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American National Standard

Hydrostatic Testing of Control Valves



ANSI/ISA-S75.19, Hydrostatic Testing of Control Valves

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Preface

This preface as well as all footnotes and annexes are included for informational purposes and are not part of ANSI/ISA-S75.19.

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1 Scope

1.1 This standard applies to control valves having bodies, bonnets, cover plates, and bottom flanges made of carbon steel, low alloy and high alloy (stainless) steel, nickel-base alloy, cast iron, and ductile iron.

1.2 This standard establishes requirements and definitions for standard hydrostatic shell testing of control valves by the valve manufacturer to prove the structural integrity and leak tightness of the valves' pressure retaining parts, including any closure parts such as the valve body to bonnet joint, but excluding packings, bellows or other moving seals and packing leakoff connections. Bellows or similar moving stem seals may be pressure tested after assembly at a pressure to be agreed upon by the valve manufacturer and the purchaser. The requirements of this standard do not cover pneumatic and hydraulic actuators and regulators.

1.3 This standard describes and specifies the specific circumstances of hydrostatic shell testing of control valves and is in accordance with the hydrostatic testing requirements of ASME/ANSI B16.1, ASME/ANSI B16.34 and ASME/ANSI B16.42 with the exception that the test requirements of paragraph 4.8 are not allowed by ASME/ANSI B16.34.

1.4 **WARNING — Serious bodily harm can be caused by high velocity leaks through the shell or seals, resulting from the energy stored in the pressurized fluid and containment equipment. Care should be exercised to ensure the safety of test and inspection personnel. Specific safety requirements for conducting hydrostatic testing and inspection are not within the scope of this standard.**

2 Definitions

2.1 control valve: Refer to ISA-S75.05, "Control Valve Terminology."

2.2 test fixture: A test fixture is a device to close off the end connections and/or stem seal areas of the control valve to allow pressurization for hydrostatic shell testing.

3 Test fixture and instrumentation

3.1 Test fixtures include, but are not limited to the following: plugs with tie-bars and tie-rods, hydraulic presses, plugs or flanges attached to the pipe connections, bosses or lugs on the valve, and expandable rubber plugs. For butt welding end valves when end plugs are used, the seal point shall be as close to the weld end as practical without overstressing the weld preparation.

3.2 The analog or digital pressure measuring instruments used in testing shall be of the indicating or recording type.

3.3 The valve manufacturer shall be responsible for maintaining the accuracy of the pressure measuring instruments.

3.4 Pressure measuring instruments shall be accurate within 3% at test pressure, and analog-type shall be used between 20% and 80% of their scale range.

4 Test requirements

4.1 The control valve, with or without its actuator, must be complete before hydrostatic shell testing, except as permitted in 4.2, 4.3, 4.4, and 4.8.

4.2 It is permissible to disassemble the valve after hydrostatic shell testing, provided

- a) new gaskets or seals used to reassemble the valve are of the same kind and size;
- b) equivalent studs and nuts are used;
- c) the same torquing procedure is used, or steps are taken to ensure the same pre-test bolt loads result; and
- d) an air or water leak test at lower than the hydrostatic shell test pressure is performed to ensure proper gasket installation.

4.3 All cavities pressurized in service shall simultaneously be subjected to the hydrostatic shell test pressure. Moving stem seals such as bellows, diaphragms, stem, and packing, that may be damaged by the hydrostatic shell test pressure, or trim parts that do not affect the pressure boundary, need not be installed during testing.

4.4 Valves with welded-on nipples, flanges, reducers and/or increasers shall be hydrostatically shell tested in accordance with paragraph 4.4 (a) or (d), at the manufacturer's option, unless paragraph 4.4 (b) or (c) is agreed to by both the valve manufacturer and the purchaser.

- a) Hydrostatically shell test the valve alone at the appropriate pressure for its class and do not retest after welding on any of the nipples, flanges, reducers or increasers.
- b) Hydrostatically shell test the valve alone at the appropriate pressure for its class and retest the valve assembly after welding on any of the nipples, flanges, reducers or increasers with the pressure in accordance with the specification applicable to the nipples, flanges, reducers or increasers. The purchaser shall provide the design pressure and temperature and the applicable specifications to the valve manufacturer.
- c) Hydrostatically shell test the valve including all weld-on nipples, flanges, reducers and increasers with the pressure in accordance with the specification applicable to the nipples, flanges, reducers and increasers. The valve nameplate and required valve body marking must then indicate the pressure and temperature limit as determined by the nipples, flanges, reducers and increasers.
- d) Hydrostatically shell test the valve including all welded-on nipples, flanges, reducers, and increasers with the pressure in accordance with this standard, provided that the nipples, flanges, reducers and increasers are adequate for that pressure.

4.5 The valve shall not be painted or otherwise coated with materials capable of sealing against leakage before the shell tests are completed, except internal linings or coatings included in the design (e.g., nonmetallic butterfly valve body linings) are permitted. Chemical corrosion protection treatments are permitted. If valve parts are to be painted for storage, they shall be hydrostatically shell tested before painting, provided the fully assembled valve is again tested in accordance with paragraph 4.2 (d). If the presence of purchaser's representative is specified for hydrostatic shell tests, painted valves may be retested without removal of the paint, unless otherwise agreed to by the valve manufacturer and purchaser.

Wrought welded-on nipples, flanges, increasers and reducers need not have their protective coating removed for hydrostatic shell testing.

4.6 The valve shall not be seated on the main seat nor on the back seat during the hydrostatic shell test.

4.7 If a valve is dual pressure rated (inlet rating higher than outlet rating from causes such as different wall thicknesses, flange rating, or materials), it may be necessary to separate the high pressure portion of the valve from the low pressure portion with a temporary barrier and test each portion at its respective pressure.

4.8 Pressure retaining parts may be hydrostatically shell tested separately if all of the following conditions are satisfied:

- a) all the pressure retaining parts in the valve assembly are hydrostatically tested at the pressures in accordance with [section 7](#), "Test Pressures;"
- b) the hydrostatic test is performed in a manner that simulates all loadings, fasteners, and restraints present when the part is tested in a completed valve;
- c) individual part testing is agreed to by both the manufacturer and the purchaser; and
- d) the fully assembled valve is pressure tested in accordance with paragraph 4.2 (d).

5 Test procedures

5.1 After filling the valve with water, which may contain a corrosion inhibitor, or with other suitable liquid (provided such liquid has a viscosity not greater than water), and venting all air, each valve shall be pressurized to no less than the pressures given in [Table 2](#) or [Table A.1](#), except as covered in paragraph 7.4.

CAUTION — IF AIR IS PRESENT IN THE TEST FLUID, THERE ARE HAZARDS INVOLVED AND APPROPRIATE PRECAUTIONS SHOULD BE TAKEN.

5.2 The minimum duration of test pressure before start of inspection shall be as follows:

Minimum Test Duration (minutes)				
Nominal Valve Size	Class 150 & Lower	Class 250 thru 600	Class 900 thru 1500	Class 2500 & Higher
2" & Smaller	1	1	2	3
2-1/2 " thru 4"	2	2	4	5
5 " thru 8"	2	3	5	8
10" & Larger	3	5	8	10

For classes not shown, use next higher class.

5.3 The temperature of the test liquid shall not exceed 52°C (125°F).

6 Acceptance standards

6.1 Any visually detected weeping or leaking through the pressure boundary walls that are part of the valve body assembly shall be cause for rejection. Leakage through the static seals and gasketed joints is also cause for rejection unless specifically allowed by the design specifications.

6.2 Distortion due to hydrostatic shell testing that impairs satisfactory functional operation of the valve shall be cause for rejection.

7 Test pressures

7.1 Hydrostatic shell test pressures for steel and nickel-base alloy valves are calculated by multiplying the 38°C (100°F) working pressures by 1.5 and rounding off to the next higher 25 psig (pounds per square inch gage) increment in accordance with ASME/ANSI B16.34. For other materials within the scope of this standard but not listed in [Table 1](#), and for Intermediate and Limited Classes, the above method shall be used to determine the test pressure.

7.2 Hydrostatic shell test pressures for cast iron valves shall be in accordance with ASME/ANSI B16.1.

7.3 Hydrostatic shell test pressures for nodular (ductile) iron valves shall be in accordance with ASME/ANSI B16.42.

7.4 For other materials within the scope of this standard but not included in [Tables 1, 2, or A.1](#) and whose pressure ratings are given in a published standard or are determined by the manufacturer, the hydrostatic shell test pressures shall be calculated as in paragraph 7.1 or paragraph 7.5, as applicable.

7.5 The metric equivalents of all test pressures in [Table 2](#) are given in [Table A.1](#) (Annex A) and are calculated by converting 1.5 times the 38°C (100°F) working pressure in psig to bar and then rounding off to the next higher bar increment except for values below 10 bar which are rounded off to the next higher 0.1 bar increment^(a).

^(a) 1 bar = 100 kPa = 100,000 Pa = 0.1 MPa = 14.5038 psi.

Table 1 — List of material specifications

Applicable ASTM Specifications						
Group 1						
Material		Product Forms				
Material Group No.	Nominal Designation	Forgings	Castings	Plates	Bars and Shapes	Tubular Products
1.1	Carbon	A 105 A 350 LF2	A 216 WCB	A 515 70 A 516 70	A 105 A 350 LF2 A 675 70 A 696 Gr C	A 672 B 70 A 672 C 70
	C-Mn-Si			A 537 Cl.1		
1.2	Carbon		A 216 WCC A 352 LCC A 352 LC2 A 352 LC3	A 203 B A 203 E	A 350 LF3	A 106 C
	2 1/2 Ni 3 1/2 Ni	A 350 LF3				
1.3	Carbon		A 352 LCB	A 515 65 A 516 65 A 203 A A 203 D	A 675 65	A 672 B 65 A 672 C 65
	2 1/2 Ni 3 1/2 Ni					
1.4	Carbon	A 350 LF1		A 515 60 A 516 60	A 675 60 A 350 LF1 A 696 Gr B	A 106 B A 672 B 60 A 672 C 60
1.5	C-1/2 Mo	A 182 F1	A 217 WC1 A 352 LC1	A 204 A A 204 B	A 182 F1	A 691 CM 70
1.6	C-1/2 Mo					A 335 P1 A 369 FP1 A 691 1/2 CR
	1/2 Cr-1/2 Mo			A 387 2 Cl.1 A 387 2 Cl.2 A 387 12Cl.1		
	1 Cr-1/2 Mo					
1.7	C-1/2 Mo 1/2 Cr-1/2 Mo Ni-Cr-1/2 Mo Ni Cr-1 Mo	A 182 F2	A 217 WC4 A 217 WC5	A 204 C	A 182 F2	A 691 CM 75

Table 1 — List of material specifications - Group 1 (Continued)

Material		Product Forms				
Material Group No.	Nominal Designation	Forgings	Castings	Plates	Bars and Shapes	Tubular Products
1.8	1 Cr- 1/2 Mo 1 1/4 Cr-1/2 Mo 2 1/4 Cr-1 Mo			A 387 12 Cl.2 A 387 11 Cl.1 A 387 22 Cl.1		A 691 1 CR A 335 P12 A 369 FP12 A 691 1 1/4 CR A 335 P11 A 369 FP11 A 691 2 1/4 CR A 355 P22 A 369 FP22
1.9	1 Cr-1/2 Mo 1 1/4 Cr-1/2 Mo	A 182 F12 A 182 F11	A 217 WC6	A 387 11 Cl.2	A 182 F12 A 182 F11 A 739 B11	
1.10	2 1/4 Cr-1 Mo	A 182 F22	A 217 WC9	A 387 22 Cl.2	A 182 F22 A 739 B22	
1.11	3 Cr-1 Mo Mn-1/2 Mo Mn-Si	A 182 F21		A 387 21 Cl.2 A 302 A & B A 302 C & D A 537 Cl.2	A 182 F 21	
1.12	5 Cr-1/2 Mo			A 387 5 Cl.1 A 387 5 Cl.2		A 691 5 CR A 335 P5 A 335 P5b A 369 FP5
1.13	5 Cr-1/2 Mo	A 182 F5a A 182 F5	A 217 C5		A 182 F5a A 182 F5	
1.14	9 Cr-1 Mo	A 182 F9	A 217 C12		A 182 F9	

Table 1 — List of material specifications (Continued)

Applicable ASTM Specifications						
Group 2						
Material		Product Forms				
Material Group No.	Nominal Designation	Forgings	Castings	Plates	Bars and Shapes	Tubular Products
2.1	18 Cr-8 Ni	A 182 F 304 A 182 F 304H	A 351 CF3 A 351 CF8 A 743 CF3 A 743 CF8 A 744 CF3 A 744 CF8	A 240 304 A 240 304H	A 182 F 304 A 182 F 304H A 479 304 A 479 304H	A 312 TP304 A 312 TP304H A 358 304 A 376 TP304 A 376 TP304H A 430 FP304 A 430 FP304H
2.2	16 Cr-12 Ni-2 Mo 18 Cr-8 Ni 18Cr-13 Ni-3 Mo 18Cr-9 Ni-2 Mo	A 182 F 316 A 182 F 316H	A 351 CF3A A 351 CF8A A 351 CF3M A 351 CF8M A 743 CF3M A 743 CF8M A 744 CF3M A 744 CF8M	A 240 316 A 240 316H A 240 317	A 182 F 316 A 182 F 316H A 479 316 A 479 316H	A 312 TP316 A 312 TP316H A 358 316 A 376 TP316 A 376 TP316H A 430 FP316 A 430 FP316H A 312 TP317
2.3	18 Cr-8 Ni 16 Cr-12 Ni-2 Mo	A 182 F304L A 182 F316L		A 240 304L A 240 316L	A 182 F 304L A 479 304L A 182 F 316L A 479 316L	A 312 TP304L A 312 TP316L

Table 1 — List of material specifications - Group 2 (Continued)

Material		Product Forms				
Material Group No.	Nominal Designation	Forgings	Castings	Plates	Bars and Shapes	Tubular Products
2.4	18 Cr-10 Ni-Ti	A 182 F321 A 182 F321H		A 240 321 A 240 321H	A 182 F 321 A 479 321 A 182 F 321H A 479 321H	A 312 TP321 A 312 TP321H A 358 321 A 376 TP321 A 376 TP 321H A 430 FP321 A 430 FP321H
2.5	18 Cr-10 Ni-Cb	A 182 F347 A 182 F347H A 182 F348 A 182 F348H	A 351 CF8c	A 240 347 A 240 347H A 240 348 A 240 348H	A 182 F347 A 182 F347H A 182 F348 A 182 F348H A 479 F347 A 479 F347H A 479 F348 A 479 F348H	A 312 TP347 A 312 TP347H A 358 347 A 376 TP347 A 376 TP347H A 430 FP347 A 430 FP347H A 312 TP348 A 312 TP348H A 376 TP348 A 376 TP348H
2.6	25 Cr-12 Ni 23 Cr-12 Ni		A 351 CH8 A 351 CH20	A240 309S		A 312 TP 309 A358 309
2.7	25 Cr-20 Ni	A 182 F310	A 351 CK20	A 240 310S	A 182 F310 A 479 310S	A 312 TP310 A 358 310

Table 1 — List of material specifications (Continued)

Group 3						
Applicable ASTM Specifications						
Material		Product Forms				
Material Group No.	Nominal Designation	Forgings	Castings	Plates	Bars and Shapes	Tubular Products
3.1	Cr-Ni-Fe-Mo-Cu-Cb Cu-Cb Alloy 20Cb	B 462 N08020	A 351 CN7M	B 463 N08020	B 473 N08020	B 464 N08020 B 468 N08020
3.2	Nickel Alloy 200	B 160 N02200		B 162 N02200	B 160 N02200	B 161 N02200 B 163 N02200
3.3	Ni-Low C Alloy 201	B 160 N02201		B 162 N02201	B 160 N02201	
3.4	Ni-Cu Alloy 400	B 564 N04400		B 127 N04400	B 164 N04400	B 165 N04400 B 163 N04400
	Alloy 405	B 164 N04405			B 164 N04405	
3.5	Ni-Cr-Fe Alloy 600	B 564 N06600		B 168 N06600	B 166 N06600	B 167 N06600 B 163 N06600
3.6	Ni-Fe-Cr Alloy 800	B 564 N08800		B 409 N08800	B 408 N08800	B 163 N00880
3.7	Ni-Mo Alloy B-2	B 335 N10665		B333 N10665	B335 N10665	B 622 N10665
3.8	Ni-Mo-Cr Alloy C-276	B 574 N10276	A 494 N10001 A 494 N10002	B 575 N10276	B 574 N10276	B 622 N10276
	Ni-Cr-Mo-Cb Alloy 625	B 564 N06625		B 443 N06625	B 446 N06625	
	Ni-Mo Alloy B	B 335 N10001		B 333 N10001	B 335 N10001	B 622 N10001
	Ni-Mo Alloy C					
	Ni-Mo-Cr-Fe Alloy N	B 573 N10003		B 434 N10003	B 573 N10003	
	Ni-Mo-Cr Alloy C4	B 574 N06455		B 575 N06455	B 574 N06455	B 622 N06455
	Ni-Fe-Cr-Mo-Cu-Alloy 825	B 425 N08825		B 424 N08825	B 425 N08825	B 423 N08825
3.9	Ni-Cr-Mo-Fe Alloy X	B 572 N06002		B 435 N06002	B 572 N06002	B 622 N06002

Table 1 — List of material specifications - Group 3 (Continued)

Material		Product Forms				
Material Group No.	Nominal Designation	Forgings	Castings	Plates	Bars and Shapes	Tubular Products
3.10	Ni-Fe-Cr-Mo-Cb Alloy 700	B 672 N08700		B 599 N08700	B 672 N08700	
3.11	Ni-Fe-Cr-Mo-Cu-Low C Alloy 904L	B 649 N08904		B 625 N08904	B 649 N08904	B 677 N08904
3.12	Ni-Fe-Cr-Mo Alloy 20 Mod	B 621 N08320		B 620 N08320	B 621 N08320	B 622 N08320
	Ni-Cr-Fe-Mo-Cu Alloy G-3	B 581 N06985		B 582 N06985	B 581 N06985	B 622 N06985
3.13	Ni-Cr-Fe-Mo-Cu Alloy G-2	B 581 N06975		B 582 N06975	B 581 N06975	B 622 N06975
3.14	Ni-Cr-Fe-Mo-Cu Alloy G	B 581 N06007		B 582 N06007	B 581 N06007	B 622 N06007
3.15	Ni-Fe-Cr Alloy 800H	B 564 N08810		B 409 N08810	B 408 N08810	B 407 N08810
3.16	Ni-Fe-Cr-Si Alloy 330	B 511 N08330		B 536 N08330	B 511 N08330	B 535 N08330

Table 2 — Hydrostatic shell test pressures (psig) (3) steel, nickel-base and other alloys per ASME/ANSI B16.34

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
1.1	450	450	1125	1125	1500	1500	2225	2250	3350	3375	5575	5625	9275	9375	16675	16875
1.2	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.3	400	400	1050	1050	1400	1400	2100	2100	3150	3150	5225	5225	8700	8700	15625	15625
1.4	375	375	950	975	1250	1300	1875	1950	2775	2900	4650	4825	7725	8050	13900	14475
1.5	400	400	1050	1050	1400	1400	2100	2100	3150	3150	5225	5225	8700	8700	15625	15625
1.6	350	350	900	900	1200	1200	1775	1775	2650	2650	4425	4425	7350	7350	13225	13225
1.7	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.8	375	375	950	975	1250	1300	1875	1950	2775	2900	4650	4825	7725	8050	13900	14475
1.9	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.10	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.11	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.12	375	375	950	975	1250	1300	1875	1950	2775	2900	4650	4825	7725	8050	13900	14475
1.13	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
1.14	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
2.1	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.2	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.3	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	5025	7500	8375	13500	15050
2.4	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.5	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
2.6	400	400	1025	1050	1350	1400	2025	2100	3025	3150	5050	5225	8400	8700	15125	15625
2.7	400	400	1025	1050	1350	1400	2025	2100	3025	3150	5050	5225	8400	8700	15125	15625
3.1	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	5025	7500	8375	13500	15050
3.2	225	250	550	600	725	825	1100	1225	1625	1825	2700	3025	4500	5025	8100	9050
3.3	150	175	375	425	500	550	725	825	1100	1225	1800	2025	3000	3350	5400	6050
3.4	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	2025	3000	3350	5400	6050
3.5	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5025	7500	8375	13500	15075
												5625	9000	9375	16200	16875

**Table 2 — Hydrostatic shell test pressures (psig) (3) steel, nickel-base and other alloys per ASME/ANSI B16.34
(Continued)**

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
3.6	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.7	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.8	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.9	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.10	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.11	375	425	975	1075	1300	1450	1925	2150	2900	3225	4825	5375	8025	8950	14425	16100
3.12	400	450	1025	1125	1350	1500	2025	2250	3025	3375	5050	5625	8400	9375	15125	16875
3.13	450	450	1125	1125	1500	1500	2250	2250	3375	3375	5625	5625	9375	9375	16875	16875
3.14	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875
3.15	350	400	900	1025	1200	1350	1800	2025	2700	3025	4500	5025	7500	8375	13500	15075
3.16	425	450	1100	1125	1450	1500	2175	2250	3250	3375	5400	5625	9000	9375	16200	16875

NOTES

- 1) For definition of "Std" and "Spcl," see ASME/ANSI B16.34.
- 2) The material groups are defined in [Table 1](#).
- 3) Values are listed for reference only. Source is ASME/ANSI B16.34.

Table 2 Hydrostatic shell test pressures (psig) (continued) Cast iron valves per ASME/ANSI B16.1 (4)

	Class 25		Class 125				Class 250				Class 800
	Class A		Class A	Class B			Class A	Class B			Class B
Sizes (NPS)	4-36	42-96	1-12	1-12	14-24	30-48	1-12	1-12	14-24	30-48	2-12
	70	40	270	300	230	230	600	750	450	450	1200

Ductile iron valves per ASME/ANSI B16.42 (5)

Class 150	Class 300
400	975

NOTES

- 4) Body and bonnet material to be per ASTM A126.
- 5) Body and bonnet material to be per ASTM A395.

Annex A — Test Pressures (Bar)

Table A.1 — Hydrostatic shell test pressures (bar gauge) (4) - Steel, nickel-base and other alloys per ASME/ANSI B 16.34

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
1.1	30	30	77	78	103	104	154	156	230	233	384	388	639	647	1150	1164
1.2	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.3	28	28	72	72	96	96	144	144	216	216	359	359	599	599	1078	1078
1.4	25	26	65	67	86	89	128	133	192	200	320	333	533	555	958	998
1.5	28	28	72	72	96	96	144	144	216	216	359	359	599	599	1078	1078
1.6	24	24	62	62	82	82	122	122	183	183	304	304	507	507	912	912
1.7	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.8	25	26	65	67	86	89	128	133	192	200	320	333	533	555	958	998
1.9	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.10	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.11	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.12	25	26	65	67	86	89	128	133	192	200	320	333	533	555	958	998
1.13	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
1.14	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
2.1	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.2	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.3	24	27	63	70	83	93	125	139	187	208	311	346	518	577	931	1066
2.4	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.5	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
2.6	27	28	70	72	93	96	140	144	209	216	348	359	580	599	1043	1078
2.7	27	28	70	72	93	96	140	144	209	216	348	359	580	599	1043	1078
3.1	24	27	63	70	83	93	125	139	187	208	311	346	518	577	931	1038
3.2	15	17	38	42	50	56	75	84	112	125	187	208	311	347	559	624

Table A.1 — Hydrostatic shell test pressures (bar gauge) (4) steel, nickel-base and other alloys per AMSE/ANSI B16.34 (Continued)

Material Group (2)	Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500		Class 2500		Class 4500	
	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl	Std	Spcl
3.3	10	11	25	28	34	37	50	56	75	84	125	139	207	231	373	416
3.4	24	27	63	70	83	93	125	139	187	208	311	347	518	578	931	1039
3.5	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.6	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.7	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.8	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.9	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.10	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.11	26	29	67	74	89	99	133	148	199	222	332	370	553	617	994	1110
3.12	27	30	70	78	93	104	140	156	209	233	348	388	580	647	1043	1164
3.13	30	30	78	78	104	104	156	156	233	233	388	388	647	647	1164	1164
3.14	29	30	75	78	100	104	149	156	224	233	373	388	621	647	1117	1164
3.15	24	27	63	70	83	93	125	139	187	208	311	347	518	578	931	1039
3.16	29	30	75	78	100	104	149	156	224	233	373	388	621	674	1117	1164

1 bar = 100kPa = 100,000Pa = 0.1MPa = 14,5038 psi

NOTES

- 1) For definition of "Std" and "Spcl," see ASME/ANSI B16.34.
- 2) The material groups are defined in [Table 1](#).
- 3) This Annex which is placed after the main text for convenience, is an integral part of S75.19.
- 4) Values are listed for reference only. Source is ASME/ANSI B16.34.

Table A.1—Hydrostatic shell test pressures (bar gauge) (Continued) - Cast iron valves per ASME/ANSI B16.1 (5)

Sizes (NPS)	Class 25		Class 125				Class 250				Class 800
	Class A		Class A	Class B			Class A	Class B			Class B
	4-36	42-96	1-12	1-12	14-24	30-48	1-12	1-12	14-24	30-48	2-12
	4.8	2.7	19	21	16	16	42	52	31	31	83

Ductile iron valves per ASME/ANSI B16.42 (6)

Class 150	Class 300
28	68

NOTES

- 5) Body and bonnet material to be per ASTM A126.
- 6) Body and bonnet material to be per ASTM A395.

Annex B — References

This Annex is an integral part of ISA S75.19. It is placed after the main text for convenience.

List of standards and specifications referenced in standards showing the year of approval.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.42-1987	Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300
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Available from:	ANSI 11 West 42nd Street New York, NY 10036	Tel: (212) 642-4900
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AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.1-1989	Cast Iron Flanges and Flanged Fittings, Class 25, 125, 250 and 800
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ASME B16.34-1988	Valves - Flanged, Threaded and Welding End
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Available from:	ASME 345 East 47th Street New York, NY 10036	Tel: (212) 705-7722
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A105/A105M-93	Standard Specification for Forgings, Carbon Steel, for Piping Components
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ASTM A106-91	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
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ASTM A126-84	Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
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ASTM A182/A182M-93	Standard Specification for Forged or Rolled Alloy- Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
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ASTM A203/A203M-93	Standard Specification for Pressure Vessel Plates; Alloy Steel, Nickel
ASTM A204/A204M-93	Standard Specification for Pressure Vessel Plates, Alloy Steel, Molybdenum
ASTM A216/A216M-89	Standard Specification for Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service
ASTM A217/A217M-91	Standard Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts Suitable for High-Temperature Service
ASTM A240 REV A-93	Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM A302/A302M-93	Standard Specification for Pressure Vessel Plates, Alloy-Steel, Manganese-Molybdenum and Manganese-Molybdenum-Nickel
ASTM A312/A312M REV A-92	Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipe
ASTM A335/A335M REV B-92	Standard Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service
ASTM A350/A350M-93	Standard Specification for Forgings, Carbon and Low-Alloy Steel, Requiring Notch Toughness Testing for Piping Components
ASTM A351/A351M REV B-91	Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts
ASTM A352/A352M-92	Standard Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
ASTM A358/A358M-92	Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy Steel Pipe for High-Temperature Service
ASTM A369/A369M-92	Standard Specification for Carbon and Ferritic Alloy Steel Forged and Bored Pipe for High-Temperature Service

ASTM A376/A376M REV A-91	Standard Specification for Seamless Austenitic Steel Pipe for High-Temperature Central-Station Service
ASTM A387/A387M-92	Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum
ASTM A395-88	Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
ASTM A430/A430M-91	Standard Specification for Austenitic Steel Forged and Bored Pipe for High-Temperature Service
ASTM A479/A479M-92	Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
ASTM A515/A515M-92	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate-and Higher-Temperature Service
ASTM A516/A516M-90	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate-and Lower-Temperature Service
ASTM A537/A537M-90	Standard Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel
ASTM A672 REV B-89	Standard Specification for Electric-Fusion-Welded Steel Pipe for High-Pressure Service at Moderate Temperatures
ASTM A675/A675M REV A-90	Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
ASTM A691 REV A-89	Standard Specification for Carbon and Alloy Steel Pipe, Electric-Fusion-Welded for High-Pressure Service at High Temperatures
ASTM A696 REV A-90	Standard Specification for Steel Bars, Carbon, Hot-Wrought or Cold-Finished, Special Quality, for Pressure Piping Components
ASTM A739 REV A-90	Standard Specification for Steel Bars, Alloy, Hot-Wrought, for Elevated Temperature or Pressure-Containing Parts

ASTM B127-93	Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
ASTM B160-93	Standard Specification for Nickel Rod and Bar
ASTM B161-93	Standard Specification for Nickel Seamless Pipe and Tube
ASTM B162-93	Standard Specification for Nickel Plate, Sheet, and Strip
ASTM B163-93	Standard Specification for Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes
ASTM B164-93	Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire
ASTM B165-93	Standard Specification for Nickel-Copper Alloy (UNS N04400) Seamless Pipe and Tube
ASTM B166-93	Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, NO6601 and NO6690) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS NO6617) Rod, Bar, and Wire
ASTM B167-93	Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, NO6601 and NO6690) Seamless Pipe and Tube
ASTM B168-93	Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, UNO6601 and N06690) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS NO6617) Plate, Sheet, and Strip
ASTM B333-92	Standard Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip
ASTM B335-89	Standard Specification for Nickel-Molybdenum Alloy Rod
ASTM B407-93	Standard Specification for Nickel-Iron-Chromium Alloy Seamless Pipe and Tube
ASTM B408-87	Standard Specification for Nickel-Iron-Chromium Alloy Rod and Bar
ASTM B409-93	Standard Specification for Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip

ASTM B434-89	Standard Specification for Nickel-Molybdenum-Chromium-Iron Alloy (UNS N10003) Plate, Sheet, and Strip
ASTM B435-93	Standard Specification for UNS N06002, UNS N06230, and UNS R30556 Plate, Sheet, and Strip
ASTM B443-93	Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) Plate, Sheet, and Strip
ASTM B446-93	Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) Rod and Bar
ASTM B462-91	Standard Specification for Forged or Rolled UNS N08020, UNS N08024, UNS N08026 and UNS N08367 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service
ASTM B463-93	Standard Specification for UNS N08020, UNS N08026, and UNS N08024 Alloy Plate, Sheet, and Strip
ASTM B464-93	Standard Specification for Welded UNS N08020, N08024, and N08026 Alloy Pipe
ASTM B468-93	Standard Specification for Welded UNS N08020, N08024 and N08026 Alloy Tubes
ASTM B473-91	Standard Specification for UNS N08020, UNS N08026 and N08024 Nickel Alloy Bar and Wire
ASTM B511-93	Standard Specification for Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes
ASTM B535-87	Standard Specification for Nickel-Iron-Chromium-Silicon Alloy (UNS N08330 and UNS N08332) Seamless Pipe
ASTM B536-93	Standard Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip
ASTM B564-93	Standard Specification for Nickel Alloy Forgings
ASTM B572 REV A87	Standard Specification for UNS N06002, UNS N06230, and UNS R30556 Rod

ASTM B573-89	Standard Specification for Nickel-Molybdenum-Chromium-Iron Alloy (UNS N10003) Rod
ASTM B574-91	Standard Specification for Low-Carbon Nickel-Molybdenum-Chromium and Low-Carbon Nickel-Chromium-Molybdenum Alloy Rod
ASTM B575-92	Standard Specification for Low-Carbon Nickel-Molybdenum-Chromium and Low-Carbon Nickel-Chromium-Molybdenum Alloy Plate, Sheet, and Strip
ASTM B581-93	Standard Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod
ASTM B582-92	Standard Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip
ASTM B599-92	Standard Specification for Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Plate, Sheet, and Strip
ASTM B620-93	Standard Specification for Nickel-Iron Chromium-Molybdenum Alloy (UNS N08320) Plate, Sheet, and Strip
ASTM B621-89	Standard Specification for Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Rod
ASTM B622-93	Standard Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
ASTM B625-93	Standard Specification for UNS N08904, UNS N08925, UNS N08931, UNS N08932, and UNS N08926 Plate, Sheet, and Strip
ASTM B649-73	Standard Specification for Ni-Fe-Cr-Mo-Cu Low-Carbon Alloy (UNS N08904) and Ni-Fe-Cr-Mo-Cu-N Low Carbon Alloys (UNS N08925, UNS N08031, and UNS N08926) Bar and Wire
ASTM B677-91	Standard Specification for UNS N08904, UNS N08925, and UNS N08926 Seamless Pipe and Tube
Available from:	ASTM 1916 Race Street Philadelphia, PA 19103-1187 Tel: (215) 299-5585

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