



STANDARD PRACTICE **SP-80**

1979
Edition

BRONZE GATE, GLOBE, ANGLE AND CHECK VALVES

Developed and Approved
by the
Manufacturers Standardization Society
of the
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An MSS Standard Practice is intended as a basis for common practice by the manufacturer, the user, and the general public. The existence of an MSS Standard Practice does not in itself preclude the manufacture, sale, or use of products not conforming to the Standard Practice. Mandatory conformance is established only by reference in a code, specification, sales contract, or public law, as applicable.

Where some slight shift of the absolute value of the minimum and maximum dimensions permitted by the inch dimensions and those provided by the converted metric dimensions do not unacceptably affect the functional or safety characteristics of the fitting, the metric conversions have been rounded to whole millimetre values in order to facilitate ease of measurement by ordinary measuring tapes or rulers with non-magnified vision. Furthermore, the rounding has not always been made to the nearest whole millimetre. In some cases it has been made to the whole millimetre which would facilitate tables manifesting logical increments in both the dimensions and their tolerances. It is recognized that the introduction of such variances will create a conflict in the acceptance dimensions or gaging between the inch and metric data. Experience indicates a probability that no serious difficulties will result from this conflict. Hence, it is the intent of this standard that any dimension which is within tolerance by either metric or inch measurement is considered to be in conformance with this standard.

Substantive changes in this 1979 edition are "flagged" by parallel bars as shown on the margins of this paragraph. The specific detail of the change may be determined by comparing the material flagged with that in the previous edition.

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0. INTRODUCTION

This MSS Standard Practice covers bronze gate, globe, angle, and check valves in Classes 125, 150, 200, 300 and 350 for threaded and solder ends and Classes 150 and 300 for flanged ends. Metric conversions for tabulated dimensions are contained in Tables 3 through 9 and metric conversions for tabulated pressure-temperature ratings, Table 1, are contained in Annex C.

1. SCOPE AND VALVE TYPES

1.1 Scope — This standard practice covers bronze gate, globe, angle, and check valves for general purpose services and provides requirements for the following:

- a) Pressure-Temperature Ratings
- b) Materials
- c) End Connections
- d) Dimensions
- e) Markings
- f) Testing and Inspection

1.2 Valve Types and Sizes

1.2.1 Gate Valves

- a) Type 1 — Solid Wedge: Non-Rising Stem (NRS) Fig. B1, Annex B
- b) Type 2 — Solid Wedge: Inside Screw Rising Stem (ISRS) Fig. B2, Annex B
- c) Type 3 — Split Wedge (Double Disc) — Inside Screw Rising Stem (ISRS) Fig. B3, Annex B

- d) Type 4 — Double Disc — Parallel Seat — Inside Screw Rising Stem (ISRS) Fig. B4, Annex B

1.2.2 Globe and Angle Valves

- a) Type 1 — Metal Disc, Integral Seat Fig. B5, Annex B
- b) Type 2 — Non-Metallic Disc, Integral Seat Fig. B6, Annex B
- c) Type 3 — Metallic Disc, Renewable Seat Fig. B7, Annex B

1.2.3 Check Valves

- a) Type 1 — Horizontal, Angle and Vertical Lift Check, Metal Disc to Metal Seat Fig. B8, Annex B
- b) Type 2 — Horizontal, Angle and Vertical Lift Check, Non-Metallic Disc to Metal Seat Fig. B9, Annex B
- c) Type 3 — Swing Check, Metal Disc to Metal Seat Fig. B10, Annex B
- d) Type 4 — Swing Check, Non-Metallic Disc to Metal Seat Fig. B11, Annex B.

1.3 Nominal Pipe Sizes — This Standard covers valve sizes 3 and under as follows:

- a) Threaded Ends — Sizes 1/8 through 3
- b) Solder Ends — Sizes 1/4 through 3
- c) Flanged Ends — Sizes 1/2 through 3

2. PRESSURE-TEMPERATURE RATINGS

2.1 The pressure-temperature ratings in Table 1 apply to all products covered by this Standard Practice. Valves conforming to the requirements of this Standard Practice must, in all respects, merit these ratings.

2.2 These ratings are the maximum allowable non-shock pressures at the temperatures shown, and allowable pressures may be interpolated between temperatures shown.

2.3 Rating Temperature: The temperature shown corresponding to the pressure rating shall be the material temperature of the pressure retaining structure. In view of the various environments in which piping components may be installed (i.e. — insulated or not, and either heated or cooled), it is assumed that the material temperature of the pressure retaining structure is the temperature of the contained fluid. Use of a pressure rating at a material temperature other than the temperature of the contained fluid is the responsibility of the user, and subject to the requirements of applicable codes.

2.4 The safe pressure-temperature rating of a solder-joint pipe system is dependent, not only on valve, fitting and tubing strength but also on the composition of the solder used

for joints. Pressure-temperature ratings for solder joints made with typical commercial solders are given in Annex A. It shall be the responsibility of the user to select a solder composition that is compatible with the service conditions; (as well as to assure adequacy of workmanship employed in making the joints).

2.5 The ratings given in Table 1 at -20°F to 150°F (-30° to 65°C) shall also apply at lower temperatures. Products that are to operate at low temperatures shall conform to the rules of the applicable codes under which they are to be used.

2.6 The safe pressure-temperature rating of valves fitted with non-metallic disc, (i.e., globe and angle valves, Type 2 and check valves, Types 2 and 4), is dependent upon the composition of the disc material. It shall be the responsibility of the user to specify the service application. When no service application is specified, discs suitable for steam service at rated working conditions shall be furnished in all bronze globe and angle valves, Type 2 and in all bronze check valves, Types 2 and 4. Users are advised to consult with the manufacturer in cases of doubt.

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TABLE 1 – PRESSURE-TEMPERATURE RATINGS – IMPERIAL UNITS
(for Metric Unit ratings see Annex C)

PRESS. CLASS	PRESSURE – psi ³							
	125	150		200	300			350
END CONN.	THD	THD	FLG ²	THD	THD ⁵	THD	FLG ²	THD
TEMP. ¹ deg. F	MATERIAL							
	ASTM B-62			ASTM B-61				
-20 To 150	200	300	225	400	1000	600	500	1000
200	185	270	210	375	920	560	475	920
250	170	240	195	350	830	525	450	830
300	155	210	180	325	740	490	425	750
350	140	180	165	300	650	450	400	670
400	---	---	---	275	560	410	375	590
406	125	150	150	---	---	---	---	---
450	120 ⁴	145 ⁴	---	250	480	375	350	510
500	---	---	---	225	390	340	325	430
550	---	---	---	200	300	300	300	350

Notes: 1 – For lower temperatures, See Paragraph 2.5

■ 2 – P-T Ratings – ANSI B16.24 ■

3 – Refer to Paragraph 2.4 for safe P-T rating for solder-joint pipe systems.

4 – Some codes (i.e., ASME BPVC, Section I) limit the rating temperatures of the indicated material to 406°F.

5 – Alternate ratings for valve size 1/8 - 2 having threaded ends and union ring body-bonnet joints.

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3. MATERIALS

3.1 General — All valve components manufactured to this standard shall be made from materials produced under recognized quality control procedures. Recommended materials are listed in Table 2.

3.2 Castings — All castings shall be clean and sound, without defects which will impair their service. No plugging, welding, repairing or impregnating of any defects is allowed.

3.3 Users are cautioned against application with fluids which may react chemically with any material used in these valves. Consultation with the manufacturer is advised to determine suitability in cases of doubt.

3.4 In certain areas of the country, where water conditions are particularly "aggressive", piping components made from certain zinc-bearing copper-base alloys are susceptible to a form of corrosion known as dezincification. Consultation with local water works division or manufacturers is advised to determine suitability in cases of doubt.

4. DESIGN

4.1 General — Valves shall be of substantial construction to resist permanent distortion under normal service conditions and shall be free of imperfections and defects which may be injurious to the performance of the valve.

4.2 Flow Passage Area

4.2.1 The flow passageway of bronze gate valves, shall have a minimum area of not less than the area of a circle having a diameter equal to the nominal pipe size except that valves fitted with seat rings may reduce the passageway area by the area of the seat ring driving lugs. The valve shall be so designed that the stem and/or wedge clear the waterway when the valve is fully open.

4.2.2 The flow passageway of bronze globe and angle valves, Types 1 and 2, designed with integral seats and when fully open, shall have an area at all points equal to the area of a circle having a diameter equal to the nominal pipe size except the area through the seat may be reduced by the area of the disc guides.

4.2.3 The flow passageway area of bronze globe and angle valves, Type 3, of the full flow design, may be reduced by the area of the seat ring driving lugs.

4.2.4 The flow passageway of bronze globe and angle valves, Type 3, of the plug design, for throttling service, may have a reduced area through the seat.

4.2.5 The flow passageway of bronze check valves, Types 3 and 4, shall have a minimum area of not less than the area of a circle having a diameter equal to the nominal pipe size except that valves fitted with seat rings may reduce the passageway area by the area of the seat ring driving lugs.

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TABLE 2 – LIST OF MATERIAL SPECIFICATIONSFOR UNIFIED NUMBERING SYSTEM (UNS)
DESIGNATIONS REFER TO ANNEX D

PART NAME	VALVE STYLE	VALVE TYPE	PRESSURE CLASS	
			125 & 150	200, 300 & 350
Body	Gate	1-4	ASTM B62-CA836-Note 2	ASTM B61-CA922-Note 2 ASTM B62-CA836-Note 1
	Globe & Angle	1-3		
	Check	1-4		
Bonnet	Gate	1-4	ASTM B62-CA836-Note 2 ASTM B124-CA377 ASTM B124-CA675 ASTM B16-CA360-Note 3 ASTM B584-CA864	ASTM B61-CA922-Note 2 ASTM B62-CA836-Note 1 ASTM B124-CA675 ASTM B16-CA360-Note 3 ASTM B584-CA864
	Globe & Angle	1-3		
Cap	Check	1-4	ASTM B62-CA836-Note 2 ASTM B124-CA377 ASTM B16-CA360-Note 3 ASTM B124-CA675 ASTM B584-CA864 ASTM B371-CA697-Note 3	ASTM B61-CA922-Note 2 ASTM B62-CA836-Note 1 ASTM B124-CA675 ASTM B584-CA864 ASTM B16-CA360-Note 3 ASTM B371-CA697-Note 3
Disc-Metal	Gate	1-4	ASTM B62-CA836 Copper-Nickel Alloy Nickel-Copper Alloy ASTM B584-CA864	ASTM B61-CA922 Copper-Nickel Alloy Nickel-Copper Alloy
	Globe & Angle	1&3	ASTM B62-CA836 ASTM B124-CA675 ASTM B124-CA377 ASTM B584-CA864 Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (400-500 BHN) Note 4	ASTM B61-CA922 ASTM B150-CA642 ASTM B584-CA864 ASTM B99-CA651 Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (400-500 BHN) Note 4
	Check	1&3	ASTM B62-CA836 ASTM B16-CA360-Note 3 ASTM B140-CA320-Note 3 Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (400-500 BHN) Note 4	ASTM B61-CA922 ASTM B16-CA360-Note 3 ASTM A494-GR.M35 ASTM B140-CA320-Note 3 ASTM B371-CA697-Note 3 Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (400-500 BHN) Note 4
Disc Holder	Globe & Angle	2	ASTM B62-CA836 ASTM B124-CA377 & CA675 ASTM B16-CA360-Note 3 ASTM B584-CA864 ASTM B140-CA320-Note 3 Note 4	ASTM B61-CA922 ASTM B62-CA836-Note 3 ASTM B124-CA377-Class 200 only ASTM B124-CA675-Class 200 only ASTM B16-CA360-Note 3 Note 4
	Check	2&4		
Disc Non-Metallic	Globe & Angle	2	Suitable for service specified in Paragraph 2.6 Pressure-Temperature Ratings	Suitable for service specified in Paragraph 2.6 Pressure-Temperature Ratings
	Check	2&4		

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TABLE 2 – LIST OF MATERIAL SPECIFICATIONS (CONTINUED)

PART NAME	VALVE STYLE	VALVE TYPE	PRESSURE CLASS	
			125 & 150	200, 300 & 350
Seats	Gate	1-4	Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (250-500 BHN) Note 4	Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (250-500 BHN) Note 4
	Globe & Angle	3	Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (400-500 BHN) Note 4	Copper-Nickel Alloy Nickel-Copper Alloy Stn. Stl. Alloy (400-500 BHN) Note 4
	Check	1-4		
Disc Nut Disc Locknut	Globe & Angle	2	ASTM B62-CA836 ASTM B16-CA360 ASTM B150-CA642 ASTM B371-CA697 Note 4	ASTM B61-CA922 ASTM B62-CA836-Note 1 ASTM B16-CA360 ASTM B150-CA642 ASTM B371-CA697 Note 4
	Check	2&4		
Stem	Gate	1-4	ASTM B61-CA922 ASTM B62-CA836 ASTM B99-CA651 ASTM B148-CA956 ASTM B371-CA694, 697 ASTM B584-CA864, 874, 875, 876 ASTM B21-CA464 ASTM B21-CA482 QC-C390 Alloy C2-CA865 QC-C390 Alloy D4-CA922 QC-C465 Alloy 614-CA614 QC-C591 Alloy 651-CA651 Note 4	ASTM B61-CA922 ASTM B62-CA836 ASTM B99-CA651 ASTM B148-CA956 ASTM B371-CA694, 697 ASTM B584-CA865, 874, 875, 876 ASTM B21-CA464 ASTM B21-CA482 QC-C390 Alloy C2-CA865 QC-C591 Alloy 651-CA651 Note 4
	Globe & Angle	1-3		
Hanger (Hinge)	Check	3&4	ASTM B62-CA836 ASTM B584-CA876 Note 4	ASTM B61-CA922 ASTM B584-CA876 Note 4
Hanger Pin (Hinge Pin) Slide Plug Stop Plug	Check	3&4	ASTM B150-CA642 ASTM B16-CA360 ASTM B371-CA697 Copper Alloy, Nickel-Copper Alloy, or Stainless Steel Alloy	ASTM B150-CA642 ASTM B16-CA360 ASTM B371-CA697 Copper Alloy, Nickel-Copper Alloy, or Stainless Steel Alloy
Union Bonnet Ring; Stuffing Box Packing Gland; Packing Nut			ASTM B62-CA836 ASTM B124-CA377 ASTM B16-CA360 ASTM B584-CA864 ASTM B584-CA844 ASTM B282 Type II-Note 6 Other Copper Alloy materials having physical and corrosive properties equivalent to those of the listed materials	ASTM B61-CA922 ASTM B124-CA377 ASTM B16-CA360-Note 3 ASTM B584-CA864 ASTM B584-CA844-Note 5 ASTM B282 Type II-Note 6 Other Copper Alloy materials having physical and corrosive properties equivalent to those of the listed materials.
Handwheels	Gate Globe & Angle		Ferrous, non-ferrous alloys or of a non-metallic material of sufficient strength and durability.	

TABLE 2 – LIST OF MATERIAL SPECIFICATIONS (CONTINUED)

- NOTES:
- 1 – Composition Bronze, ASTM B62-CA836, can be used in lieu of Steam or Valve Bronze, ASTM B61-CA922, for Class 200 valves with non-metallic discs when temperature limitation of the disc is a maximum of 450 degrees F (232 deg. C).
 - 2 – Steam or Valve Bronze, ASTM B61-CA922, for Class 200, 300 and 350 valves may be substituted for Class 125 and 150 valves at the manufacturer's option.
 - 3 – Bonnet, cap, disc and discholder, sizes 3/4 and smaller only. Union rings, sizes 3/8 and smaller only.
 - 4 – Other materials having physical and corrosive properties equivalent to those of the listed material.
 - 5 – For use Class 200 valves with non-metallic discs when temperature limitation of the disc is a maximum of 450 degrees F (232 deg. C).
 - 6 – Glands (non-bolted, non-threaded) only.

■ Extensive detail changes throughout Table 2. ■

4.3 Body and Bonnet

4.3.1 The body-bonnet joint on bronze gate, globe and angle valves and the body-cap joint on bronze check valves may be inside screw, screw-over, union ring or bolted construction.

4.3.2 Threaded Ends

4.3.2.1 Threaded end bodies may have polygon ends or may have rounded ends with ribs.

Valves with threaded ends shall be threaded in accordance with the requirements of ANSI B2.1.

4.3.2.2 All threads shall be countersunk a distance not less than one-half the pitch of threads at an angle of approximately 45 degrees. Countersinking shall be concentric with threads.

4.3.2.3 The length of threads specified in Table 3 shall be measured to include the countersink or chamfer. The maximum allowable variation in the alignment of threads of all openings of threaded valves shall be 0.06 inches in 12 inches (1.5mm in 305mm).

TABLE 3 - MINIMUM LENGTH AND DEPTH OF THREAD

Nominal Pipe Size	Length of Thread (minimum)		Depth of Thread Chamber* (minimum)	
	Inches	mm	Inches	mm
1/8	0.25	6.4	0.35	8.9
1/4	0.28	7.1	0.40	10.2
3/8	0.31	7.9	0.42	10.7
1/2	0.37	9.4	0.54	13.7
3/4	0.44	11.2	0.57	14.5
1	0.51	13.0	0.70	17.8
1-1/4	0.60	15.2	0.71	18.0
1-1/2	0.62	15.8	0.75	19.0
2	0.67	17.0	0.79	20.1
2-1/2	0.82	20.8	1.14	29.0
3	0.88	22.4	1.20	30.5
* Allowable entry of male pipe thread				

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4.3.3 Solder Joint Ends – Solder joint ends shall be prepared in accordance with applicable requirements of ANSI B16.18.

4.3.4 Flanged Ends – Flanges and drilling of flanged end valves shall be in accordance with applicable requirements of ANSI B16.24. The finish of facing shall be in accordance with MSS SP-6.

4.3.5 Stem Thread Engagement

4.3.5.1 Rising stem valves shall have a minimum length of thread engagement with the valve stem equal to the outside diameter of the thread when the valve is closed and 75% of the outside diameter of the stem thread when the valve is fully opened.

4.3.5.2 In the case of non-rising stem valves, the length of the stem thread in contact with the wedge shall be at least equal to the outside diameter of the thread when the valve is closed.

4.3.6 Backseating – A backseat shall be provided in gate, globe and angle valves; however, repacking while the valve is pressurized is not recommended as a normal procedure.

4.4 Discs and Seat Rings

4.4.1 Discs and Seat Rings for Bronze Gate Valves

4.4.1.1 Solid wedge discs shall be of one piece construction with disc guides. The stem chamber of the NRS discs shall be open at the bottom for proper drainage.

4.4.1.2 Split wedge and parallel seat (double disc) shall be so designed that on reaching the

point of closure, thrust from the stem will cause the disc to contact and bear evenly against the seat.

4.4.1.3 All discs shall have machined seating surfaces and shall be securely attached to the stem in all operating positions.

4.4.1.4 Seats may have expanded-in, threaded-in or otherwise renewable rings or may be cast integral with the body at the manufacturer's option.

4.4.2 Discs and Seat Rings for Bronze Globe and Angle Valves

4.4.2.1 Discs shall be securely fastened to the end of the stem in such a manner as to allow these parts to freely swivel. Valve Types 1 and 2 in sizes 1/2 and smaller may have the disc or disc holder formed on the end of the stem. Discs, plugs or disc holders of the slip-on-type shall be adequately guided for self-centering and shall be so constructed with relation to body and bonnet that when the valve is fully opened, they will not slip off the stem.

Disc holders for Valves Type 2 shall be designed to contain the periphery of the non-metallic disc in position.

4.4.2.2 The seat may have an expanded-in, threaded-in or otherwise renewable ring or may be cast integral with the body at the manufacturer's option.

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4.4.3 Discs and Seats for Bronze Check Valves

4.4.3.1 Bronze check valves, Types 1 and 2 shall have the disc or disc holder substantially guided to ensure proper seating.

4.4.3.2 Bronze check valves, Types 3 and 4 shall have disc and disc holder securely fastened to the hanger or hinge. The connection shall allow sufficient freedom so that the disc will properly seat by gravity. The joint shall swivel freely to allow uniform wear except that disc or disc holders and hanger may be integral in Class 125 valves.

4.4.3.3 Disc holders for Bronze check valves, Types 2 and 4 shall be designed to hold and support the non-metallic disc.

4.4.3.4 The seat may have an expanded-in, threaded-in or otherwise renewable ring or may be cast integral with the body at the manufacturer's option.

4.5 Stems for Bronze Gate Valves, and Bronze Globe and Angle Valves

Stems shall be threaded with either Acme form threads or 60° truncated "V" threads, so that the valve will be opened when the handwheel is rotated counter-clockwise. The handwheel end of the stem shall be a tapered square with its greatest diagonal approximately equal to the diameter of the stem or it may be of the splined or serrated design of equal strength. A threaded extension shall be provided to accommodate a wheel nut.

This wheel nut may be brass, or if made of steel, it shall have a corrosion protective plating. The diameter of that portion of the stem passing through the stuffing box shall not be less than shown in Tables 4 and 5.

4.6 Stuffing Box and Packing Nut for Bronze Gate Valves and Bronze Globe and Angle Valves

4.6.1 Stuffing box for Class 125 valves may be of gland follower type or packing nut type. Stuffing box for all other valves, sizes greater than 1/2, shall be of the gland follower type. The length of packing in contact with the stem shall be at least one diameter of the stem passing through it. The thread of the packing nut shall be of sufficient length to enable the nut to be screwed on to the stuffing box at least two full threads when the full amount of packing is in place and the length of thread engagement between the stuffing box and the packing nut shall be sufficient for full travel of the gland follower.

4.6.2 Stem Packing: Stem packing shall be lubricated or graphited asbestos or tetrafluoroethylene impregnated asbestos of the braided, twisted, or formed ring type suitable for the pressure-temperature rating of the valve.

4.7 Handwheels for Bronze Gate Valves, and Bronze Globe and Angle Valves

Handwheels smaller than 6 in. (152mm) in diameter shall be of the non-heat design with a raised rim to protect the hands. Handwheels 6 in. (152mm) in diameter and larger may be of the plain rim type marked to show the direction of opening. The diameter of the handwheel shall not be less than shown in Tables 6 and 7. All handwheels shall have at least three spokes.

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TABLE 4 – BRONZE GATE VALVES

Nominal Valve Size	DIAMETER OF STEM – MINIMUM							
	PRESSURE CLASS							
	125		150		200		300 & 350	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1/4	0.25	6.4	0.29	7.4	0.31	7.9	0.31	7.9
3/8	0.28	7.1	0.29	7.4	0.31	7.9	0.31	7.9
1/2	0.31	7.9	0.31	8.6	0.34	8.6	0.34	8.6
3/4	0.35	8.9	0.35	9.4	0.38	9.6	0.38	9.6
1	0.39	9.9	0.40	10.2	0.40	10.2	0.40	10.2
1-1/4	0.42	10.7	0.43	10.9	0.44	11.2	0.44	11.2
1-1/2	0.48	12.2	0.48	12.2	0.50	12.7	0.50	12.7
2	0.53	13.5	0.53	13.5	0.53	13.5	0.53	13.5
2-1/2	0.59	15.0	0.59	15.0	0.61	15.5	0.61	15.5
3	0.67	17.0	0.67	17.0	0.70	17.8	0.70	17.8

TABLE 5 – BRONZE GLOBE AND ANGLE VALVES

Nominal Valve Size	DIAMETER OF STEM – MINIMUM							
	PRESSURE CLASS							
	125		150		200		300 & 350	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1/4	0.24	6.1	0.28	7.1	0.28	7.1	0.28	7.1
3/8	0.28	7.1	0.28	7.1	0.28	7.1	0.28	7.1
1/2	0.31	7.9	0.35	8.9	0.35	8.9	0.35	8.9
3/4	0.35	8.9	0.39	9.9	0.40	10.2	0.40	10.2
1	0.39	9.9	0.42	10.7	0.44	11.2	0.44	11.2
1-1/4	0.42	10.7	0.49	12.4	0.50	12.7	0.50	12.7
1-1/2	0.49	12.4	0.53	13.5	0.53	13.5	0.53	13.5
2	0.53	13.5	0.59	15.0	0.62	15.7	0.62	15.7
2-1/2	0.59	15.0	0.67	17.0	0.67	17.0	0.67	17.0
3	0.67	17.0	0.75	19.0	0.75	19.0	0.75	19.0

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TABLE 6 – BRONZE GATE VALVES

Nominal Valve Size	DIAMETER OF HANDWHEEL – MINIMUM							
	PRESSURE CLASS							
	125		150		200		300 & 350	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1/4	1.62	41	1.75	44	2.00	51	2.00	51
3/8	1.62	41	1.75	44	2.00	51	2.00	51
1/2	1.88	48	2.00	51	2.25	57	2.25	57
3/4	2.25	57	2.50	64	2.50	64	2.50	64
1	2.62	66	2.62	66	2.75	70	2.75	70
1-1/4	3.00	76	3.00	76	3.25	82	3.25	82
1-1/2	3.25	82	3.50	89	3.62	92	3.62	92
2	3.62	92	4.00	102	4.00	102	4.00	102
2-1/2	4.38	111	4.62	117	4.62	117	4.62	117
3	5.00	127	5.00	127	5.50	140	5.50	140
When irregular handwheels are furnished, the largest dimension of the shape shall be considered the handwheel diameter.								

TABLE 7 – BRONZE GLOBE AND ANGLE VALVES

Nominal Valve Size	DIAMETER OF HANDWHEEL – MINIMUM							
	PRESSURE CLASS							
	125		150		200		300 & 350	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1/4	1.50	38	1.75	44	1.75	44	1.75	44
3/8	1.75	44	2.00	51	2.00	51	2.00	51
1/2	2.00	51	2.25	57	2.50	64	2.50	64
3/4	2.50	64	2.62	66	2.75	70	2.75	70
1	2.75	70	3.00	76	3.00	76	3.00	76
1-1/4	3.00	76	3.50	89	3.50	89	3.50	89
1-1/2	3.50	89	3.75	95	4.00	102	4.00	102
2	4.00	102	4.38	111	4.75	120	4.75	120
2-1/2	4.75	120	5.00	127	5.38	137	5.38	137
3	5.38	137	5.75	146	6.00	152	6.00	152
When irregular handwheels are furnished, the largest dimension of the shape shall be considered the handwheel diameter.								

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5. MARKINGS

5.1 All valves shall be legibly marked in accordance with the requirements of MSS SP-25.

5.2 All bronze check valve bodies shall be legibly marked to indicate the direction of flow by means of an arrow cast on the valve body or the word "in" or "inlet" cast or stamped on the inlet end of the body.

6. TOLERANCE

Tolerance specified in the standards referenced for dimensions shall be applied to these valves.

7. INSPECTION AND TESTING

7.1 All valve parts shall be made within inspection limits which will insure ready interchangeability of parts.

7.2 Manufacturers shall be prepared to certify that their products meet the minimum requirements of this Standard Practice.

7.3 Pressure Test

7.3.1 Shell Test—Each valve assembly shall be given a hydrostatic, pneumatic or steam shell test as specified in Table 8. No visible leakage is permitted in the valve pressure boundary except at the stem packing (when adjustable) or test connection seals.

TABLE 8 – SHELL TEST

Pressure Class	SHELL TEST PRESSURE-MINIMUM					
	Air		Water		Steam	
	psig	bar	psig	bar	psig	bar
125	80	5.6	300	20.7	125	8.7
150	80	5.6	450	31.0	125	8.7
200	80	5.6	600	41.4	—	—
300	80	5.6	1500	100.4	—	—
350	80	5.6	1500	100.4	—	—

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7.3.2 Seat Test

7.3.2.1 Each gate, globe and angle valve shall be given a hydrostatic, pneumatic or steam seat test as specified in Table 9. The maximum permissible leakage rate shall be 10 ml of water per hour per inch of diameter of nominal valve size or 0.1 of a standard cubic foot of air per hour (50 standard ml of air per minute) per inch of diameter of nominal valve size for valves in sizes 1 and larger, and 10 ml of water per hour or 0.1 of a standard cubic foot of air per hour (50 standard ml of air per minute) for valves in sizes smaller than 1.

7.3.2.2 Each check valve shall be given a hydrostatic or pneumatic seat test. The test pressure shall be equal to 50 psig (3.5 bar

gage) minimum. The pressure is to be applied at the outlet side of the disc. The maximum permissible leakage rate shall be 40 ml of water per hour per inch of diameter of nominal valve size or 0.4 of a standard cubic foot of air per hour (200 standard ml of air per minute) per inch of nominal valve size for valves in sizes 1 and larger and 40 ml of water per hour or 0.4 of a standard cubic foot of air per hour (200 standard ml of air per minute) for valves in sizes smaller than 1.

7.3.3 Alternate Test Methods

Alternate test procedures may be substituted when an established quality assurance program provides equivalent results to the test requirements of Paragraphs 7.3.1 and 7.3.2.

TABLE 9 – SEAT TEST

Pressure Class	SEAT TEST PRESSURE-MINIMUM					
	Air		Water		Steam	
	psig	bar	psig	bar	psig	bar
125	80	5.6	200	13.8	125	8.7
150	80	5.6	300	20.7	125	8.7
200	80	5.6	400	27.6	125	8.7
300	80	5.6	1000	69.0	125	8.7
350	80	5.6	1000	69.0	125	8.7

ANNEX A

This annex is an integral part of this Standard Practice which is placed after the main text for convenience.

American National Standard - ANSI B16.18, Cast Copper Alloy Solder-Joint Pressure Fittings.

Strength of Solder-Joints

The maximum recommended pressure-temperature ratings for solder-joints made with copper tube and copper alloy fittings, using representative commercial solders are listed in the table below for customary and metric units.⁽¹⁾

Note - For extremely low working temperatures (in the 0°F to -100°F (-18°C to -73°C) range) it is recommended that a brazing alloy melting at or above 1000°F (540°C) be used.

Table A Pressure-Temperature Ratings
Maximum Working Pressure, psi

Solder Used in Joints	Working Temperatures Deg. F	1/4 to 1 inch Incl.	1 1/4 to 2 inch Incl.	2 1/2 to 3 inch Incl.
50-50 Tin- Lead ⁽²⁾	100	200	175	150
	150	150	125	100
	200	100	90	75
	250	85	75	50
95-5 Tin- Antimony	100	500	400	300
	150	400	350	275
	200	300	250	200
	250	200	175	150
Brazing Filler Metals Melting at or Above 1000°F and Not Over 1400°F	Pressure-temperature ratings consistent with the materials and procedures employed.			

Maximum Working Pressure, bar, gage

Solder Used in Joints	Working Temperatures Deg. C	1/4 to 1 inch Incl.	1 1/4 to 2 inch Incl.	2 1/2 to 3 inch Incl.
50-50 Tin- Lead ⁽²⁾	38	13.8	12.1	10.3
	66	10.3	8.6	6.9
	94	6.9	6.2	5.2
	121	5.9	5.2	3.4
95-5 Tin- Antimony	38	34.5	27.6	20.7
	66	27.6	24.1	19.0
	94	20.7	17.2	13.8
	121	13.8	12.1	10.3
Brazing Filler Metals Melting at or Above 540°C and Not Over 760°C	Pressure-temperature ratings consistent with the materials and procedures employed.			

1 bar = 10⁵ Pa.

⁽¹⁾Soldering is defined as "A group of welding processes which produces coalescence of materials by heating them to a suitable temperature and by using a filler metal having a liquidus not exceeding 840°F (450°C) and below the solidus of the base materials. The filler metal is distributed between the closely fitted surfaces of the joint by capillary attraction."

⁽²⁾ASTM B32 Alloy Grade 50A.

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ANNEX B

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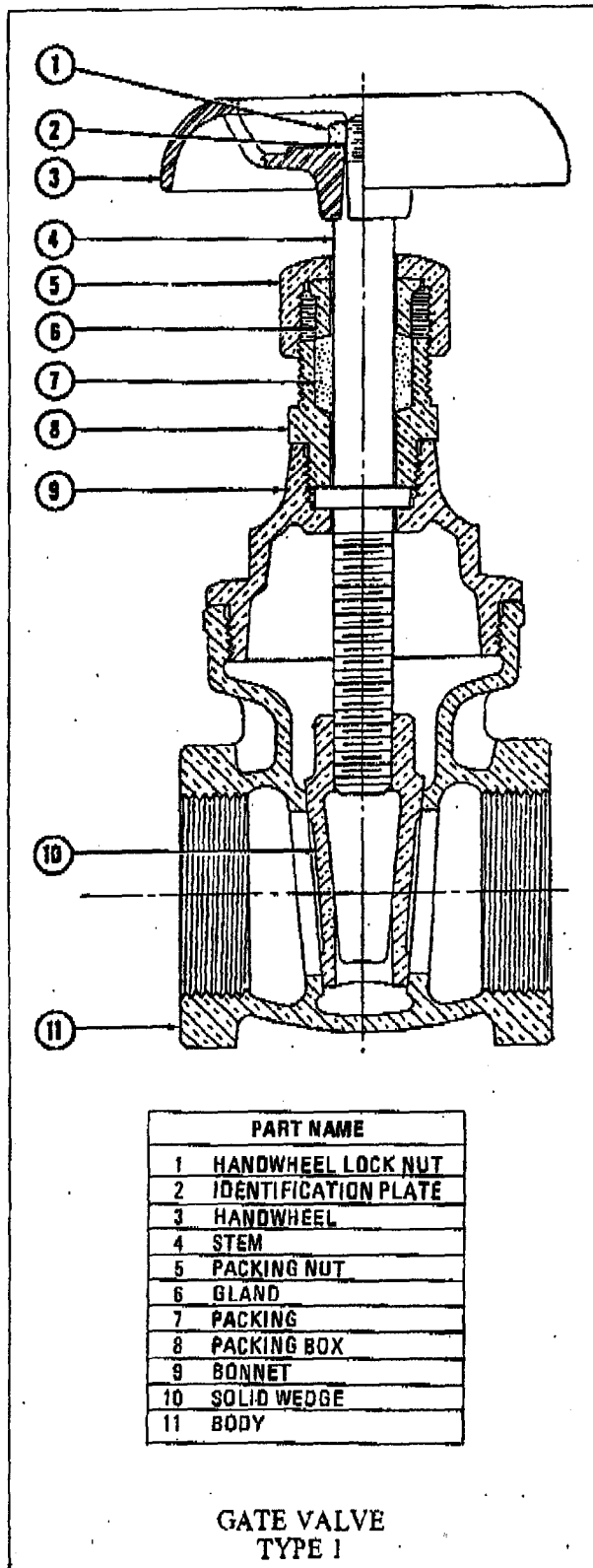


Figure B1

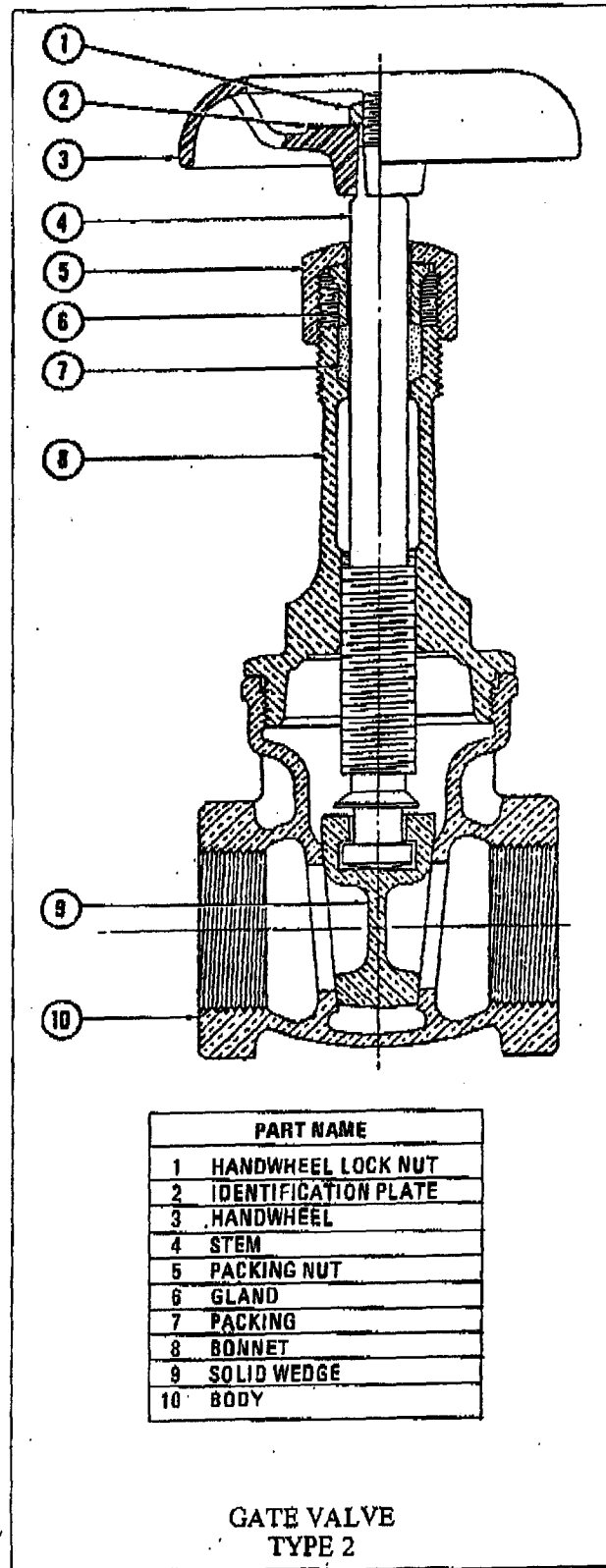


Figure B2

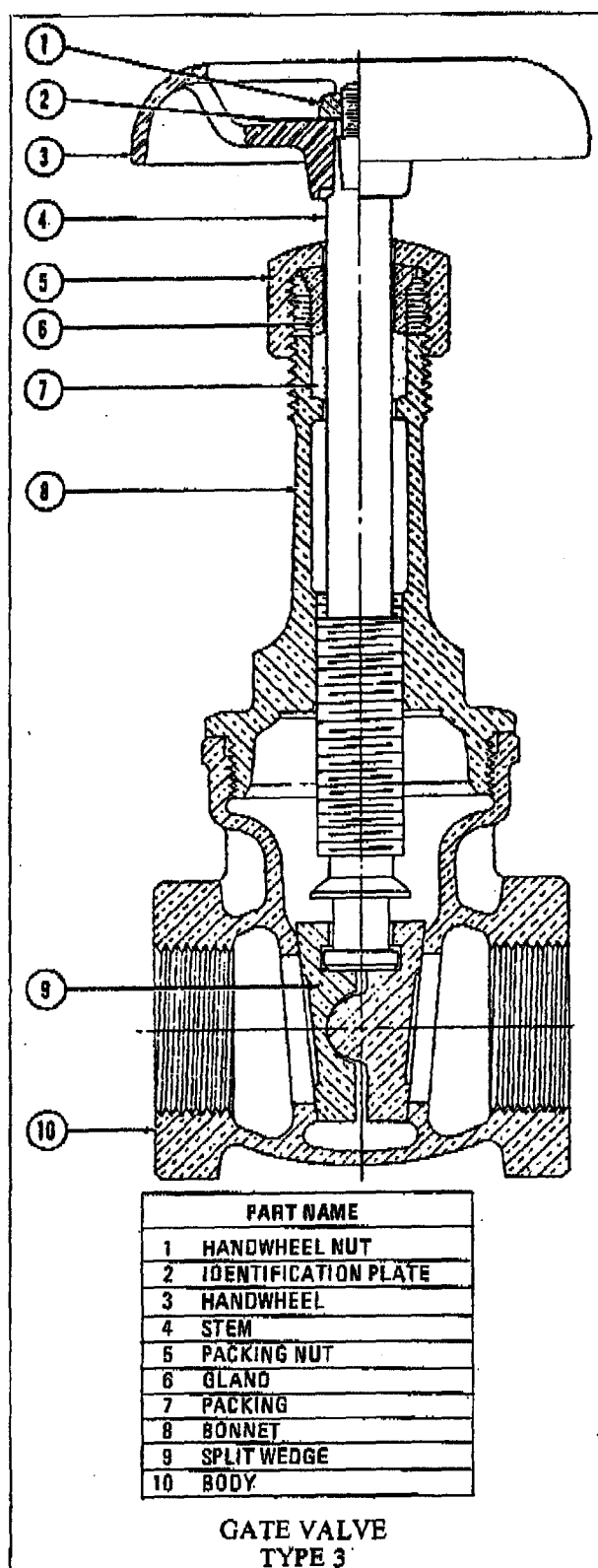


Figure B3

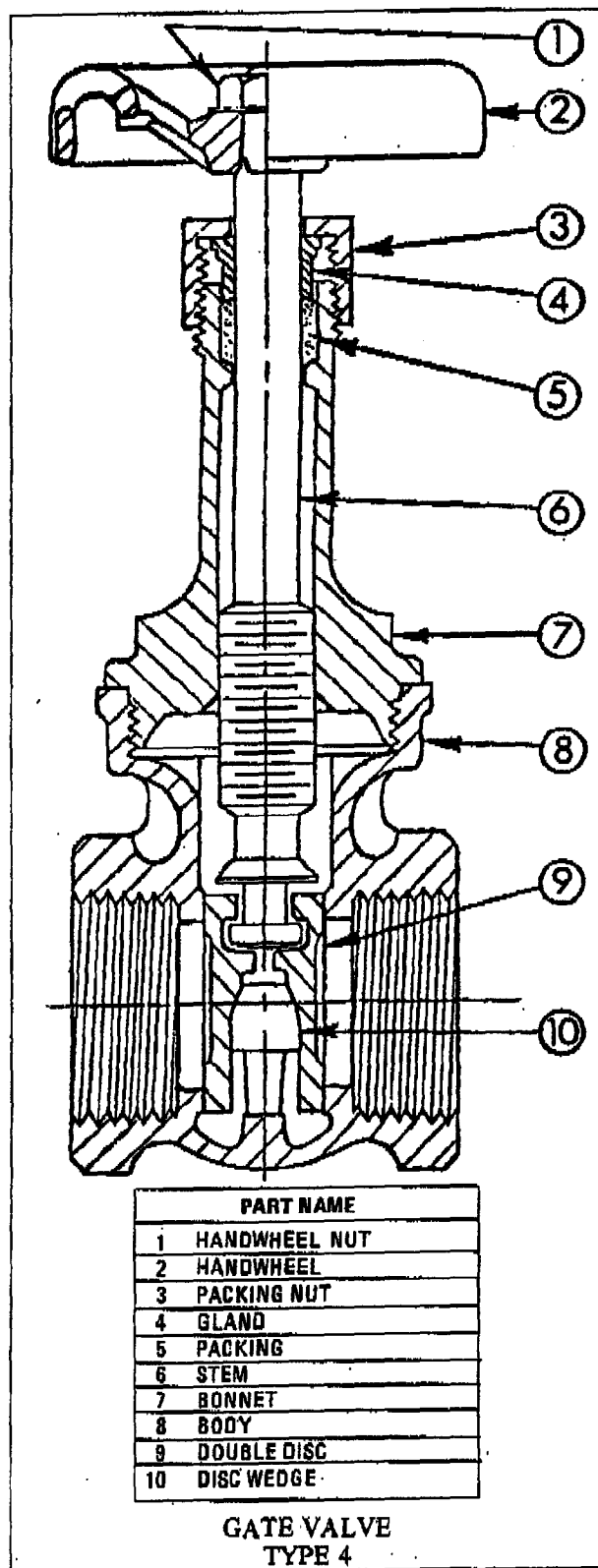
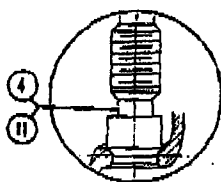
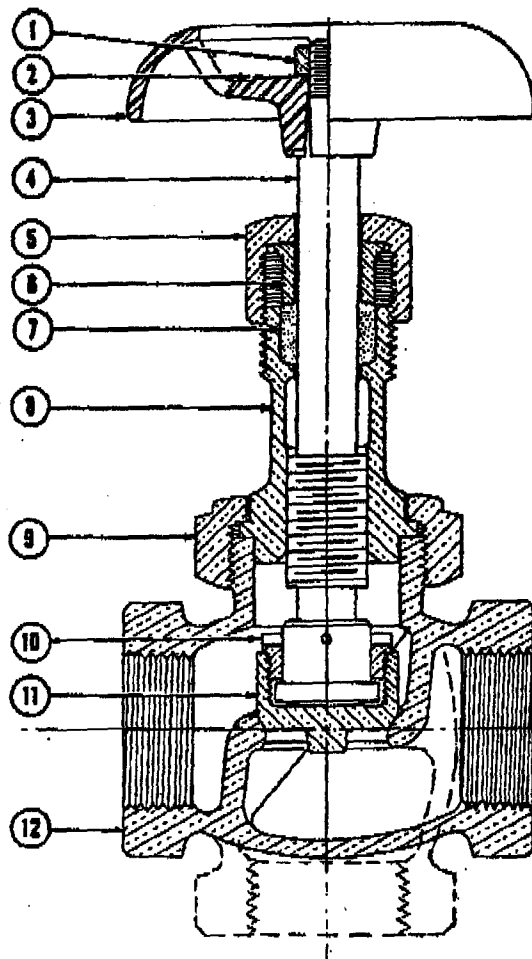


Figure B4



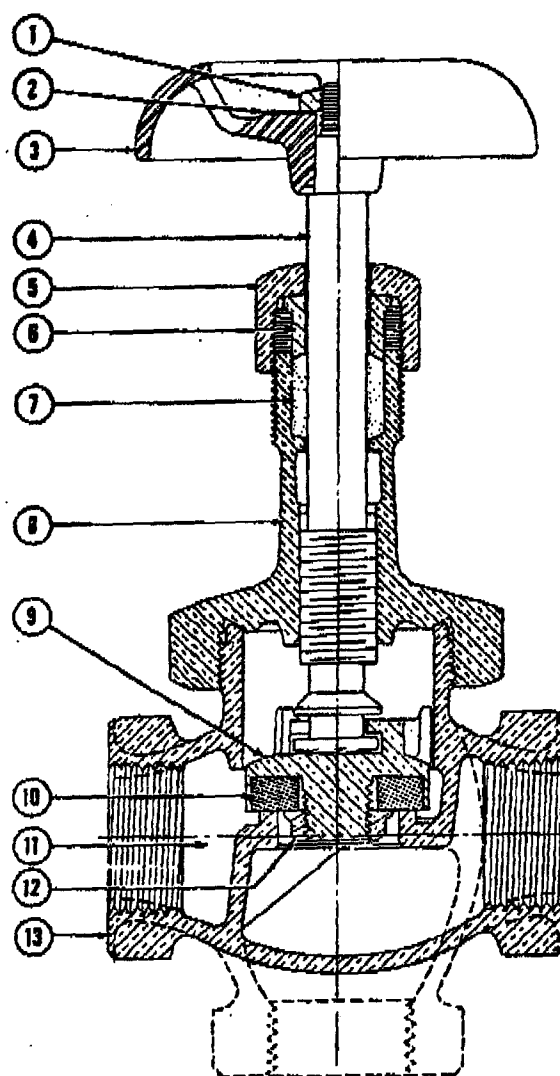
STEM & DISC
1/4"-1/2" VALVES

PART NAME	
1	HANDWHEEL LOCK NUT
2	IDENTIFICATION PLATE
3	HANDWHEEL
4	STEM
5	PACKING NUT
6	GLAND
7	PACKING
8	BONNET
9	UNION BONNET RING
10	LOCK NUT
†11	DISC
12	BODY

†1/4"-1/2" may have integral stem

GLOBE AND ANGLE VALVES
TYPE 1

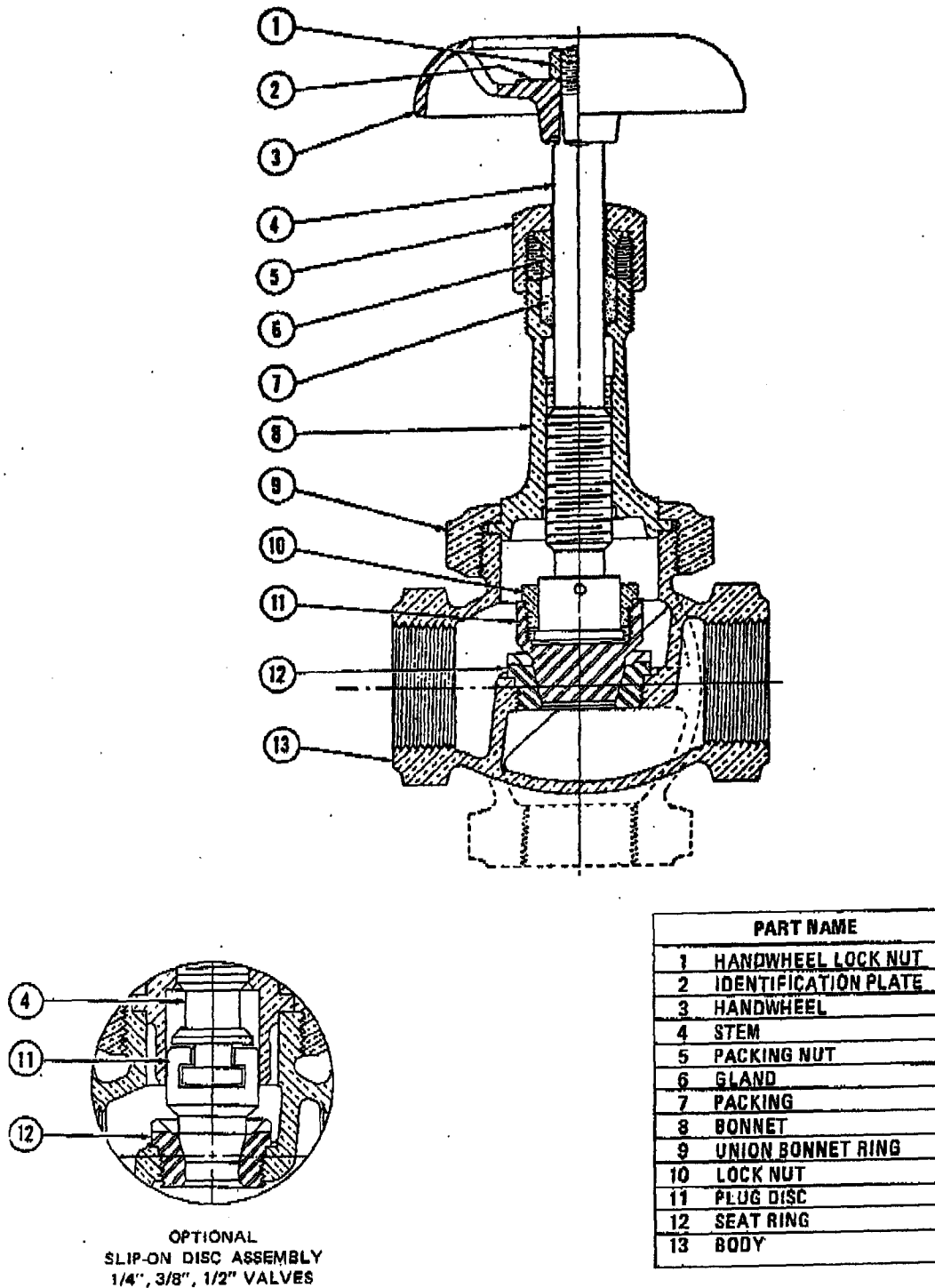
Figure B5



PART NAME	
1	HANDWHEEL LOCK NUT
2	IDENTIFICATION PLATE
3	HANDWHEEL
4	STEM
5	PACKING NUT
6	GLAND
7	PACKING
8	BONNET
9	DISC HOLDER
10	DISC
11	DISC PLATE (not shown)
12	DISC NUT
13	BODY

GLOBE AND ANGLE VALVES
TYPE 2

Figure B6



GLOBE AND ANGLE VALVES
TYPE 3

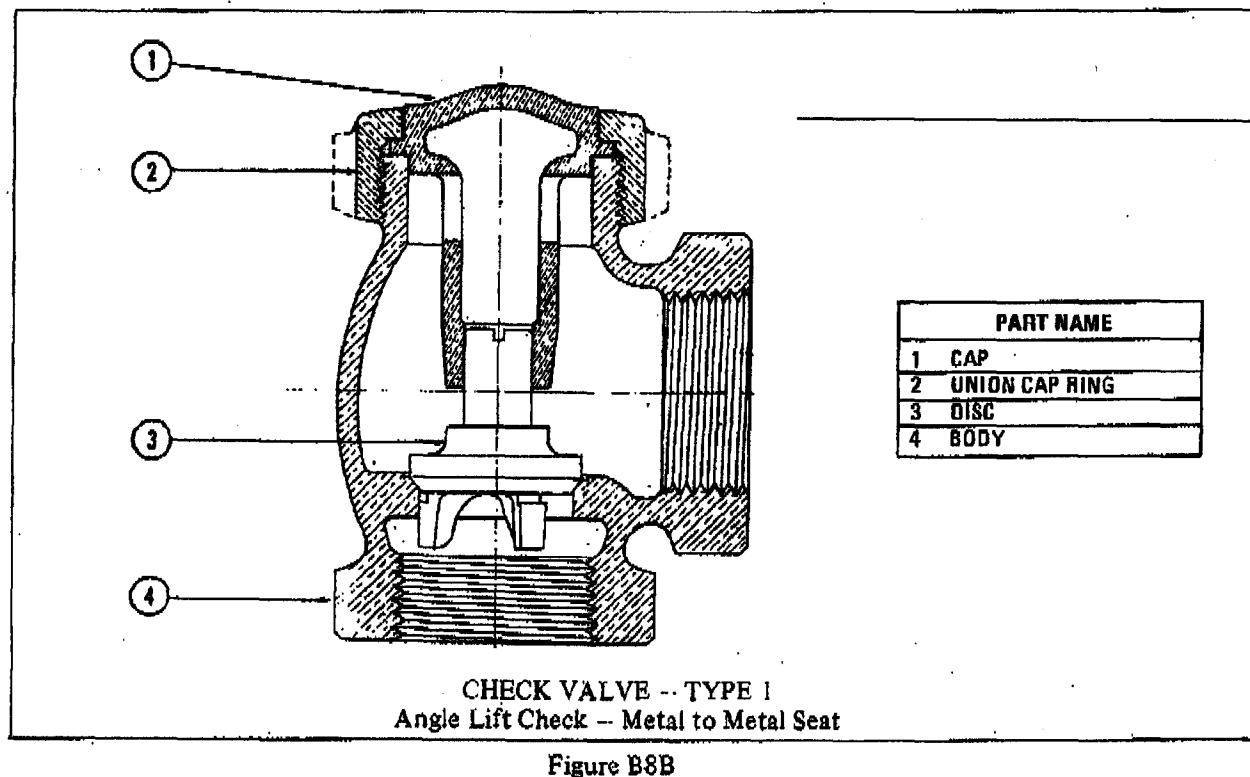
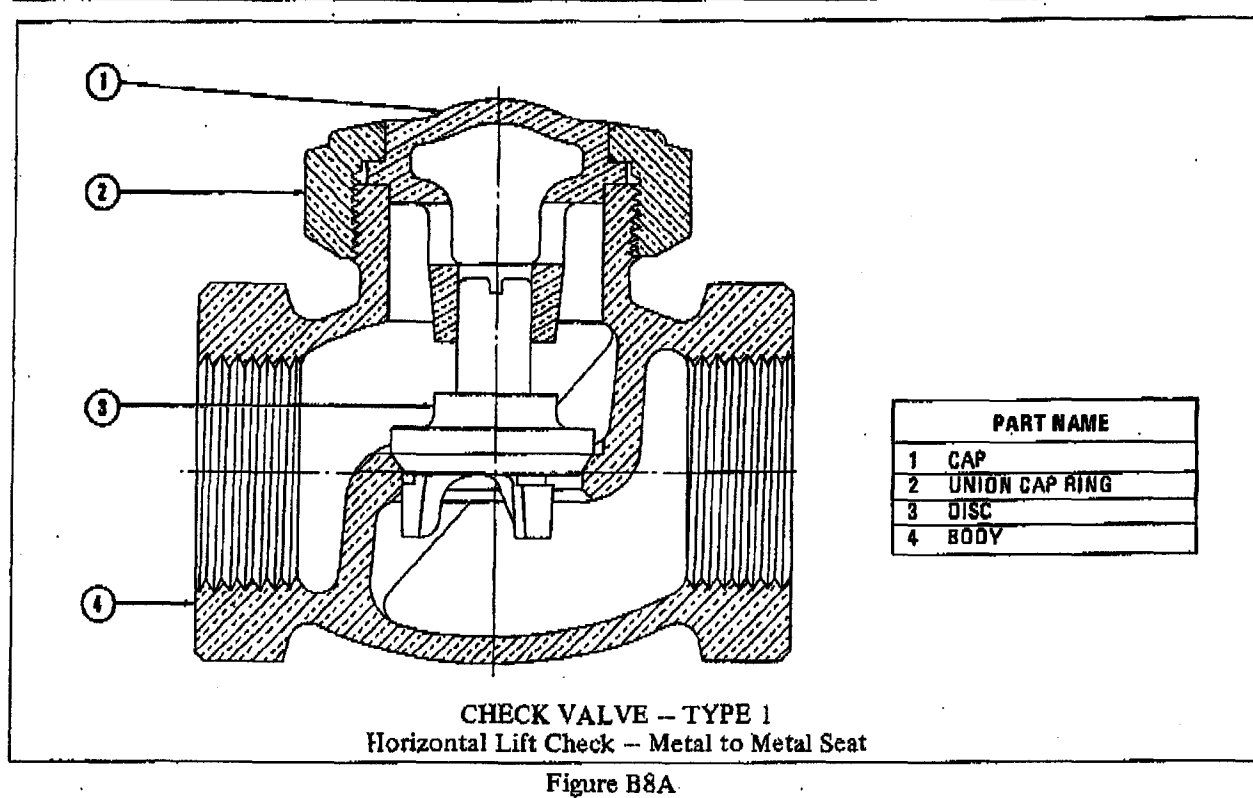
Figure B7

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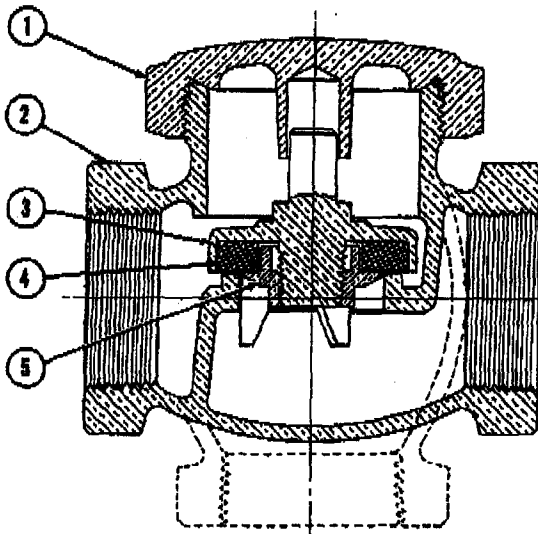
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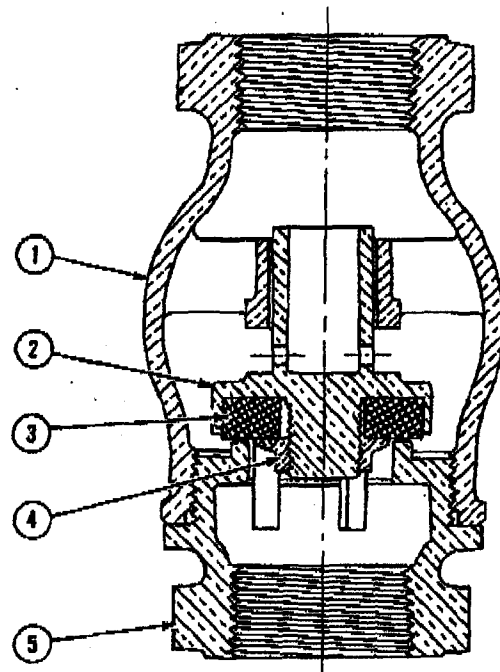
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PART NAME	
1	CAP OR COVER
2	BODY
3	DISC HOLDER
4	DISC
5	DISC GUIDE NUT

**CHECK VALVE
TYPE 2**
Horizontal and Angle lift Check
Composition to Metal Seat

Figure B9A



PART NAME	
1	BODY
2	DISC HOLDER
3	DISC
4	DISC GUIDE NUT
5	SCREW-IN HUB

**CHECK VALVE
TYPE 2**
Vertical Lift Check
Composition to Metal Seat

Figure B9B

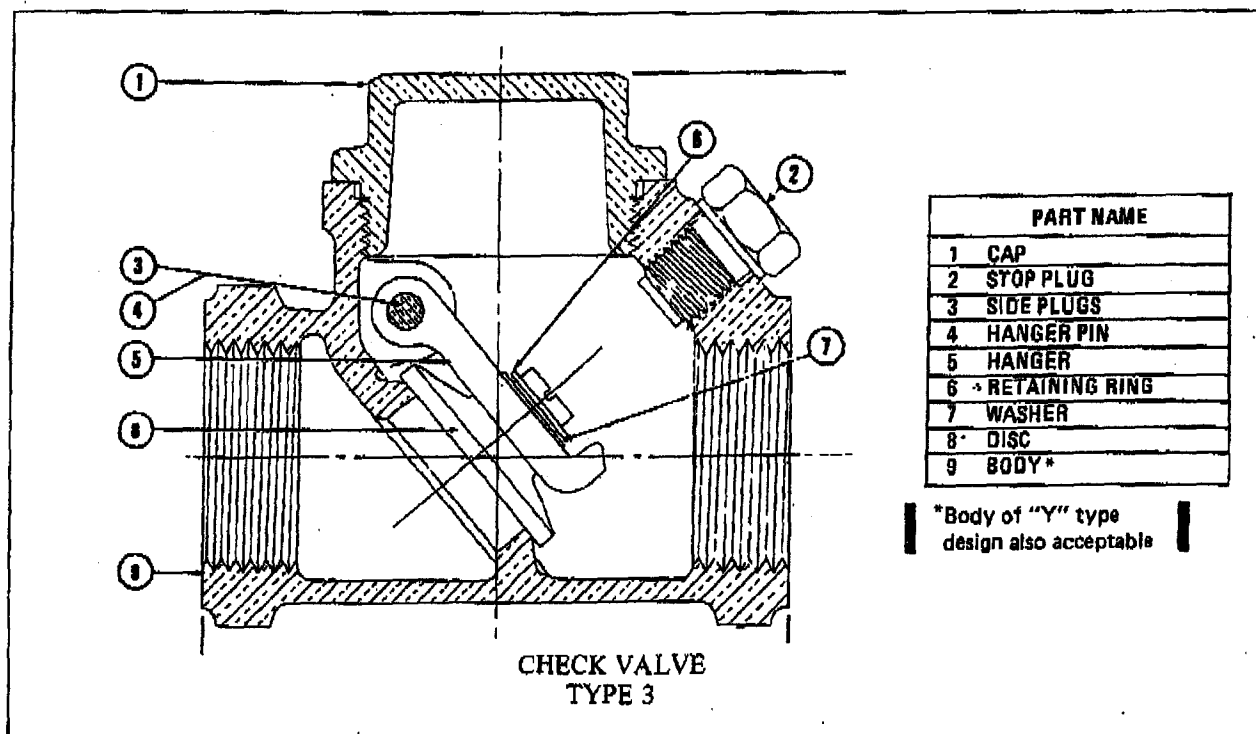


Figure B10

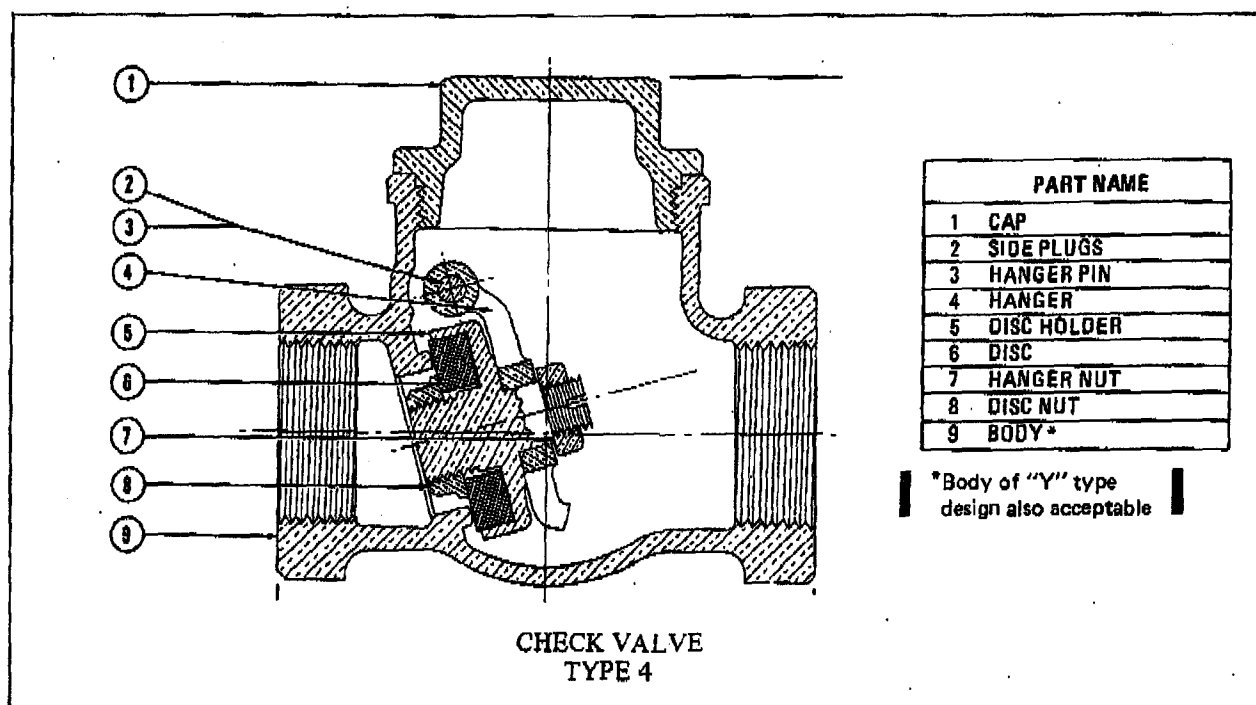


Figure B11

ANNEX C

Metric Equivalents

- I. This annex contains the metric version of the following Pressure-Temperature Rating, Table C-1.
- II. Pressure-Temperature Rating, Table 1: The table in this annex was developed by using the equation of the P-T curve between 65 deg. C and 208 deg. C or 288 deg. C and calculating the pressure in bars (gage) for the temperatures listed in Table C 1 of this annex. The conversion unit for 1 bar is equal to 14.5038 pounds per square inch.
- III. Conversion of Dimensions to Metric Equivalents:
 - A. The dimensions listed below, which are usually listed as two place decimals in the standards, shall be considered to be fractions when converting the dimension – Handwheel diameter.
 - B. All other decimals shall be considered to be exact decimal dimensions for the purposes of this conversion. Examples: stem diameters, length of pipe threads, depth of thread chamber, etc.
 - C. Significant Figures: The following rules shall be applied for rounding the metric equivalents calculated in accordance with A and B above.
 1. Fractions – round to nearest mm (25).
 2. Decimals – round to one decimal place (25.0).

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TABLE C 1 - PRESSURE - TEMPERATURE RATINGS - METRIC UNITS

PRESS CLASS	PRESSURE -- bar ³							
	125	150		200	300			350
END CONN	THD	THD	FLG ²	THD	THD ⁵	THD	FLG ²	THD
TEMP. ¹ deg. C	MATERIAL							
	ASTM B-62			ASTM B-61				
-30 To 65	13.8	20.6	15.5	27.6	69.0	41.4	34.5	69.0
75	13.4	19.9	15.2	27.0	67.0	40.6	33.8	67.2
100	12.5	18.1	14.2	25.4	61.6	38.3	32.3	62.0
125	11.6	16.3	13.3	23.9	56.1	36.0	30.8	57.0
150	10.7	14.5	12.4	22.5	50.6	33.6	29.2	52.0
175	9.8	12.7	11.5	20.8	45.2	31.3	27.6	47.0
200	8.9	10.9	10.6	19.2	39.7	29.0	26.1	42.0
208	8.6	10.3	10.3	---	---	---	---	---
225	---	---	---	17.7	34.3	26.6	24.5	36.8
232	8.2 ⁴	10.0 ⁴	---	---	---	---	---	---
250	---	---	---	16.2	28.8	24.3	23.0	30.8
275	---	---	---	14.6	23.4	22.0	21.4	26.7
288	---	---	---	13.8	20.7	20.7	20.7	24.1

Notes: 1 - For lower temperatures, See Paragraph 2.5.

2 - P-T Ratings - ANSI B16.24.

3 - Refer to Paragraph 2.4 for safe P-T Rating for solder-joint pipe systems.

4 - Some codes (i.e. - ASME BPVC, Section I) limit the rating temperature of the indicated material to 208° C.

5 - Alternate ratings for valve size 1/8 - 2 having threaded ends and union ring body-bonnet joints.

ANNEX D
UNS DESIGNATION

This annex provides the unified numbering system's designation (UNS No.) for the ASTM Standards and the Federal Specifications that are referenced in Table 2 – List of Material Specifications.

<u>ASTM STDS.</u>	<u>UNS No.</u>
A494-GR M35	---
B16-CA360	C36000
B21-CA464	C46400
B21-CA482	C48200
B61-CA922	C92200
B62-CA836	C83600
B99-CA651	C65100
B124-CA377	C37700
B124-CA675	C67500
B140-CA320	C32000
B148-CA956	C95600
B150-CA642	C64200
B282 Type 2	---
B371-CA694	C69400
B371-CA697	C69700
B584-CA844	C84400
B584-CA864	C86400
B584-CA874	C87400
B584-CA875	C87500
B584-CA876	C87600
<u>FEDERAL SPECS.</u>	<u>UNS NO.</u>
QQ-C-390 Alloy C2-CA865	C86500
QQ-C-390 Alloy D4-CA922	C92200
QQ-C-465 Alloy 614-CA614	C61400
QQ-C-591 Alloy 651-CA651	C65100

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ANNEX E REFERENCE STANDARDS

This annex is an integral part of this Standard Practice which is placed after the main text for convenience.

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

ASME Publications (Approved as American National Standards)

ANSI B2.1-1968	Pipe Threads (Except Dryseal)
ANSI B16.18-1978	Cast Copper Alloy Solder-Joint Pressure Fittings
ANSI B16.24-1979	Bronze Flanges and Flanged Fittings, Class 150 and 300

ASTM Publications

ASTM A494-76	Specification for Nickel and Nickel Alloy Castings
ASTM B16-78	Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines
ASTM B21-78	Specification for Naval Brass Rod, Bar, and Shapes
ASTM B61-76	Specification for Steam or Valve Bronze Castings
ASTM B62-76	Specification for Composition Bronze or Ounce Metal Castings
ASTM B99-77	Specification for Copper-Silicon Alloy Wire for General Purposes
ASTM B124-78	Specification for Copper and Copper-Alloy Forging Rod, Bar and Shapes
ASTM B140-74	Specification for Copper, Zinc, Lead (Leaded Red Brass or Hardware Bronze) Rod, Bars and Shapes
ASTM B148-78	Specification for Aluminum-Bronze Sand Castings
ASTM B150-78	Specification for Aluminum Bronze Rod, Bar and Shapes
ASTM B282-70	Specification for Sintered Brass Structural Parts
ASTM B371-74a	Specification for Copper-Zinc-Silicon Alloy Rod
ASTM B584-78	Specification for Copper Alloy Sand Castings for General Applications

MSS Publications

MSS SP-6-1974	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
MSS SP-25-1978	Standard Marking System for Valves, Fittings, Flanges and Unions

Federal Specifications

QQ-C-390	Copper Alloy Castings
QQ-C-465	Copper-Aluminum Alloys
QQ-C-591	Copper-Silicon, Copper-Zinc-Silicon & Copper-Nickel-Silicon Alloys

Publications of the following organizations appear on above list:

ASME	The American Society of Mechanical Engineers 345 East 47th Street, New York, New York 10017
ASTM	American Society for Testing and Material 1916 Race Street, Philadelphia, Pennsylvania 19103
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 5203 Leesburg Pike, Suite 502, Falls Church, Virginia 22041

Publications appearing above which have been approved as American National Standards may also be obtained from:

ANSI	American National Standards Institute, Inc. 1430 Broadway, New York, New York 10018
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