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An American National Standard

Standard Specification for Automatic Shut-Off Valves (Also Known as Excess Flow Valves, EFV) for Air Or Nitrogen Service[1]

This standard is issued under the fixed designation F 1793; 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.

1. Scope

1.1 This specification covers self-contained automatic shut-off valves (also known as excess flow valves) for air or nitrogen service. They are intended to be installed as safety devices to quickly and automatically shut off flow under certain excess flow conditions caused by a downstream failure or casualty, such as a hose rupture.

1.2 The values stated in this specification in inch-pound units are to be regarded as the standard. The SI equivalents shown in parentheses are provided for information only.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

F 992 Specification for Valve Label Plates

2.2 *American National Standards Institute (ANSI):*[3]

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

B1.20.1 Pipe Threads, General Purpose (Inch)

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

B16.25 Buttwelding Ends

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 Sound 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 Fitting, 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 *automatic shut-off valve*—automatic shut-off valves covered by this specification trip shut in response to the pressure differential across the valve.

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

3.1.3 *external leakage*—leakage from the automatic shut-off valve that escapes to atmosphere.

3.1.4 *hydrostatic shell test pressure*—the hydrostatic shell test pressure that the automatic shut-off valve is required to withstand without damage. Automatic shut-off valve operation is not required during application of shell test pressure, but it must meet all performance requirements after the shell test pressure has been removed.

3.1.5 *pressure ratings*—the pressure ratings of the automatic shut-off valves 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.

3.1.6 *seat tightness*—the ability of the automatic shut-off valve to prevent leakage from the valve-inlet to the valve-outlet.

3.1.7 *set point*—a combination of inlet pressure and flow, at which the valve trips shut.

3.1.8 *set point accuracy*—the band of accuracy of the automatic shut-off valve expressed as a range of flow rates at a given inlet pressure, established by the following two points:

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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.

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

TABLE 1 Pressure Ratings for Automatic Shut-Off 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.

3.1.8.1 *Discussion*—A combination of inlet pressure-flow, at or below which the automatic shut-off valve will not trip shut (valve will remain open) regardless of influences such as spring relaxation, mechanical shock or vibration, and so forth.

3.1.8.2 A combination of inlet pressure-flow, at or above which the automatic shut-off valve will trip shut (valve will not remain open) regardless of influences tending to resist closure such as breakloose friction, corrosion, or sludge, and so forth.

3.1.9 *set-point range*—the range of set points over which the automatic shut-off valve can be adjusted. Expressed as a range of flow rates at a given inlet pressure.

4. Classification

4.1 Automatic shut-off valves shall be of the following types, styles, sizes, pressure ratings, and end connections:

4.1.1 *Types*:

4.1.1.1 *Type I*—Valves that can be adjusted or repaired without removing the valve from pipe line.

4.1.1.2 *Type II*—Valves that cannot be adjusted or repaired without removing the valve from pipe line.

4.1.2 *Styles*:

4.1.2.1 *Style 1—Automatic Reset Construction*—These valves are designed to limit the flow of air or nitrogen upon closure to a small predetermined level. These valves reset automatically once the service line downstream is made air or nitrogen-tight and pressure is equalized across the valve.

4.1.2.2 *Style 2—Manual Reset Construction*—These valves are designed to stop the flow of air or nitrogen upon closure. These valves must be manually reset.

4.1.3 *Sizes*—Automatic shut-off valves shall be of the following NPS sizes: ¼ (13.5 mm), ⅜ (17.2 mm), ½ (21.3 mm), ¾ (26.9 mm), 1 (33.7 mm), 1¼ (42.4 mm), 1½ (48.3 mm), and 2 (60.3 mm). Unless otherwise specified in 5.0, the valve inlet size shall be the same as the outlet size.

4.1.4 *Pressure Ratings*—Automatic shut-off valves shall have pressure rating(s) selected (see 3.1.5) from Table 1. The pressure rating(s) selected shall be specified in Section 5. The inlet and outlet pressure ratings of the automatic shut-off valve shall be the same for any given valve.

4.1.5 *End Connections*—Automatic shut-off valves shall have end connections selected from those listed in Table 1 and specified in Section 5.

5. Ordering Information

5.1 Ordering documentation for automatic shut-off 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 End connections (see 4.1.5),

5.1.7 Valve inlet operating pressure,

5.1.8 Set point (see 3.1.7 and 7.2),

5.1.9 Tamper-proof set point adjustment, if required (see 6.3.2),

5.1.10 Supplementary requirements, if any (see S1 through S4), and

5.1.11 Maximum vibration frequency and displacement amplitude, if other than specified (see S1.2).

6. Valve Construction

6.1 Valves shall incorporate the features specified in 6.2-6.16.

6.2 *Materials of Construction*—Material requirements for the automatic shut-off valve shall be as follows: The pressure-containing envelope shall be 300 series corrosion-resistant steel (304, 304L, 316, or 316L). Internal parts including springs, poppets, retainers, etc. shall be 300 series corrosion-resistant steel, nickel-aluminum-bronze, nickel-copper (70-30), or bronze. Other materials for both the pressure-containing envelope and internal parts 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.

6.3 *General Requirements*:

6.3.1 Automatic shut-off valves shall be self-contained, requiring no external power source for operation. The automatic shut-off valve shall be capable of meeting all requirements of this specification and provide extended reliable operation.

6.3.2 Automatic shut-off valves shall incorporate a provision for manually resetting. This shall constitute an isolatable bleed-by which is operable with the valve in the pipeline under pressure and which functions by equalizing pressure across the poppet. Style 1 valves shall in addition, incorporate a provision which automatically resets the valve, and which constitutes a small non-isolatable bleed-by.

6.4 *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.

6.5 *Interchangeability*—The automatic shut-off 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.

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

6.7 *Maintainability*—Maintenance shall require standard tools to the maximum extent possible. Any special tools required for maintenance shall be identified, and shall be supplied as part of the valve.

6.8 *Reversibility*—Seating inserts, if applicable, shall not be physically reversible unless they are also functionally reversible to preclude incorrect assembly.

6.9 *Adjustments*—There shall be no adjustments required in the automatic shut-off valve during or after assembly other than the set point.

6.10 *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 damage.

6.11 *Body Construction*—All pressure lines, including the reset bleed line, shall be internally ported. The bonnet and bottom cap (where applicable) shall be attached to the body by bolting, threading, or threaded-union connections.

6.12 *Set-Point Adjustment*—Set point shall be adjustable through the range specified in 7.4. Type I valves shall be adjustable with the valve in the line under pressure. Type II valves may be removed from the line for adjustment. The set point shall incorporate right-hand threads so that a clockwise rotation increases the set point. Means shall be used to prevent an accidental or inadvertent change in set point. The option of a tamper-proof set-point adjustment (lead seal, and so forth) shall be available and shall be specified as in Section 5.

6.13 *Port Configuration*—The automatic shut-off valve shall have in-line inlet and outlet ports.

6.14 *Springs*—Spring incorporated in the automatic shut-off valve shall not be compressed solid during operation. Spring ends shall be squared and ground. Engagement or disengagement of parts against spring compression shall not be permitted.

6.15 *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.

6.16 *Accessibility*—Type I automatic shut-off valve shall be accessible for adjustment or service, without removing the automatic shut-off valve from the line.

7. Performance Requirements

7.1 Automatic shut-off valves shall meet the requirements of 7.2-7.8.

7.2 *Set Point*—The required set point as defined in 3.1.7, shall be as specified (see Section 5).

7.3 *Set-Point Accuracy*—The set-point accuracy, as defined in 3.1.8, shall be plus or minus 10 % of the set point.

7.4 *Range of Set-Point Adjustment*—Automatic shut-off valves shall be capable of meeting all performance requirements when set at any point within plus or minus 25 % of the nominal specified set point.

7.5 *Trip Differential Pressure*—The pressure differential at which the automatic shut-off valve trips shut shall not exceed the values specified in Table 2.

7.6 *Reset Pressure*—Once shut, the automatic shut-off valve shall remain shut until the pressure across the valve is equalized.

7.7 *Seat Tightness*—Once shut, and with the manually operated isolatable bleed-by closed, the automatic shut-off valve shall meet the following seat tightness requirements. Where necessary, leakage measurement shall start after temperature stabilization.

7.7.1 *Style 1 Valves*—Flow leakage shall not be less than 2 % and no greater than 5 % of the set-point flow.

7.7.2 *Style 2 Valves*—Flow leakage shall not exceed 60 standard cubic inches per hour (SCIH), per inch of valve size.

7.8 *External Leakage*—The automatic shut-off valve external leakage shall be bubble-tight at its operating pressure conditions over a 3-min period.

8. Tests Required

8.1 Each automatic shut-off valve must pass the tests outlined in 8.2-8.6.

8.2 *Visual Examination*—The automatic shut-off valve shall be examined visually to determine conformance with the ordering data, interface dimensions, and workmanship without disassembly.

8.3 *Hydrostatic Shell Test*—The automatic shut-off valve shall be hydrostatically tested using water by applying a test pressure equal to the 1.5 times the 100°F (38°C) pressure rating to the valve inlet and outlet to check its structural integrity. 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.

8.4 *Seal Tightness Test (Style 2 Valves Only)*—The automatic shut-off valve shall be tested with air or nitrogen gas with an inlet test pressure equal to the 1.1 times the 100°F (38°C) pressure rating. The leakage requirements of 7.7 shall be met.

TABLE 2 Maximum Allowable Trip Differential Pressures

Maximum Inlet Operating Pressure, psi (MPa)	Maximum Allowable Trip Differential Pressure, psi (kPa)
400 (2.758)	15 (103)
1500 (10.342)	40 (276)
3000 (20.684)	60 (414)
6000 (41.369)	75 (517)

8.5 *External Leakage Test*—Air or nitrogen at a test pressure equal to the 100°F (38°C) pressure rating of the valve shall be applied to the inlet and outlet of the automatic shut-off valve. External leakage shall be checked using bubble fluid, or by submerging the valve under water. There shall be no visible external leakage over a 3-min period.

8.6 *Set-Point Test*—Apply air or nitrogen at the nominal pressure rating to the valve inlet. Instrumentation shall include a pressure gage at the valve inlet, and a flow-measuring device. With the inlet pressure maintained at the nominal rating, establish flow at less than 90 % of the specified set point. Slowly increase flow until the valve trips shut. The valve shall not close at less than 90 % of the set-point flow, and shall close at no greater than 110 % of the set-point flow.

9. Marking

9.1 *Body Markings*—Valve bodies shall have the manufacturer's name or trademark, and flow arrow or "inlet" and "outlet" cast, forged or stamped with round bottom dies on them.

9.2 *Identification Plate*—An identification plate of corrosion-resistant metal in accordance with Specification F 992; types I, II, III, or IV shall be permanently attached to the automatic shut-off valve and shall include the following information (some or all information may instead be stamped or etched directly on the outside surface of the automatic shut-off valve):

9.2.1 Manufacturer's name.

9.2.2 ASTM designation and year of issue.

9.2.3 Rated pressure.

9.2.4 Set point and range of adjustment.

9.2.5 Manufacturer's model/part number.

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.

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 examinations and tests selected from those specified in S1.2 through S1.5.

S1.2 *Shock Test*—The automatic shut-off 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 inlet port shall be pressurized to the maximum inlet operating pressure. There shall be no structural damage to the automatic shut-off valve. There shall be no degradation to the performance capability of the automatic shut-off valve. Tripping shut of the automatic shut-off valve is permissible.

S1.3 *Vibration Test*—The automatic shut-off valve shall be vibration tested in accordance with type I of MIL-STD-167-1 pressurized with water, air, or nitrogen. The inlet port shall be pressurized to the maximum inlet operating pressure. 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 frequencies tested. There shall be no structural damage or degradation to the performance capability of the automatic shut-off valve.

S1.4 *Noise Test*—The automatic shut-off valve shall be tested for airborne noise in accordance with MIL-STD-740-1. The noise (sound pressure level) shall not exceed 85 db observed at one-metre distance from the automatic shut-off valve.

S1.5 *Posttest Examination*—The automatic shut-off valve shall be disassembled and examined for any evidence of excessive wear, degradation, or impending damage or breakage.

S2. Technical Data and Certification Requirements

S2.1 *Drawings*—Assembly drawings or catalog sheets of the automatic shut-off 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 where standard commercial or military parts are or can be employed, 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.

S2.1.6 The following performance information shall be included:

S2.1.6.1 Set point and adjustable range.

S2.1.6.2 Specified operating conditions.

S2.2 *Technical Manuals*—Technical manuals shall provide a description, installation procedures, operation and maintenance instructions, and illustrated parts breakdown for the automatic shut-off 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.

S2.2.9 In addition, the following shall be included as part of the technical manual content:

S.2.2.9.1 The assembly drawings for the automatic shut-off 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.

S2.2.9.2 Table listing wrench sizes and assembly torques (or other equivalent procedures) for making up all joints and threaded assemblies.

S2.2.9.3 Detailed disassembly and reassembly procedures. In addition to a section providing procedures for the complete disassembly and reassembly of the automatic shut-off 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.

S2.2.9.4 Adjustment procedures for the automatic shut-off valve.

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 that 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 and/or qualified by a recognized national body, 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 non-inspected 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 automatic shut-off valve.

APPENDIX

(Nonmandatory Information)

X1. GUIDELINES FOR SELECTION OF AUTOMATIC SHUT-OFF VALVES

X1.1 *Scope*—This appendix provides general guidelines for the selection of automatic shut-off valves, and therefore, its use does not in any way relieve the user of the final responsibility in the selection and installation of automatic shut-off valves.

X1.2 The automatic shut-off valves described by this specification are intended to be installed as safety devices in air or nitrogen service to quickly and automatically shut off flow under certain excess flow conditions caused by a downstream failure, such as a hose rupture. They are designed to respond only to the pressure differential across the automatic shut-off valve created by the flow. Therefore, these valves are not intended primarily to preserve the upstream fluid from causes such as a slow downstream leak.

X1.2.1 In the open position and under no flow conditions, the valve is fully balanced with no net pressure force tending to open or close the valve. The valve is actuated to close when the pressure drop across the valve caused by a flow exceeds a set valve. The valve is set by adjusting the distance between the poppet and the seat in the open position (that is, changing the restriction to flow presented by the valve) and thereby changing the flow-pressure conditions under which the set pressure drop occurs. Once shut, the valve remains shut until the static pressure drop across the valve is reduced.

X1.3 To function as intended, the characteristics of the system and the location of the automatic shut-off valve must be such that the lowest pressure drop created across the automatic shut-off valve as the result of a casualty will always be greater than the highest pressure drop created across the valve during any normal operating condition. The separation between these two points must be sufficient to be compatible with the accuracy of the automatic shut-off valve selected. If there is not a sufficient separation, or if these points overlap, then either the automatic shut-off valve will inadvertently trip shut during certain normal operating situations, or it will fail to trip shut under certain casualty situations, or both, and therefore, its successful application will not be possible.

X1.4 Since the automatic shut-off valve is statically pressure balanced, the set point at which it would trip shut is established by the spring preload tending to hold the poppet in the open position combined with the flow restriction presented by the valve when in the open position.

X1.5 Type I automatic shut-off valves are intended to provide maximum maintainability (particularly in systems where removal and reinstallation of the valve body from the pipe-line may be difficult because of pipe spring) by permitting valve adjustment and removal of all valve internals with the valve in the pipe-line. Type II automatic shut-off valves require removal of the valve from the pipe-line for adjustment or repair and are intended for applications where compactness and light-weight are the primary considerations.