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An American National Standard

Standard Specification for Hand-Operated, Globe-Style Valves for Gas (Except Oxygen Gas) and Hydraulic Systems[1]

This standard is issued under the fixed designation F1794; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—Keywords were added editorially in September 2016.

1. Scope

1.1 This specification covers the design, construction, testing, and operating requirements for hand-operated, quick-change cartridge trim, in-line body and angle-body, globe-style valves for use in gas (except oxygen gas) and hydraulic systems. These valves may be used for on-off, or throttling applications, or both.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F992 Specification for Valve Label Plates

2.2 *ANSI Standards:*[3]

ANSI B1.1 Unified Screw Threads (UN and UNR Thread Form)

ANSI B1.20.1 Pipe Threads, General Purpose (Inch)

ANSI B16.11 Forged Steel Fittings, Socket-Welding and Threaded

ANSI B16.25 Buttwelding Ends

ANSI B16.34 Valves—Flanged, Threaded, and Welded End

2.3 *Military Standards and Specifications:*[4]

MIL-STD-167-1 Mechanical Vibrations of Shipboard Equipment (Type I—Environmental and Type II—Internally Excited)

MIL-STD-740-1 Airborne Noise Measurements and Acceptance Criteria of Shipboard Equipment

MIL-S-901 Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for

MIL-F-1183 Fittings, Pipe, Cast Bronze, Silver-Brazing, General Specification for

2.4 *Government Drawings:*[4]

Naval Sea Systems Command (NAVSEA)

NAVSEA 803-1385884 Unions, Fittings and Adapters Butt and Socket Welding 6000 PSI, WOG, NPS

NAVSEA 803-1385943 Unions, Silver Brazing 3000 PSI, WOG, NPS, for UT Inspection

NAVSEA 803-1385946 Unions, Bronze Silver Brazing, WOG for UT Inspection

3. Terminology

3.1 *Definitions:*

3.1.1 *bubble-tight*—no visible leakage over a 3-min period using either water submersion or the application of bubble fluid for detection.

3.1.2 *external leakage*—leakage from the valve that escapes to atmosphere.

3.1.3 *flow capacity*—the ability of a valve to pass flow under any given set of pressure conditions. The flow capacity of a valve is directly related to its Flow Coefficient (C_v). The Flow coefficient is the quantity of water passing through a valve, expressed in gallons/minute (litres/minute), when 1 psi (6.895 kPa) pressure drop at 60°F (16°C) is applied across the valve.

3.1.4 *globe-style valves*—a basic control valve type that gets its name from the globular shape of its body with an internal bridgewall construction. It normally uses a basic rising stem/plug for the closure member.

3.1.5 *hydrostatic shell test pressures*—the hydrostatic test pressures that the valve is required to withstand without damage. Valve operation is not required during application of shell test pressure, but the valve must meet all performance requirements after the shell test pressure has been removed.

3.1.6 *internal leakage*—leakage from higher pressure to lower pressure portions of the valve.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

3.1.7 *operating pressures*—the pressures within the valve during service.

3.1.8 *pressure ratings*—the pressure ratings of the valve shall be as defined in the documents listed in Table 1. The pressure ratings (also called pressure-temperature ratings) establish the maximum allowable working (service) pressures of a component (valve, end connections, and so forth) at various temperatures.

3.1.9 *quick-change cartridge trim*—a construction that facilitates rapid and reliable seat-ring/seat removal and replacement by retaining the seat-ring/seat in the valve cartridge, as opposed to a seat-ring which is threaded, welded, brazed, or made integral with the valve body.

3.1.10 *seat tightness*—the ability of a valve to prevent internal leakage from the valve-inlet to the valve-outlet.

4. Classification

4.1 Valves shall be of the following types, styles, sizes, pressure ratings, and end connections, as specified in Section 5.

4.1.1 *Types*—Valves shall have either Type I (angle body construction) or Type II (inline body construction).

4.1.2 *Styles*—Valves shall be either Style I (shut-off valves) or Style 2 (throttling valves).

4.1.3 *Sizes*—Valve sizes shall be ⅛ NPS (10.2 mm), ¼ NPS (13.5 mm), ⅜ NPS (17.2 mm), ½ NPS (21.3 mm), ¾ NPS (26.9 mm), 1 NPS (33.7 mm), 1¼ NPS (42.4 mm), 1½ NPS (48.3 mm), and 2 NPS (60.3 mm).

4.1.4 *Pressure Ratings*—Valves shall have a pressure rating selected from those listed in Table 1 and specified in Section 5. The inlet and outlet pressure ratings of the valve shall be identical for any given valve.

4.1.5 *End Connections*—Valves shall have end connections selected from those listed in Table 1 and specified in Section 5. The inlet and outlet end connections of the valve shall be identical for any given valve.

TABLE 1 End Connections and Pressure Ratings for Valves

Type of End Connection	Pressure Rating	Applicable Documents for Dimensional Details of End Connections
Butt-welded	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ANSI B16.25
Socket-welded	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ANSI B16.11
Threaded (tapered pipe thread)	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, or 2500	ANSI B1.20.1 and ANSI B16.11
Union-end,[A] Silver-brazed	MIL-F-1183 (O-ring type) 400 lb/in.^{2} (2.758 MPa)	MIL-F-1183 (O-ring type) 400 lb/in.^{2} (2.758 MPa)
Union-end,[A] Silver-brazed	803-1385946 1500 lb/in.^{2} (10.342 MPa)	803-1385946 1500 lb/in.^{2} (10.342 MPa)
Union-end,[A] Silver-brazed	803-1385943 3000 lb/in.^{2} (20.684 MPa)	803-1385943 3000 lb/in.^{2} (20.684 MPa)
Union-end,[A] Butt/socket weld	803-1385884 6000 lb/in.^{2} (41.369 MPa)	803-1385884 6000 lb/in.^{2} (41.369 MPa)
Other, as specified	As specified	As specified

[A] For union inlet and outlet end connections, only the pertinent dimensions listed in the applicable documents (Military Specification or NAVSEA Requirements) shall apply. The valve shall be supplied with the thread-pieces only, without the tail-pieces and union-nuts.

5. Ordering Information

5.1 Ordering documentation for valves under this specification shall include the following information, as required to describe the equipment adequately.

5.1.1 ASTM designation and year of issue,

5.1.2 Valve type (see 4.1.1),

5.1.3 Valve style (see 4.1.2),

5.1.4 Valve size (see 4.1.3),

5.1.5 Valve pressure rating (see 4.1.4),

5.1.6 Valve end connections (see 4.1.5),

5.1.7 Line medium,

5.1.8 Temperature of line medium,

5.1.9 Supplementary requirements, if any (see S1 through S4),

5.1.10 Maximum vibration frequency and displacement amplitude, if other than specified (see S1.4), and

5.1.11 Maximum permissible noise level, if other than specified (see S1.5).

6. Valve Construction

6.1 Valves shall incorporate the design features specified in 6.1.1 – 6.1.17.

6.1.1 *General Requirements:*

6.1.1.1 Valves furnished under this specification shall be soft-seated, globe-style valves using a cartridge in which all working parts including the seat are removable as an assembly.

6.1.2 *Materials of Construction*—Material requirements for these valves shall be as follows: The pressure containing envelope shall be 300 series corrosion-resistant steel, nickel-copper (70-30), nickel-aluminum-bronze, or bronze. Internal parts in contact with the line media shall be 300 series corrosion-resistant steel, nickel-copper (70-30), copper-nickel (70-30), bronze, nickel-aluminum-bronze, or naval brass. Other materials not listed above may be selected to assure compatibility with the line medium, weldability, and to provide corrosion resistance without requiring painting, coating, or plating. Materials for contacting parts shall be selected to minimize electrolytic corrosion and galling.

6.1.3 *Soft-Seating Insert*—A soft-seating (non-metallic) insert, if applicable, shall be field replaceable and incorporated in the valve plug. Soft-seating inserts shall be protected from direct flow impingement, excessive loading and extrusion, or any other effect jeopardizing their useful life. Soft-seating inserts shall be of the simplest practical configuration to facilitate emergency replacement manufacture where necessary.

6.1.4 *Pressure Envelope*—The valve shall be designed to pass a hydrostatic shell test at a pressure of at least 1.5 times the 100°F (38°C) pressure rating of the valve without any damage.

6.1.5 *Threads*—Threads shall be as specified in ANSI B1.1. Where necessary, provisions shall be incorporated to prevent the accidental loosening of threaded parts. The design shall be such that standard wrenches can be used on all external bolting. Lock-wire shall not be used. Any exposed threads shall be protected by plastic caps for shipping.

6.1.6 *Accessibility*—All internal parts of the valve shall be accessible for adjustment or service, without removing the valve body from the line.

6.1.7 *Interchangeability*—The valve, including all associated piece parts, shall have part number identity, and shall be replaceable from stock or the manufacturer on a nonselective and random basis. Parts having the same manufacturer's part number shall be directly interchangeable with each other with respect to installation (physical) and performance (function). Physically interchangeable assemblies, components, and parts are those which are capable of being readily installed, removed, or replaced without alteration, misalignment, or damage to parts being installed or to adjoining parts. Fabrication operations such as cutting, filing, drilling, reaming, hammering, bending, prying, or forcing shall not be required.

6.1.8 *Nonmetallic Element Interchangeability*—Nonmetallic elements, including but not limited to, seat rings, soft-seating inserts, cushions, and O-rings shall be treated as separately identified and readily replaceable parts.

6.1.9 *Maintainability*—Valve maintenance shall require standard tools to the maximum extent possible. Any special tools required for maintenance shall be identified, and shall be supplied with the valve.

6.1.10 *Reversibility*—Seat inserts shall not be physically reversible unless they are also functionally reversible to preclude incorrect assembly.

6.1.11 *Adjustments*—There shall be no adjustments required in the valve during or after assembly.

6.1.12 *Bidirectional Operation and Bubbletight Shut-Off*—The valve shall be capable of operation and bubbletight shut-off with a differential pressure equal to the rated pressure applied across the valve in either direction of flow.

6.1.13 *Guiding*—The valve poppet shall be guided to prevent binding or seizing, and to ensure proper seating, under all operating conditions. Proper alignment of all internal operating parts shall be maintained with interchangeable parts and under all tolerance stack-up conditions.

6.1.14 *Valve Operating Force*—The maximum permissible total tangential force required on the handwheel/handle for operating or seating/unseating the valve shall not exceed 50 lb (222 N), when the valve is subjected to a differential pressure equal to the rated pressure applied across the valve in either direction of flow.

6.1.15 *Pressurization Rate*—To prevent the possibility of auto-ignition, the valve shall be capable of being operated to limit the rate of downstream pressure buildup in a depressurized volume (with the rated pressure upstream) to 200 psi (1380 kPa) per second. Downstream volumes for this pressurization rate shall be taken as 10 pipe diameters.

6.1.16 *Operation*—The valve shall close by a clockwise rotation of handwheel/handle when viewed from directly over the handwheel/handle.

6.1.17 *Envelope Dimensions*—For union-end valves only, the overall envelope dimensions shall be as shown in Fig. 1 (angle body construction) or Fig. 2 (inline body construction), as applicable, and Table 2.

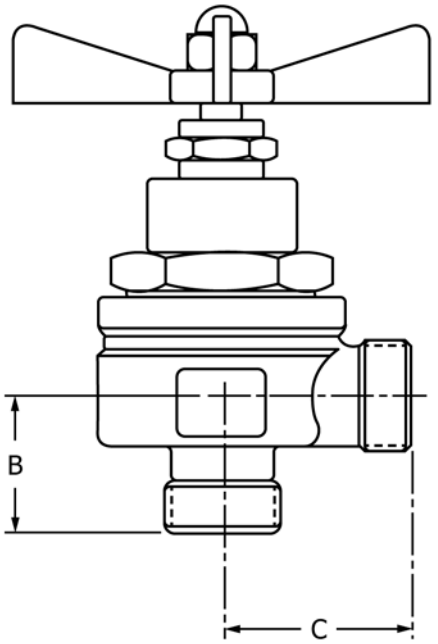

FIG. 1 Angle Body

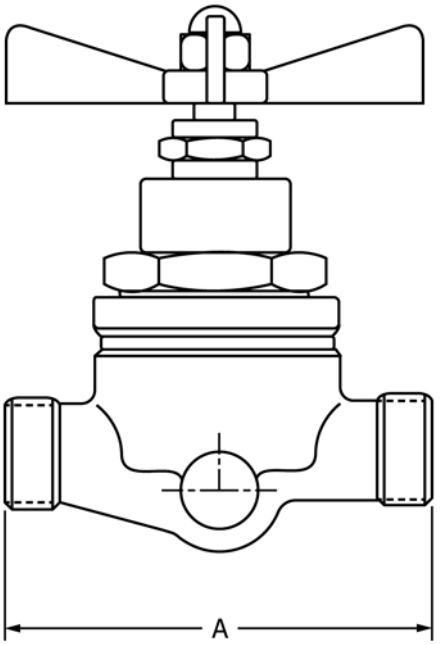

FIG. 2 Inline Body

7. Performance

7.1 Valves shall meet the performance requirements of 7.1.1 – 7.1.3.

7.1.1 *Flow Capacity*—The flow capacity of the valve, expressed in terms of C_v shall be equal or greater than the values shown in Table 3.

7.1.2 *Seat Tightness*—Valve shall be bubbletight at 1.1 times the 100°F (38°C) pressure rating in both directions when closed with a handwheel/handle force not exceeding that specified in 6.1.14 (or the manufacturer's published recommendations, when less).

TABLE 2 Envelope Dimensions (for Union-End Valves Only)

Valve Size, NPS	Envelope Dimensions, ±0.015 in. (±0.38 mm)		
	Dim. A	Dim. B	Dim. C
⅛ (10.2 mm)	2.750 (69.85)	1⅛ (28.59)	1⅜ (34.92)
¼ (13.5 mm)	3.375 (85.73)	1½ (38.10)	1 11/16 (42.86)
⅜ (17.2 mm)	4.000 (101.60)	1⅝ (41.28)	2 (50.40)
½ (21.3 mm)	4.250 (107.95)	1¾ (44.45)	2⅛ (53.98)
¾ (26.9 mm)	4.625 (117.75)	2⅜ (60.33)	2 5/16 (59.05)
1 (33.7 mm)	5.250 (133.35)	2¾ (69.85)	2⅝ (66.65)
1¼ (42.4 mm)	6.500 (228.60)	3 (76.20)	3¼ (82.55)
1½ (48.3 mm)	9.000 (241.30)	4 (101.60)	4 (101.60)
2 (60.3 mm)	9.500 (241.30)	4.500 (114.30)	4.500 (114.30)

TABLE 3 Flow Coefficient (C_v)

Valve Size NPS	Flow Capacity, C_v , gpm	Flow Capacity, C_v , litres/m
⅛ (10.2 mm)	0.5	1.89
¼ (13.5 mm)	1.1	4.16
⅜ (17.2 mm)	2.3	8.71
½ (21.3 mm)	3.1	11.73
¾ (26.9 mm)	5.0	18.93
1 (33.7 mm)	8.9	33.69
1¼ (42.4 mm)	13.8	52.24
1½ (48.3 mm)	22.0	83.28
2 (60.3 mm)	36.0	136.27

7.1.3 *External Leakage*—Valve external leakage shall be bubbletight at its 100°F (38°C) pressure rating.

8. Tests Required

8.1 Each valve shall pass the tests outlined in 8.1.1 – 8.1.4.

8.1.1 *Visual Examination*—The valve shall be examined visually to determine conformance with the ordering data and workmanship without disassembly.

8.1.2 *Hydrostatic Shell Test*—The valve shall be hydrostatically tested with water by applying test pressures equal to 1.5 times the 100°F (38°C) pressure rating to the inlet and outlet ports (with the valve in the open position) to check the structural integrity of the valve. Pressure shall be applied for three minutes. Air or nitrogen may be used in lieu of water, providing appropriate safety precautions are taken to minimize the risk associated with the use of a compressible fluid. There shall be no external leakage, permanent distortion, or structural failure.

8.1.3 *Seat Tightness Test*—The valve shall be seated with an applied handwheel/handle force not exceeding that specified in 6.1.14 (or the manufacturer's published recommendations, when less). Air or nitrogen at 1.1 times the 100°F (38°C) pressure rating of the valve shall be used for seat tightness test, using bubble fluid or immersing the outlet, or a line from the outlet, under water. The valve shall show no visible evidence of leakage over a 3-min period. The valve shall be tested in both directions of flow to assure bidirectional seat tightness. For valves used for helium or helium mixture service, the testing medium shall be helium or helium/nitrogen mixture.

8.1.4 *External Leakage Test*—With the valve in the partially open position, air or nitrogen shall be applied at a test pressure equal to the 100°F (38°C) pressure rating of the valve to the inlet port, and the outlet port blanked off. External leakage shall be checked using bubble fluid, or by submerging the valve in water. There shall be no visible external leakage over a 3-min period. For valves used for helium or helium mixture service, the testing medium shall be helium or helium/nitrogen mixture.

9. Marking

9.1 *Identification Plate*—An identification plate of corrosion-resistant metal in accordance with Specification F992; Types I, II, III, or IV shall be permanently attached to the valve and shall include the following information (some or all information may instead be stamped, etched, or cast on the valve body):

9.1.1 Manufacturer's name,
9.1.2 ASTM designation and year of issue,
9.1.3 Manufacturer's model/part number,
9.1.4 Size, and
9.1.5 Pressure rating.

9.2 *Body Markings*—Valve body shall be marked per ANSI B16.34.

10. Quality Assurance System

10.1 The manufacturer shall establish and maintain a quality assurance system that will ensure all the requirements of this specification are satisfied. This system shall also ensure that all valves will perform in a similar manner to those representative valves subjected to original testing for determination of the operating and flow characteristics.

10.2 A written description of the quality assurance system the manufacturer will use shall be available for review and acceptance by the inspection authority.

10.3 The purchaser reserves the right to witness the production tests and inspect the valves in the manufacturer's plant to the extent specified on the purchase order.

11. Keywords

11.1 gas; globe; hand-operated; valve

SUPPLEMENTARY REQUIREMENTS

One or more of the following supplementary requirements S1, S2, S3, or S4 shall be applied only when specified by the purchaser in the inquiry, contract, or order. Details of those supplementary requirements shall be agreed upon in writing by the manufacturer and purchaser. Supplementary requirements shall in no way negate any requirement of the specification itself.

S1. Supplemental Tests

S1.1 Supplemental tests shall be conducted at a laboratory satisfactory to the customer and shall consist of the examination and tests selected from those specified in S1.1.1 through S1.1.6.

S1.1.1 *Operational Test*—The valve shall be attached to an air or nitrogen source at the rated pressure with flow through the valve over the seat. A needle valve shall be installed downstream to limit flow during cycling tests. The valve shall be cycled as follows:

(a) Cycle 50 times and then seat valve with the maximum seating force as specified per manufacturer's recommended published data. One cycle shall consist of one complete opening and closing.

(b) Allow valve to remain pressurized for 1 h in the seated condition.

(c) Repeat (*a*) and (*b*) above until valve has undergone 2500 cycles.

(d) After each 50 cycles, stem and seat leakage shall be checked.

(e) Seating, unseating, and running torques shall be noted during this test. Maximum valves should be within those listed in manufacturer's published data.

No lubrication shall be applied to the stem seal either before or during these tests.

S1.1.2 *Pressurization Rate Test*—With a test pressure equal to the 100°F (38°C) pressure rating applied upstream, and a depressurized downstream volume as specified in 6.1.15, the valve shall be operated to demonstrate its ability to meet the pressurization rate specified in 6.1.15.

S1.1.3 *Shock Test*—The valve shall be subjected to and meet the high-impact shock tests for Grade A, Class I as specified in MIL-S-901, pressurized with water, air, or nitrogen. The valve inlet shall be pressurized to a test pressure of the 100°F (38°C) pressure rating. There shall be no structural damage to the valve. There shall be no degradation to the performance capability of the valve.

S1.1.4 *Vibration Test*—The valve shall be vibration tested in accordance with Type I of MIL-STD-167-1 pressurized with air or nitrogen. The valve inlet shall be pressurized to the 100°F (38°C) pressure rating. At frequencies up to and including 33 Hz (unless otherwise specified in the ordering information, Section 5), there shall be no resonance in the range of frequency tested. There shall be no structural damage or degradation to the performance capability of the valve.

S1.1.5 *Noise Test*—The valve shall be tested for airborne noise in accordance with MIL-STD-740-1. The noise (sound pressure level) shall not exceed 85 db, unless otherwise specified in 5.0, observed at one-metre distance from the valve.

S1.1.6 *Post-Test Examination*—After completion of each or all of the tests specified in S1.1.1 through S1.1.5, the valve shall be disassembled and examined for any evidence of excessive wear, degradation, or impending damage or breakage.

S2. Technical Data Requirements

S2.1 *Drawings*—Assembly drawings or catalog sheets of the valve which clearly depict design shall be provided. The following information shall also be included as part of the drawings or catalog sheets:

S2.1.1 Bill of material listing specification, grade, condition, and any other data required to fully identify the properties of the materials proposed. This shall include identifications, material and size designations, shore hardness, and any other data necessary to fully identify the parts.

S2.1.2 In cases in which standard commercial or military parts are or can be used, these shall be appropriately identified.

S2.1.3 Outline dimensions, disassembly space, location, and size of end connections.

S2.1.4 Estimated weight and center of gravity (vertical, longitudinal, and transverse).

S2.1.5 Recommended assembly torques or equivalent procedures for making up all joints and threaded assemblies.

S2.2 *Technical Manuals*—Technical manuals shall provide a description, installation procedures, operation and maintenance instructions, and illustrated parts breakdown for the valve, organized as follows:

S2.2.1 *Chapter 1*—General Information and Safety Precautions.

S2.2.2 *Chapter 2*—Operation.

S2.2.3 *Chapter 3*—Functional Description.

S2.2.4 *Chapter 4*—Scheduled Maintenance.

S2.2.5 *Chapter 5*—Troubleshooting.

S2.2.6 *Chapter 6*—Corrective Maintenance.

S2.2.7 *Chapter 7*—Parts List.

S2.2.8 *Chapter 8*—Installation.

S2.3 In addition, the following shall be included as part of the technical manual content:

S2.3.1 The assembly drawings for the valve, supplemented by additional illustrations where necessary to adequately illustrate operation and maintenance. These additional illustrations may consist of blowouts, partial or full sections, and may eliminate extraneous lines and details to clarify the interaction of parts.

S2.3.2 Table listing wrench sizes and assembly torques (or other equivalent procedures) for making up all joints and threaded assemblies.

S2.3.3 Detailed disassembly and reassembly procedures. In addition to a section providing procedures for the complete disassembly and reassembly of the valve, maintenance, and

troubleshooting sections shall contain, or refer to, only the limited disassembly and reassembly required to accomplish each particular operation. This is intended to reduce the possibility of unnecessary disassembly and unnecessary disturbance of adjustments when performing specific or limited maintenance or troubleshooting operations.

S3. Quality Assurance

S3.1 *Scope of Work*—The written description of the quality assurance system shall include the scope and locations of the work to which the system is applicable.

S3.2 *Authority and Responsibility*—The authority and responsibility of those in charge of the quality assurance system shall be clearly established.

S3.3 *Organization* —An organizational chart showing the relationship between management and the engineering, purchasing, manufacturing, construction, inspection, and quality control groups is required. The purpose of this chart is to identify and associate the various organizational groups with the particular functions for which they are responsible. These requirements are not intended to encroach on the manufacturer's right to establish, and from time to time to alter, whatever form of organization the manufacturer considers appropriate for its work. Persons performing quality control functions shall have a sufficiently well-defined responsibility and the authority and the organizational freedom to identify quality control problems and to initiate, recommend, and provide solutions.

S3.4 *Review of Quality Assurance System*—The manufacturer shall ensure and demonstrate the continuous effectiveness of the quality assurance system.

S3.5 *Drawings, Design Calculations, and Specification Control*—The manufacturer's quality assurance system shall include provisions to ensure that the latest applicable drawings, design calculations, specifications, and instructions, including all authorized changes, are used for manufacture, examination, inspection, and testing.

S3.6 *Purchase Control*—The manufacturer shall ensure that all purchased material and services conform to specified requirements and that all purchase orders give full details of the material and services ordered.

S3.7 *Material Control*—The manufacturer shall include a system for material control that ensures the material received is properly identified and that any required documentation is present, identified to the material, and verifies compliance to the specified requirements. The material control system shall ensure that only the intended material is used in manufacture. The manufacturer shall maintain control of material during the manufacturing process by a system which identified inspection status of material throughout all stages of manufacture.

S3.8 *Manufacturing Control*—The manufacturer shall ensure that manufacturing operations are carried out under controlled conditions utilizing documented work instructions. The manufacturer shall provide for inspection, where appropriate, for each operation that affects quality or shall arrange an appropriate monitoring operation.

S3.9 *Quality Control Plan*—The manufacturer's quality control plan shall describe the fabrication operations, including examinations and inspections.

S3.10 *Welding*—The quality control system shall include provisions for ensuring that welding conforms to specified requirements. Welders shall be qualified to the appropriate standards and the qualification records shall be made available to the inspection authority if required.

S3.11 *Nondestructive Examination*—Provisions shall be made to utilize non-destructive examination, as necessary, to ensure that material and components comply with the specified requirements. Nondestructive examinations shall be authorized by their employer or qualified by a recognized national body, or both, and their authorizations/qualification records shall be made available to the inspection authority if required.

S3.12 *Nonconforming Items*—The manufacturer shall establish procedures for controlling items not in conformance with the specified requirements.

S3.13 *Heat Treatment*—The manufacturer shall provide controls to ensure that all required heat treatments have been applied. Means should be provided by which heat treatment requirements can be verified.

S3.14 *Inspection Status*—The manufacturer shall maintain a system for identifying the inspection status of material during all stages of manufacture and shall be able to distinguish between inspected and noninspected material.

S3.15 *Calibration of Measurement and Test Equipment*—The manufacturer shall provide, control, calibrate, and maintain inspection, measuring, and test equipment to be used in verifying conformance to the specified requirements. Such calibration shall be traceable to a national standard and calibration records shall be maintained.

S3.16 *Records Maintenance*—The manufacturer shall have a system for the maintenance of inspection records, radiographs, and manufacturer's data reports that describe the achievement of the required quality and the effective operation of the quality system.

S3.17 *Sample Forms*—The forms used in the quality control system and any detailed procedures for their use shall be available for review. The written description of the quality assurance system shall make reference to these forms.

S3.18 *Inspection Authority*—The manufacturer shall make available to the inspection authority at the manufacturer's plant a current copy of the written description of the quality assurance system. The manufacturer's quality assurance system shall provide for the inspection authority at the manufacturer's plant to have access to all drawings, calculations, specifications, procedures, process sheets, repair procedures, records, test results, and any other documents as necessary for the inspection authority to perform its duties in accordance with this supplementary requirement. The manufacturer may provide for such access by furnishing the inspection authority with originals or copies of such documents.

S4. Special Material, Design, and Performance Considerations

S4.1 *Recovered Materials*—Unless otherwise specified in this specification, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without

jeopardizing the intended use. The term "recovered materials" means materials that have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

S4.2 Pipe threads shall not be used in the construction of the valve.