponding to nominal pipe sizes in ASME B36.10M or ASME B36.19M. Flanged-end and butt-welding-end valves are limited to sizes NPS 4 and smaller; threaded-end and socket-welding-end valves are limited to sizes NPS 2½ and smaller. The following valves are specifically covered by this standard:

a. Class 800 valve with threaded, socket-welding, or butt-welding ends; an inside screw with rising stem (ISRS) and threaded packing nut or an outside screw and yoke (OS&Y) with rising stem and bolted packing-gland flange; and a bolted, union, welded, or threaded-and-seal-welded bonnet.
b. Class 1500 valve with threaded, socket welding, butt-welding, or flanged ends; an OS&Y with rising stem and bolted packing-gland flange; and a bolted, welded, or threaded-and-seal-welded bonnet.
c. Class 150, 300, and 600 flanged-end or butt-welding-end OS&Y valves with rising stem; bolted packing-gland flange; and a bolted, welded, or threaded-and-seal-welded bonnet.
d. Class 800 and Class 1500 extended-body valves conforming to Items a and b above, except with male by female ends in sizes NPS ½, ¾, 1, 1½, and 2 and in size NPS ¾ male by NPS ½ female.

One end of each extended-body valve shall have a threaded or socket-welding female connection, and the other end shall have an extension with a male threaded or welding end. (Threaded-end male extensions for Class 1500 or for size NPS ½ in Class 800 are not covered by this standard.)

1.1.2 Figures 1 and 2 present illustrations of a typical ISRS gate valve and an OS&Y gate valve. Figure 3 shows a typical extended-body valve and some requirements of this standard. The illustrations should not be construed as sponsoring such designs in whole or in part or as discriminating against other designs offered that conform to the general requirements of this standard.

1.1.3 The illustrations in Tables 5 and 6 show some of the typical arrangements for the male end of extended-body valves. These illustrations should not be considered preferable to other arrangements that conform to the requirements of this standard.

1.2 Referenced Publications

The most recent editions of the following standards, codes, and specifications shall, to the extent specified, form a part of this standard:

API

Std 598	*Valve Inspection and Testing*
Std 600	*Steel Gate Valves—Flanged and Butt-Welding Ends*

ASME[1]

B1.5	*Acme Screw Threads*
B1.8	*Stub Acme Screw Threads*
B1.20.1	*Pipe Threads, General Purpose (Inch)*
B16.5	*Pipe Flanges and Flanged Fittings*
B16.10	*Face-to-Face and End-to-End Dimensions of Valves*
B16.11	*Forged Fittings, Socket-Welding and Threaded*
B16.25	*Buttwelding Ends*
B16.34	*Valves—Flanged, Threaded, and Welding End*
B31.3	*Chemical Plant and Petroleum Refinery Piping*
B36.10M	*Welded and Seamless Wrought Steel Pipe*
B36.19M	*Stainless Steel Pipe*

ASTM[2]

A 105	*Forgings, Carbon Steel, for Piping Components*
A 106	*Seamless Carbon Steel Pipe for High-Temperature Service*
A 182	*Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service*
A 193	*Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*
A 194	*Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service*
A 216	*Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service*

[1]American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017.
[2]American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

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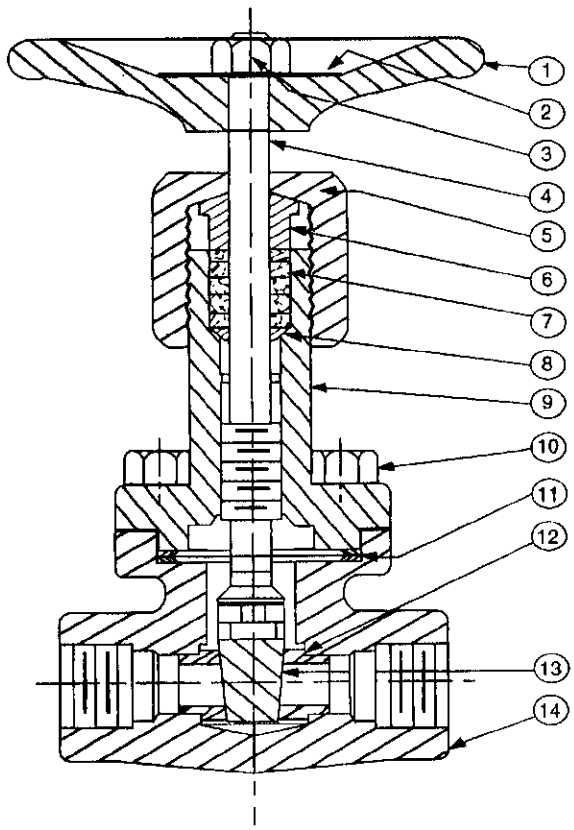
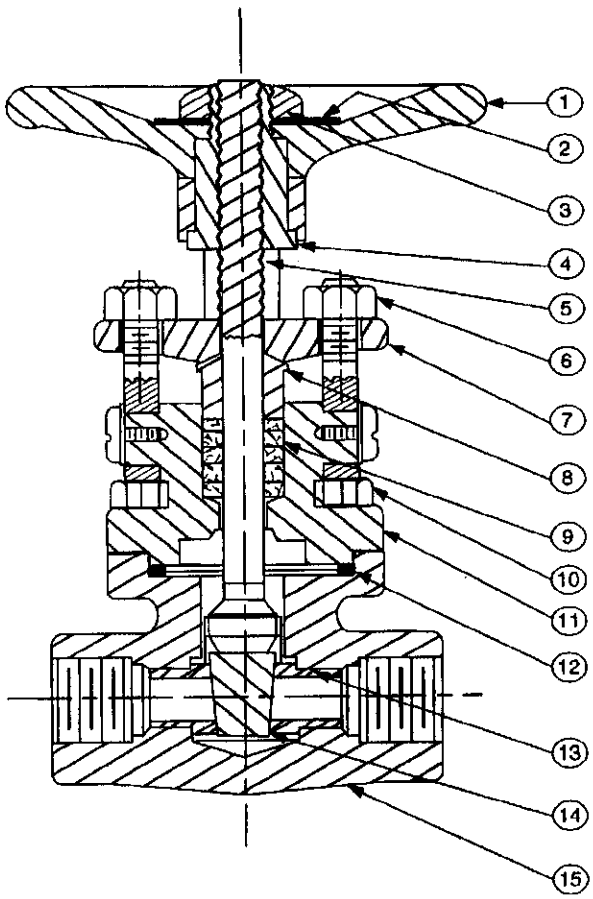


Part Names:
1. Handwheel.
2. Identification plate.
3. Handwheel nut.
4. Stem.
5. Packing nut.
6. Gland.
7. Packing.
8. Packing ring (when used).
9. Bonnet.
10. Bonnet bolting.
11. Gasket.
12. Seat ring.
13. Gate.
14. Body.

Figure 1—Typical Inside Screw With Rising Stem Gate Valve



Part Names:
1. Handwheel.
2. Identification plate.
3. Handwheel nut.
4. Stem nut.
5. Stem.
6. Gland bolting.
7. Gland flange.
8. Gland.
9. Packing.
10. Bonnet bolting.
11. Bonnet.
12. Gasket.
13. Seat ring.
14. Gate.
15. Body.

Figure 2—Typical Outside Screw and Yoke Gate Valve

A 217 *Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts Suitable for High-Temperature Service*

A 276 *Stainless and Heat-Resisting Steel Bars and Shapes*

A 312 *Seamless and Welded Austenitic Stainless Steel Pipe*

A 320 *Alloys-Steel Bolting Materials for Low-Temperature Service*

A 333 *Seamless and Welded Steel Pipe for Low-Temperature Service*

A 335 *Seamless Ferritic Alloy Steel Pipe for High-Temperature Service*

A 350 *Forgings, Carbon and Low-Alloy Steel, Requiring Notch Toughness Testing for Piping Components*

A 351 *Steel Castings, Austenitic, for High-Temperature Service*

A 352 *Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts Suitable for Low-Temperature Service*

A 582 *Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished*

B 473 *UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire*

E 10 *Test Method for Brinell Hardness of Metallic Materials*

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Table 2—Pressure-Temperature Ratings for Class 800 Gate Valves

Service Temperature[a]		Material Group Number (see Table 3)													
		1.1		1.2		1.3		1.9		1.10		1.13		1.14	
		A 105[b] A 350-LF2[c] A 216-WCB[b]		A 350-LF3[c] A 352-LC2[c] A 352-LC3[c]		A 352-LCB[c]		A 182-F11[d] A 217-WC6[e]		A 182-F22[d] A 217-WC9[e]		A 182-F5 A 182-F5a A 217-C5		A 182-F9 A 217-C12	
°F	°C	psig	MPa	psig	MPa	psig	MPa	psig	MPa	psig	MPa	psig	MPa	psig	MPa
–20 to 100	–29 to 38	1975	13.62	2000	13.79	1855	12.79	2000	13.79	2000	13.79	2000	13.79	2000	13.79
200	93.5	1800	12.41	2000	13.79	1750	12.06	1900	13.10	1910	13.17	2000	13.79	2000	13.79
300	149	1750	12.07	1940	13.38	1700	11.72	1795	12.38	1805	12.45	1940	13.38	1940	13.38
400	204.5	1690	11.65	1880	12.96	1645	11.34	1755	12.10	1730	11.93	1880	12.96	1880	12.96
500	260	1595	11.00	1775	12.24	1550	10.69	1710	11.79	1705	11.76	1775	12.24	1775	12.24
600	315.5	1460	10.07	1615	11.14	1420	9.79	1615	11.14	1615	11.14	1615	11.14	1615	11.14
650	343.5	1430	9.86	1570	10.82	1395	9.62	1570	10.82	1570	10.82	1570	10.82	1570	10.82
700	371	1420	9.79	—	—	—	—	1515	10.45	1515	10.45	1515	10.45	1515	10.45
750	399	1345	9.27	—	—	—	—	1420	9.79	1420	9.79	1420	9.79	1420	9.79
800	426.5	1100	7.58	—	—	—	—	1355	9.34	1355	9.34	1325	9.14	1355	9.34
850	454.5	715	4.93	—	—	—	—	1300	8.96	1300	8.96	1170	8.07	1300	8.96
900	482	460	3.17	—	—	—	—	1200	8.27	1200	8.27	940	6.48	1200	8.27
950	510	275	1.90	—	—	—	—	1005	6.93	1005	6.93	695	4.79	985	6.79
1000	538	140	0.96	—	—	—	—	595	4.10	715	4.93	510	3.52	780	5.38
1050	565.5	—	—	—	—	—	—	365	2.52	530	3.65	375	2.59	505	3.48
1100	593.5	—	—	—	—	—	—	255	1.76	300	2.07	275	1.90	300	2.07
1150	621	—	—	—	—	—	—	140	0.96	275	1.90	185	1.28	200	1.38
1200	649	—	—	—	—	—	—	95	0.65	145	1.00	120	0.83	140	0.97

Note: psig = pounds per square inch gauge; MPa = megapascals.

[a]For a material shown in Table 2 that is acceptable for low temperature service, the pressure rating for a service at any temperature below –20°F (–29°C) shall be no greater than the rating shown in Table 2 for –20°F to 100°F (–29°C to 38°C).

[b]Permitted but not recommended for prolonged use above about 800°F (425°C).

[c]Not to be used over 650°F (345°C).

[d]Permitted but not recommended for prolonged use above about 1100°F (595°C).

[e]Not to be used over 1100°F (595°C).

Table 2—Pressure-Temperature Ratings for Class 800 Gate Valves (continued)

Service Temperature[a]		Material Group Number (see Table 3)											
		2.1		2.2		2.3		2.5					
		A 182-F304 A 351-CF3[f] A 351-CF8		A 182-F316 A 351-CF3M[g] A 351-CF8M		A 182-F304L A 182-F316L		A 182 F347H A 351-CF8C					
°F	°C	psig	MPa	psig	MPa	psig	MPa	psig	MPa				
-20 to 100	-29 to 38	1920	13.24	1920	13.24	1600	11.03	1920	13.24				
200	93.5	1600	11.03	1655	11.41	1350	9.31	1695	11.69				
300	149	1410	9.72	1495	10.31	1210	8.34	1570	10.82				
400	204.5	1255	8.65	1370	9.45	1100	7.58	1480	10.20				
500	260	1165	8.03	1275	8.79	1020	7.03	1380	9.51				
600	315.5	1105	7.62	1205	8.31	960	6.62	1310	9.03				
650	343.5	1090	7.52	1185	8.17	935	6.45	1280	8.83				
700	371	1075	7.41	1150	7.93	915	6.31	1250	8.62				
750	399	1060	7.31	1130	7.79	895	6.17	1230	8.48				
800	426.5	1050	7.24	1105	7.62	875	6.03	1215	8.38				
850	454.5	1035	7.14	1080	7.45	860	5.93	1185	8.17				
900	482	1025	7.07	1050	7.24	—	—	1150	7.93				
950	510	1000	6.89	1030	7.10	—	—	1030	7.10				
1000	538	860	5.93	970	6.69	—	—	970	6.69				
1050	565.5	825	5.69	960	6.62	—	—	960	6.62				
1100	593.5	685	4.72	860	5.93	—	—	860	5.93				
1150	621	520	3.58	735	5.07	—	—	735	5.07				
1200	649	415	2.86	550	3.79	—	—	460	3.17				
1250	676.5	295	2.03	485	3.34	—	—	330	2.28				
1300	704.5	220	1.51	365	2.52	—	—	250	1.72				
1350	732	165	1.14	275	1.90	—	—	180	1.24				
1400	760	130	0.90	200	1.38	—	—	140	0.97				
1450	788	95	0.66	155	1.07	—	—	110	0.76				
1500	815.5	65	0.45	110	0.76	—	—	95	0.66				

[f]Not to be used over 800°F (425°C).
[g]Not to be used over 850°F (455°C).

only by the bore specification (wall thickness) of the end connection.

2.2 End Connections

2.2.1 Threaded-end valves, as well as the female threaded ends of extended-body valves, shall be internally taper-threaded as specified in ASME B1.20.1. All internal threads shall be countersunk a distance of approximately one-half the pitch of the thread at an angle of approximately 45 degrees with the axis of the thread. Countersinking shall be concentric with the threads. The minimum wall thickness of female threaded ends shall be in accordance with the Class 800 or Class 1500 requirements of Table 4 of ASME B16.34.

2.2.2 Socket-welding-end preparation, including the female ends of extended-body valves, shall conform to ASME B16.11. The bottom of the socket shall be square and flat.

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The minimum wall thickness of female socket-welding ends shall be in accordance with the Class 800 or Class 1500 requirements of Table 4 of ASME B16.34.

2.2.3 End flange dimensions shall conform to ASME B16.5.

2.2.4 Flanged-end valves may have the flanges integral with or welded to the body. When the flanges are welded to the body, the welding procedure and the welder or welding operator shall be qualified under the provisions of ASME B31.3. Weld quality shall conform to the acceptance standards of Paragraph 341 of ASME B31.3 for visual examination under normal service conditions. The examination shall be performed in accordance with Paragraph 344 of ASME B31.3.

2.2.4.1 Flanges may be welded to the body with full penetration groove butt welding or with inertia welding. Socket welding of flanges to the valve body is not permitted by this standard. Integral centering (backing) rings used to facilitate welding shall be removed by machining after welding. There shall be no abrupt change in the internal diameter; no transition shall be more than 1 to 4, radial to axial. The final thickness of the weld shall not be less than the body wall thickness listed in Table 4.

2.2.4.2 All valve bodies with welded-on flanges or butt-welding stub ends (see 2.2.7) shall be postweld heat treated in accordance with the provisions of 2.4.3 for extension-to-body attachment welds. Valves with welded-on flanges or butt-welding stub ends that have been postweld heat treated shall have the type of postweld heat treatment indicated on the identification plate, or stamped on the body, or both, in accordance with the requirements of 1.3.4.

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

2.2.6 The facing finish of end flanges shall be in accordance with the requirements of ASME B16.5. When a more restrictive facing finish is required, it shall be specified on the purchase order.

2.2.7 The end-to-end dimensions for Class 150, 300, 600, and 1500 butt-welding-end valves shall conform to ASME B16.10. Butt-welding-end valves may have stub ends integral with or welded to the body. Welded stub ends shall be welded onto the body in accordance with 2.2.4.

2.2.8 The end-to-end dimensions for Class 800 and Class 1500 socket-welding-end and threaded-end valves and for Class 800 butt-welding-end valves shall be the manufacturer's standard.

2.2.9 Butt-welding ends shall conform to ASME B16.25 for the bore specified in the purchase order for use without backing rings.

2.2.10 The design of integrally reinforced ends for extended-body valves must comply with the requirements of Paragraph 304.3.2 of ASME B31.3.

2.3 Extension Dimensions

2.3.1 Table 5 shows the required dimensions for extensions without threaded ends. Table 6 shows the more restrictive requirements for extensions with threaded ends. When the extension is intended to be socket welded and the outside diameter of the extension exceeds the outside diameter of the corresponding pipe, the male end of the extension shall have the profile shown in Table 7. Table 8 shows comparative wall thicknesses for extensions and pipe and is for reference only.

2.3.2 The dimensions labeled "minimum" in Tables 5 and 6 are the minimum required for acceptable service. Any extension that does not meet or exceed these dimensions shall be rejected. The length of the extension is the length of the extended body from the axis of the valve stem to the outer end of the male extension (*L* in Figure 3). The integral backing ring shown in Table 5 is optional unless otherwise specified in the purchase order, and its length is not included in *L* in Figure 3 or Table 5. The minimum distance from the handwheel to the end of the extension shall be 2.25 inches (57.2 millimeters), as shown in Figure 3.

2.3.3 Threaded-end male extensions are not permitted for Class 1500 or for NPS ½ in Class 800. Threaded-end extensions shall be threaded in accordance with ASME B1.20.1. Threaded ends shall be free from tears and other visible imperfections.

2.4 Extensions Attached by Welding

2.4.1 Unless otherwise specified in the purchase order, extensions may be either integral with the valve or attached to the body by welding. When the extension is welded to the body, the welding procedure and the welder or welding operator shall be qualified in accordance with ASME B31.3. Weld quality shall conform to the acceptance standards of Paragraph 341 of ASME B31.3 for visual examination under normal service conditions. The examination shall be performed in accordance with Paragraph 344 of ASME B31.3.

2.4.2 Extensions may be welded to the body with full penetration groove butt welding or with inertia welding. Other

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Table 3—Material Specifications and Applicable ASTM Specifications

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

[a]Temperature limitations on bolting are as follows: Gr B7, 1000°F (538°C); Gr L7, 1000°F (538°C); Gr B16, 1100°F (595°C); Gr B8-CL1, 1500°F (816°C); Gr B8M-CL1, 1500°F (816°C); Gr B8-CL2, 1000°F (538°C); and Gr B8M-CL2, 1000°F (538°C).
[b]Upon prolonged exposure to temperatures above 800°F (425°C), the carbide phase of carbon steel may be converted to graphite.
[c]Only killed steel shall be used above 850°F (455°C).
[d]ASTM A 320, Gr L7 bolts, and ASTM A 194, Gr 4 nuts are also acceptable.
[e]ASTM A 193, Gr B8-CL1 and Gr B8M-CL1 bolting may be substituted, provided that the requirements of 2.7.1 are met.
[f]ASTM A 193, Gr B8-CL2 bolts are also acceptable.
[g]Use normalized and tempered material only.
[h]ASTM A 194, Gr 7 nuts are also acceptable.
[i]At temperatures over 1000°F (540°C), use only when the carbon is 0.04 percent or higher.

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

welding processes may be used by agreement between the purchaser and the manufacturer. Integral centering (backing) rings used to facilitate welding shall be removed by machining after welding. There shall be no abrupt change in the internal diameter; no transition shall be more than 1 to 4, radial to axial. The final thickness of the weld shall not be less than that required for the extension by Tables 5 and 6.

2.4.3 For all austenitic stainless steel valves, the extension-to-body attachment weld shall be solution annealed unless both the body and the extension piece are L grades or stabilized grades of stainless steel. For all valves of P4 and P5 materials (see note), the extension-to-body attachment weld, irrespective of the thickness of the weld joint, shall be postweld heat treated in accordance with the requirements of ASME B31.3. For valves of P1 and P9 materials whose nominal wall thickness is greater than ¾ inch (19.1 millimeters) at the weld joint, the extension-to-body attachment weld shall be postweld heat treated in accordance with ASME B31.3. For valves of P1 and P9 materials whose nominal wall thickness is less than or equal to ¾ inch (19.1 millimeters), postweld heat treatment of the extension-to-body attachment weld is not required unless specified in the purchase order. Valves with welded extensions shall be marked as required in 1.3.4.

Note: For an explanation of P numbers, see ASME B31.3.

2.5 Body Extension Materials

Extensions to be welded to the body shall be fabricated from one of the materials listed in Table 9 that has the same nominal composition as the valve body.

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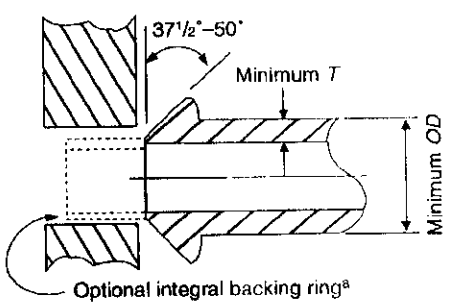
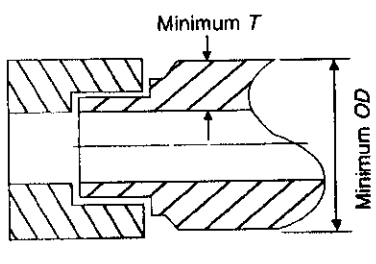
Table 4—Body and Bonnet Wall Thickness

Valve Size NPS	Minimum Wall Thickness			
	Classes 150, 300, 600, and 800		Class 1500	
	Inches	Millimeters	Inches	Millimeters
¼	0.12	3.1	0.15	3.8
⅜	0.13	3.3	0.17	4.3
½	0.16	4.1	0.19	4.8
¾	0.19	4.8	0.24	6.1
1	0.22	5.6	0.28	7.1
1¼	0.23	5.8	0.33	8.4
1½	0.24	6.1	0.38	9.7
2	0.28	7.1	0.47	11.9
2½	0.33	8.4	0.56	14.2
3	0.38	9.7	0.65	16.5
4	0.47	11.9	0.84	21.3

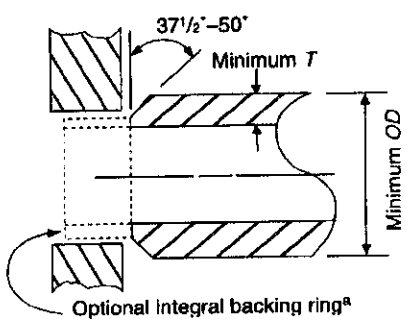
Table 5—Dimensions for Welded-End Connections on Class 800 and Class 1500 Extended-Body Valves



INTEGRALLY REINFORCED END FOR WELDING



SOCKET–WELDED END[b]



BEVELED END FOR WELDING

Extension (NPS)	Length, L[a, c]		Minimum Outside Diameter, OD		Minimum Wall Thickness, T			
					Class 800		Class 1500	
	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
½	≤4.0	≤100	0.91	23.1	0.220	5.59	0.220	5.59
	4.1–6.5	105–165	1.06	26.9	0.250	6.35	0.250	6.35
	6.6–8.0[d]	170–205[d]	1.25	31.7	0.250	6.35	0.250	6.35
¾	≤5.5	≤140	1.02	25.9	0.191	4.85	0.240	6.10
	5.6–8.0	145–205	1.25	31.7	0.297	7.54	0.297	7.54
1	≤9.0	≤230	1.28	32.5	0.219	5.56	0.280	7.11
1½	≤9.0	≤230	1.87	47.5	0.246	6.25	0.380	9.65
2	≤10.0	≤255	2.34	59.4	0.300	7.62	0.470	11.94

[a]The length of the optional integral backing ring is not included in L (see 2.3.2 and Figure 3).
[b]See Table 7 for dimensions of end connection.
[c]Extensions with lengths longer than the tabulated values are not permitted.
[d]The maximum extension length for NPS ½ extensions with socket-welding ends is 6.5 inches (165 millimeters).

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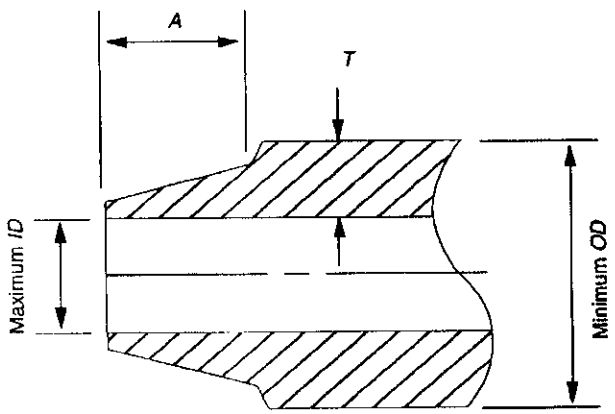
Table 6—Dimensions for Threaded-End Connections on Class 800 Extended-Body Valves



Extension (NPS)[a]	Length, L[b]		Maximum Inside Diameter, ID		Minimum Outside Diameter, OD		Minimum Wall Thickness, T		Maximum End Connection Length, A	
	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
¼	≤4.5	≤115	0.65	16.5	1.02	25.9	0.18	4.6	0.92	23.4
1	≤7.0	≤180	0.84	21.3	1.28	32.5	0.22	5.6	1.11	28.2
1½	≤9.0	≤230	1.50	38.1	1.87	47.5	0.18	4.6	1.15	29.2
2	≤10.0	≤255	1.87	47.5	2.34	59.4	0.24	6.1	1.18	30.0

[a]NPS ½ threaded-end male extensions are not permitted.
[b]Extensions with lengths longer than the tabulated values are not permitted.

2.6 Body and Bonnet

2.6.1 The valve body and bonnet (also the union nut in a union bonnet design) shall be made of a forging or casting material specified in the purchase order using a material specification as listed in Table 3, except that bonnet nuts, welded and threaded-and-seal-welded bonnets, and bonnets for ISRS valves may also be made from bar stock material. The bar stock material shall be nonfree-machining and shall be listed in and meet the requirements of Table 1 of ASME B16.34, including the notes, for the appropriate material group.

2.6.2 The minimum body wall thickness at any point, except at end connections (see 2.2.1, 2.2.2, and 2.3.1), shall not be less than the values shown in Table 4.

2.6.3 The minimum bonnet wall thickness at any point below the bottom ring of backing shall not be less than the values listed in Table 4.

2.7 Body–Bonnet Joint

2.7.1 The body-bonnet joint design shall be either bolted, union, welded, or threaded-and-seal-welded. Bolted and threaded-and-seal-welded bonnet valve designs shall meet the design requirements of Paragraph 6.4 of ASME B16.34.

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

2.7.3 Bolting shall conform to Table 3, but other bolting combinations (not listed in Table 3) may be used by agreement between the purchaser and the manufacturer.

2.7.4 Bolted and union body-bonnet joints shall be designed to confine the gasket and prevent overcompression.

2.7.5 Unless otherwise specified in the purchase order, the bonnet joint shall be fitted with a soft iron gasket or a spiral wound gasket of Type 304, 304L, 316, or 316L stainless steel winding and filler material suitable for the conditions specified in 2.7.6. The metallic portion of the gasket exposed to the service environment shall be of a material whose corrosion resistance is at least equal to that of the shell.

2.7.6 Unless otherwise specified in the purchase order, the gasket shall be suitable for the pressure rating of the valve within a valve design temperature range of –20°F (–29°C) to 1000°F (538°C).

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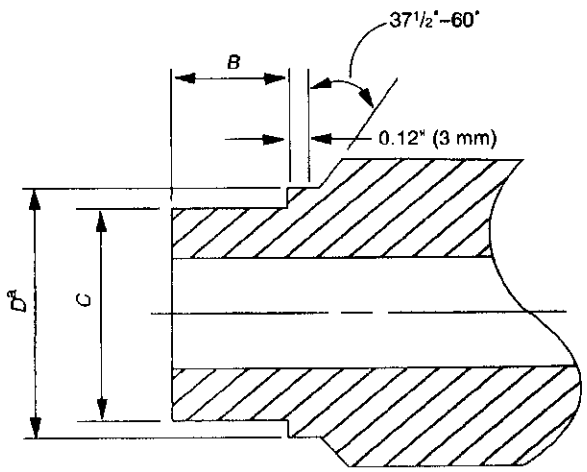
Table 7—Dimensions for Socket-Welding End Connections on Class 800 and Class 1500 Extended-Body Valves



Extension (NPS)	Male End					
	Length, *B*		Diameter, *C*		Step Diameter, *D*[a]	
	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
½	0.31	7.9	0.84	21.3	0.90	22.9
¾	0.44	11.2	1.05	26.7	1.11	28.2
1	0.44	11.2	1.31	33.3	1.38	35.1
1½	0.44	11.2	1.90	48.3	1.96	49.8
2	0.56	14.2	2.37	60.2	2.44	62.0

Note: The tolerances for the tabulated dimensions are +0.01, −0.03 inch (+0.2, −0.8 millimeter) for NPS ½ through NPS 1½; and ±0.03 inch (±0.8 millimeter) for NPS 2.
[a]See 2.3.1.

2.7.7 Where the bonnet is welded to the body, the welding procedure and the welder or welding operator shall be qualified under the provisions of ASME B31.3. Weld quality shall conform to the acceptance standards of Paragraph 341 of ASME B31.3 for visual examination under normal service conditions. The examination shall be performed in accordance with Paragraph 344 of ASME B31.3.

2.7.8 Bonnet welds (including seal welds) shall be postweld heat treated in accordance with the provisions of 2.4.3. Unless otherwise specified in the purchase order, seal welds of P4 and P5 materials are exempt from postweld heat treatment requirements if techniques and procedures are used to provide a weld hardness not to exceed 235 HB. Solution annealing of any type of bonnet weld cannot be performed and is exempt from postweld heat treatment requirements. Valves with bonnet welds that have been postweld heat treated shall have the type of postweld heat treatment indicated on the identification plate, or on the body, or both, in accordance with 1.3.4.

2.8 Trim

2.8.1 The valve trim shall consist of stem, gate seat surface, and seat ring surface.

2.8.1.1 If an overlay weld-deposit is used for the gate seat and/or seat ring seating surface, the corrosion resistance of the base material of the gate and/or seat ring shall be at least equal to the corrosion resistance of the material of the valve body.

2.8.1.2 Table 10 lists the nominal seating surface materials, categorized by trim numbers, available under this standard.

2.8.1.3 Except as provided in Items a through d below, the standard trim number shall be as specified in Table 3. When a trim other than standard is desired, it shall be specified on the purchase order by a trim number from Tables 10 and 11. The typical specifications included in Tables 10 and 11 are for materials whose nominal compositions represent some acceptable grades.

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Table 8—Comparative Wall Thicknesses of Extended-Body Valves

Extension (NPS)	Shortest Welding-End Extension				Longest Welding-End Extension				Threaded Extension (Class 800)		Schedule 80 Pipe		Schedule 160 Pipe		XXS Pipe	
	Class 800		Class 1500		Class 800		Class 1500									
	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
½	0.22	5.6	0.22	5.6	0.25	6.4	0.25	6.4	—	—	0.13	3.3	0.16	4.1	0.26	6.6
¾	0.19	4.8	0.24	6.1	0.30	7.6	0.30	7.6	0.18	4.6	0.14	3.6	0.19	4.8	0.27	6.9
1	—	—	—	—	0.22	5.6	0.28	7.1	0.22	5.6	0.16	4.1	0.22	5.6	0.31	7.9
1½	—	—	—	—	0.25	6.4	0.38	9.6	0.18	4.6	0.18	4.6	0.25	6.4	0.35	8.9
2	—	—	—	—	0.30	7.6	0.47	11.9	0.24	6.1	0.19	4.8	0.30	7.6	0.38	9.7

Note: This table is for information only. The tabulated thicknesses are minimum.

Table 9—Materials for Extensions Welded on Extended-Body Valves

Material Group Number	Nominal Steel Designation	ASTM Forging Specification	ASTM Pipe Specification
1.1	Carbon	A 105[a,b] A 350, Grade LF2	A 106, Grade B[a] A 333, Grade 1 seamless
1.2	2½Ni 3½Ni	— A350, Grade LF3	— A 333, Grade 3 seamless
1.3	Carbon	—	A 333, Grade 1 seamless
1.9	1¼Cr-½Mo	A 182, Grade F11[c]	A 335, Grade P11
1.10	2¼Cr-1Mo	A 182, Grade F22	A 335, Grade P22
1.13	5Cr-½Mo 5Cr-½Mo	A 182, Grade F5 A 182, Grade F5a	A 335, Grade P5 A 335, Grade P5
1.14	9Cr-1Mo	A 182, Grade F9	A 335, Grade P9
2.1	18Cr-8Ni	A 182, Grade F304[d]	A 312, Grade 304 seamless[d]
2.2	16Cr-12Ni-2Mo 18Cr-9Ni-2Mo	A 182, Grade F316[d] —	A 312, Grade 316 seamless[d] A 312, Grade 316 seamless[d]
2.3	18Cr-8Ni 16Cr-12Ni-2Mo	A 182, Grade F304L A 182, Grade F316L	A 312, Grade 304L seamless A 312, Grade 316L seamless
2.5	18Cr-10Ni-Cb	A 182, Grade F347[d]	A 312, Grade 347 seamless[d]

[a]Upon prolonged exposure to temperatures above 800°F (425°C), the carbide phase of carbon steel may be converted to graphite.
[b]Only killed steel shall be used above 850°F (455°C).
[c]Only normalized and tempered material shall be used.
[d]At temperatures above 1000°F (538°C), this material shall only be used when the carbon content is 0.04 percent or higher.

Source: Except for the pipe specifications column, this table, including Footnotes a–d, is extracted from ASME B16.34, Table 1. Reprinted courtesy of the American Society of Mechanical Engineers.

a. If the trim number tabulated below is specified (as a standard trim or in the purchase order), an alternative trim number may be furnished as follows:

Specified Trim Number	Alternative Trim Number
1	8 or 8A
101	108 or 108A
2	10
5A	5
105A	105
6	8
106	108
8A	8
108A	108

b. If trim number 1, 101, 2, 3, 4, 104, 5, 105, 5A, 105A, 9, 10, or 13 is furnished, both the seat ring seating surface and the gate seating surface shall be of the material shown in Table 10.
c. If trim number 6, 106, 7, 107, 8, 108, 8A, 108A, 11, 12, or 14 is furnished, the seat ring seating surface shall be of one of the two material types shown in Table 10, and the gate seating surface shall be of the other material type shown.
d. The stem trim number shall correspond to the nominal seating surface trim number and shall be of the material type and hardness listed in Table 11. The stem shall be of a wrought material.

2.8.2 Other trims not listed in Tables 10 and 11 may be used by agreement between the purchaser and the manufacturer.

2.9 Gate

The gate shall be of a solid wedge design.

2.10 Stem

2.10.1 The stem shall have a shoulder that will backseat against the bonnet in the fully open position.

2.10.2 The stem diameter (measured at the section that passes through the packing) shall not be less than that shown in Table 12.

2.10.3 The threads of stem and stem nut shall be (a) ACME type conforming to ASME B1.5 or (b) 60-degree stub threads conforming to ASME B1.8 (minor modifications are permitted for either thread). The ACME thread major diameter may be undersized by a maximum of 1/16 inch (1.6 millimeters) from the diameter of the stem shown in Table 12.

2.10.4 The stem shall have a surface finish R_a of 32 microinches (0.80 micrometers) or smoother in the area in contact with the packing.

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Table 10—Nominal Seating Surface Materials

Trim Number	Nominal Trim	Seat Hardness[a] (HB, minimum)	Material Type	Typical Specification (Grade)		
				Cast	Forged	Welded
1; 101[b]	F6	[c]	13Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410
2	304	[d]	18Cr-8Ni	ASTM A 351 (CF8)	ASTM A 182 (F304)	AWS A5.9 ER308
3	F310	[d]	25Cr-20Ni		ASTM A 182 (F310)	AWS A5.9 ER310
4; 104[b]	Hard F6	750[e]	Hard 13Cr		[h]	
5; 105[b]	Hardfaced	350[e]	Co Cr-A[g]			AWS A5 13 ERCoCr-A
5A; 105A[b]	Hardfaced	350[e]	Ni-Cr			[j]
6; 106[b]	F6 and Cu-Ni	250[f] 175[f]	13Cr Cu-Ni	ASTM A 217 (CA15)	ASTM A 182 (F6a) [i]	AWS A5.9 ER410
7; 107[b]	F6 and Hard F6	300[f] 750[f]	13Cr Hard 13Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a) [h]	AWS A5.9 ER410
8; 108[b]	F6 and Hardfaced	300[f] 350[f]	13Cr Co Cr-A[g]	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410 AWS A5 13 ERCoCr-A
8A; 108A[b]	F6 and Hardfaced	300[f] 350[f]	13Cr Ni-Cr	ASTM A 217 (CA15)	ASTM A 182 (F6a)	AWS A5.9 ER410 [j]
9	Monel	[d]	Ni-Cu alloy		Manufacturer's standard	
10	316	[d]	18Cr-8Ni	ASTM A 351 (CF8M)	ASTM A 182 (F316)	AWS A5.9 ER316
11	Monel and Hardfaced	[d] 350[f]	Ni-Cu alloy Trim 5 and 5A		Manufacturer's standard	See Trim 5 or 5A
12	316 and Hardfaced	[d] 350[f]	18Cr-8Ni Trim 5 or 5A	ASTM A 351 (CF8M)	ASTM A 182 (F316)	AWS A5.9 ER316 See Trim 5 or 5A
13	Alloy 20	[d]	19Cr-29Ni	ASTM A 351 (CN7M)	ASTM B 473	AWS A5.9 ER320
14	Alloy 20 and Hardfaced	[d] 350[f]	19Cr-29Ni Trim 5 or 5A	ASTM A 351 (CN7M)	ASTM B 473	AWS A5.9 ER320 See Trim 5 or 5A

[a]HB is Brinell hardness number symbol per ASTM E 10 (formerly BHN).
[b]Trims 101, 104, 105, 105A, 106, 107, 108, and 108A denote trims that permit the use of free-machining grades of 13 percent Cr material. Specify Trims 1, 4, 5, 5A, 6, 7, 8, and 8A when the use of free-machining grades of 13 percent Cr materials is not desired.
[c]Seat ring and gate seat surfaces 250 HB minimum, with 50 HB minimum differential between seat ring and gate seat surfaces.
[d]Manufacturer's standard hardness.
[e]Differential hardness between seat ring and gate seat surfaces not required.
[f]Hardness differential between seat ring and gate seat surfaces shall be the manufacturer's standard.
[g]This classification includes such trademarked materials as Stellite 6, Stoody 6, and Wallex 6.
[h]Case hardened by nitriding to thickness of 0.005 inch (0.13 millimeter) minimum.
[i]Manufacturer's standard, with 30 percent Ni minimum.
[j]Manufacturer's standard hardfacing, with 25 percent Fe maximum.

2.11 Stem–To–Gate Connection

2.11.1 The stem-to-gate connection for an ISRS valve shall be a button, and for an OS&Y valve the connection shall be a T-head-and-slot arrangement. The stem, including the button or T-head, shall be one piece. Stems formed from welding two or more pieces are not permitted.

2.11.2 For an OS&Y valve, the stem train (stem, gate, stem nut, handwheel, and handwheel nut) shall be designed to fail outside the pressure boundary in the event of a locked gate. The strength of the stem (in tension) outside the pressure boundary shall not be less than the calculated (theoretical) failure load based on the thread root area and the minimum ultimate tensile strength of the stem material. The strength (in tension) of the stem-to-gate connection and of all parts of the stem within the pressure boundary shall be greater than the strength of the stem at the root of the threads.

2.11.3 For an ISRS valve, the stem and stem-to-button head connection shall be designed to assure that stem failure occurs outside the valve pressure boundary in the event of a locked gate.

2.12 Gate Guiding

The gate shall be accurately guided throughout the travel distance to its seat.

2.13 Seat Rings

Seat rings shall be threaded, pressed, and/or rolled into the body. They shall be renewable.

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Table 11—Stem Material

Trim Number[a]	Material Type	Hardness (HB, Minimum)	Typical Specification (Type)
1	13Cr	200	ASTM A 276-T410 or T420
101	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
2	18Cr-8Ni	Manufacturer's standard	ASTM A 276-T304
3	25Cr-20Ni	Manufacturer's standard	ASTM A 276-T310
4 through 8A	13Cr	200	ASTM A 276-T410 or T420
104	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
105	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
105A	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
106	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
107	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
108	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
108A	13Cr	200	ASTM A 276-T410 or T420 ASTM A 582-T416
9 and 11	Ni-Cu alloy	Manufacturer's standard	Manufacturer's standard
10 and 12	18Cr-8Ni	Manufacturer's standard	ASTM A 276-T316
13 and 14	19Cr-29Ni	Manufacturer's standard	ASTM B 473

*Trims 1 and 4 through 8A denote trims that prohibit free-machining grades of 13 percent Cr material.

Table 12—Minimum Stem[a] Diameter

Valve Size NPS	Classes 150, 300, 600, and 800		Class 1500	
	inches	millimeters	inches	millimeters
¼	9/32	7.1	13/32	10.3
⅜	9/32	7.1	13/32	10.3
½	11/32	8.7	13/32	10.3
¾	3/8	9.5	7/16	11.1
1	7/16	11.1	9/16	14.3
1¼	½	12.7	⅝	15.9
1½	9/16	14.3	⅝	15.9
2	⅝	15.9	21/32	16.7
2½	11/16	17.5	¾	19.1
3	¾	19.1	1	25.4
4	⅞	22.2	1⅛	28.6

[a]See 2.10.2. A finish machining undertolerance of .005 inch (0.13 millimeter) is permitted.

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2.14 Port Opening

The bore of the seat rings shall not be less than that shown in Table 13.

2.15 Threaded Packing–Gland Assembly

2.15.1 The packing-gland assembly shall include a steel gland located under the packing nut. A separate packing ring or washer at the base of the packing is permitted and shall be of a material whose nominal composition is equal to that of the valve bonnet or trim.

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

2.16 Bolted Packing–Gland Assembly

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

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

2.16.3 Gland bolts shall be made of Type 302, 304, 410, 416, or 420 stainless steel in either a stud-bolt or swinging-eyebolt design. Gland-bolt nuts shall be hex head and shall conform to ASTM A 194, Grade 2H, or shall be made of Type 302, 303, 304, 410, 416, or 420 stainless steel.

2.16.4 Stud bolts shall be adequately retained. Swinging eyebolts should be of either the hinge-pin or trunnion type. Hinge pins shall be made of one of the materials specified for gland bolts (see 2.16.3).

2.17 Packing Material

2.17.1 Unless otherwise specified in the purchase order, the packing shall be suitable for steam and petroleum fluid for the pressure rating of the valve within a design temperature range of –20°F (–29°C) to 1000°F (538°C). The packing shall contain a corrosion inhibitor.

2.17.2 The minimum depth of packing material furnished shall be as listed in Table 14. Packing-gland adjustment length remaining after testing and with the gland tight shall be greater than 25 percent of the minimum packing depth listed in Table 14.

2.18 Stuffing Box

The stuffing box finish R_a shall be 125 microinches (3.2 micrometers) or smoother unless otherwise specified in the purchase order.

2.19 Stem Nut

Stem nuts for OS&Y gate valves shall be made of a material highly resistant to galling and corrosion and shall have a minimum melting point of 1750°F (954°C). Gray cast iron is prohibited.

Table 13—Port Opening

Valve Size (NPS)	Minimum Seat Ring Bore[a]			
	Classes 150, 300, 600, and 800		Class 1500	
	inches	millimeters	inches	millimeters
¼	¼	6.4	¼	6.4
⅜	¼	6.4	¼	6.4
½	⅜	9.5	⅜	9.5
¾	½	12.7	½	12.7
1	11/16	17.5	⅝	15.9
1¼	15/16	23.8	¾	22.2
1½	1¼	28.6	1 1/16	27.0
2	1 7/16	36.5	1⅜	34.9
2½	1¾	44.5	1½	38.1
3	2	50.8	1¾	47.6
4	2¼	69.9	2½	63.5

[a]For extended body valves, an additional 1/32 inch (0.8 millimeter) undersize from dimension shown will be permitted.

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Table 14—Minimum Depth of Packing

Valve Size (NPS)	Classes 150, 300, 600 and 800				Class 1500	
	Outside Screw and Yoke Valves		Inside Screw with Rising Stem Valves		Outside Screw and Yoke Valves	
	inches	millimeters	inches	millimeters	inches	millimeters
¼	½	12.7	½	12.7	¼	22.2
¾	½	12.7	½	12.7	¾	22.2
½	⅝	15.9	⅝	15.9	⅝	22.2
¾	⅝	15.9	⅝	15.9	1	25.4
1	1	25.4	¾	22.2	1 3/16	30.2
1¼	1	25.4	15/16	23.8	1½	38.1
1½	1⅛	28.6	15/16	23.8	1½	38.1
2	1¼	28.6	1¼	28.6	1½	38.1
2½	1¼	31.8	—	—	1¾	44.5
3	1½	38.1	—	—	1⅞	47.6
4	1¾	44.5	—	—	2	50.8

2.20 Handwheel

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

SECTION 3—INSPECTION, EXAMINATION, AND TEST

3.1 Inspection and Examination

If inspection by the purchaser is specified in the purchase order, inspection shall be in accordance with API Standard 598. Examination by the manufacturer shall be as specified in API Standard 598.

3.2 Pressure Test

Each valve shall be pressure tested as specified in API Standard 598.

3.3 Repair of Defects

Defects in the shell of a cast or forged valve that are revealed by inspection or test may be repaired as permitted by the applicable material specification.

SECTION 4—SHIPMENT

4.1 Protection of Female Threaded and Socket-Welding Ends

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

4.2 Protection of Male Extension

The male extension shall be protected by a metal or plastic cap.

4.3 Protection of End Flanges and Butt-Welding Ends

End flanges and butt-welding ends shall be fully blanked to protect the gasket surfaces or welding ends and valve internals during shipment and storage. Protective covers shall be wood, wood fiber, plastic, or metal and shall be securely attached to the valve ends by bolting, steel straps, steel clips, or suitable friction locking devices. Covers shall be of such design that the valve cannot be installed without complete removal of the protective cover.

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