NOT MEASUREMENT SENSITIVE

MIL-DTL-2F
25 September 2002
SUPERSEDING
MIL-DTL-2E
9 June 1995

DETAIL SPECIFICATION

VALVES, CYLINDER, GAS (FOR COMPRESSED OR LIQUEFIED GASES), GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification provides design and operational requirements for valves used with compressed gas cylinders containing liquefied or non-liquefied compressed gases or mixtures.

1.2 Classification. The valves are of the following styles, classes, compositions, inlet sizes, and pressure relief device (PRD) types.

Style I	-	Compression packed valve.
Style II	-	O-ring seal valve.
Style III	-	Pressure seal valve.
Style IV	-	Diaphragm seal valve.

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be of use in improving this document should be addressed to: Defense Supply Center Richmond, ATTN: DSCR-VBD, 8000 Jefferson Davis Highway, Richmond, VA 23297-5610 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

Class 05	-	Maximum service pressure 500 psig (3450 kPa).
Class 30	-	Maximum service pressure 3000 psig (20680 kPa).
Class 40	-	Maximum service pressure 4000 psig (27580 kPa).
Class 55	-	Maximum service pressure 5500 psig (37900 kPa).
Class 75	-	Maximum service pressure 7500 psig (51700 kPa).

Composition A	-	Forged brass body.
Composition B	-	Forged steel body.
Composition C	-	Forged bronze.
Composition D	-	Machined brass (medical post).

Inlet size 3	-	0.375 inch 18 NGT.
Inlet size 4	-	0.50 inch 14 NGT.
Inlet size 6	-	0.75 inch 14 NGT.
Inlet size 8	-	1.00 inch 11.50 NGT.
Inlet size 9	-	1.25 inch 12 UNF.

PRD (S-0)	-	None required.
PRD (S-1)	-	Rupture disk.
PRD (S-2)	-	Fusible plug, 165 °F (74 °C) nominal.
PRD (S-3)	-	Fusible plug, 212 °F (100 °C) nominal.
PRD (S-4)	-	Combination rupture disk-fusible plug 165 °F (74 °C).
PRD (S-5)	-	Combination rupture disk-fusible plug 212 °F (100 °C).
PRD (S-7)	-	Spring loaded, reseating PRD.
PRD (S-P)	-	Prohibited.

1.2.1 International standardization agreement code number.

QSTAG - 236 (see 6.6).

1.3 Type designation. The type designations are formed by the use of letters and numbers representing the specific supplemental specification sheet, the designated valve outlet connection number as assigned by the Compressed Gas Association, and a numerical designator to identifying the type and pressure rating of the PRD.

-0 PRD not required
-1 Fusible plug PRD for pressures through 500 psig (3450 kPa).
-2 Combination rupture disk and fusible plug PRD for cylinder service pressure of 1800 psig (12400 kPa) through 2400 psig (16550 kPa). Rupture disk rated to fracture at a maximum of 3000 psig (20680 kPa).
-3 Rupture disk PRD--Service pressure of 1800 psig (12400 kPa).
-4 Rupture disk PRD--Service pressure of 2015 psig (13890 kPa).
-5 Rupture disk PRD--Service pressure of 2265 psig (15620 kPa).
-6 Rupture disk PRD--Service pressure of 2400 psig (16550 kPa).
-7 Rupture disk PRD--Service pressure of 3000 psig (20680 kPa).
-8 Rupture disk PRD--Service pressure of 3500 psig (24130 kPa).

-9 Rupture disk PRD--Service pressure of 6000 psig (41350 kPa).
-10 Rupture disk PRD--Service pressure of 4000 psig (27580 kPa).
-11 Rupture disk PRD--Service pressure of 4500 psig (31000 kPa).
-12 PRD prohibited.
-13 Spring loaded PRD--Service pressure 225 psig (1550 kPa)(Single Port Vapor).
-14 Spring loaded PRD--Service pressure 240 psig (1653 kPa)(Single Port Vapor).
-15 Spring loaded PRD--Service pressure 260 psig (1790 kPa)(Single Port Vapor).
-16 Spring loaded PRD--Service pressure 300 psig (2066 kPa)(Single Port Vapor).
-17 Spring loaded PRD--Service pressure 400 psig (2755 kPa)(Single Port Vapor).
-18 Spring loaded PRD--Service pressure 300 psig (2066 kPa)(Dual Port Liquid/Vapor).
-19 Spring loaded PRD--Service pressure 400 psig (2755 kPa)(Dual Port Liquid/Vapor).
-20 Spring loaded PRD--Service pressure 300 psig (2066 kPa)(Single Port Liquid/Vapor).

EXAMPLES:

V1-510-0
Acetylene, Outlet 510, No PRD required.
(An example of the use of this valve is on an Acetylene cylinder where the fusible plug type PRD is in the top and bottom heads of the cylinder).

V39-540-4
Oxygen, Outlet 540, Rupture disk for use with a 2015 psig (13890 kPa) service pressure cylinder.

V11-580-2
Nitrogen, Outlet 580, Combination rupture disk and fusible plug PRD for use with 1800 psig (12400 kPa) through 2400 psig (16550 kPa) service pressure cylinders.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for addition information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbook. The following specifications, standards, and handbook form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS), and the supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

A-A-59588	-	Rubber, Silicone.
L-P-390	-	Plastic, Molding and Extrusion Material, Polyethylene and Copolymers (Low, Medium and High Density).
L-P-410	-	Plastic, Polyamide (Nylon), Rigid: Rods, Tubes, Flats, Molded and Cast Parts.
RR-C-271	-	Chains and Attachments, Welded and Weldless.

DEPARTMENT OF DEFENSE

MIL-I-24768/9	-	Insulation, Plastic, Laminated, Thermosetting, Nylon-Fabric-Base, Phenolic-Resin (NPG).
MIL-PRF-81733	-	Sealing and Coating Compound, Corrosion Inhibitive.

(See supplement 1 for list of specification sheets.)

STANDARDS

FEDERAL

FED-STD-H28	-	Screw-Thread Standards for Federal Services.
FED-STD-H28/2	-	Screw-Thread Standards for Federal Services Section 2 Unified Inch Screw Threads- UN and UNR Thread Forms.
FED-STD-H28/9	-	Screw-Thread Standards for Federal Services Section 9 Gas Cylinder Valve Outlet and Inlet Threads.

DEPARTMENT OF DEFENSE

MIL-STD-889	-	Dissimilar Metals.

HANDBOOK

DEPARTMENT OF DEFENSE

MIL-HDBK-831	-	Preparation of Test Reports.

(Unless otherwise indicated, copies of the above specifications, standards, and handbook are available from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. Electronic copies of military and federal specifications, standards, and handbooks are available at http://astimage.daps.dla.mil/quicksearch/.)

2.2.2 Other government publications. The following other government publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation (see 6.2).

CODE OF FEDERAL REGULATIONS (CFR)

49 CFR - Transportation.

(Application for copies should be addressed to Superintendent of Documents, U.S. Government Printing Office, North Capitol & "H" Streets, N.W., Washington, DC 20402-0002. Electronic copies of CFR documents may be obtained from http://www.access.gpo.gov/.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA-STD-6001 - Flammability, Odor, Offgassing, and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion.

(Application for copies should be addressed to NASA Technical Standards, EL01 MSFC, AL 35801 (Phone: 205-544-2448). Electronic copies of NASA publications may be obtained from http://standards.nasa.gov/.)

2.3 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of documents that are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DoDISS are the issues of documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD adopted).

(Application for copies should be addressed to the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203. Electronic copies of ASQ publications may be obtained from http://www.asq.org/.)

ASTM INTERNATIONAL

ASTM A 27/A 27M - Standard Specification for Steel Castings, Carbon, for General Application (DoD adopted).

ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless (DoD adopted).

ASTM INTERNATIONAL - Continued

ASTM A 108	-	Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality (DoD adopted).
ASTM A 148/A 148M	-	Standard Specification for Steel Castings, High Strength, for Structural Purposes (DoD adopted).
ASTM A 167	-	Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip (DoD adopted).
ASTM A 176	-	Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip (DoD adopted).
ASTM A 181/A 181M	-	Standard Specification for Carbon Steel Forgings, for General-Purpose Piping (DoD adopted).
ASTM A 240/A 240M	-	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Application (DoD adopted).
ASTM A 313/A 313M	-	Standard Specification for Stainless Steel Spring Wire (DoD adopted).
ASTM A 331	-	Standard Specification for Steel Bars, Alloy, Cold-Finished (DoD adopted).
ASTM A 580/A 580M	-	Standard Specification for Stainless Steel Wire (DoD adopted).
ASTM A 666	-	Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar (DoD adopted).
ASTM A 693	-	Standard Specification for Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip (DoD adopted).
ASTM B 16/B 16M	-	Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines (DoD adopted).
ASTM B 21/B 21M	-	Standard Specification for Naval Brass Rod, Bar, and Shapes (DoD adopted).
ASTM B 85	-	Standard Specification for Aluminum-Alloy Die Castings (DoD adopted).
ASTM B 86	-	Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings (DoD adopted).
ASTM B 98/B 98M	-	Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes (DoD adopted).
ASTM B 99/B 99M	-	Standard Specification for Copper-Silicon Alloy Wire for General Applications (DoD adopted).

ASTM INTERNATIONAL - Continued

ASTM B 117	- Standard Practice for Operating Salt Spray (Fog) Apparatus (DoD adopted).
ASTM B 124/B 124M	- Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes (DoD adopted).
ASTM B 134/B 134M	- Standard Specification for Brass Wire (DoD adopted).
ASTM B 138/B 138M	- Standard Specification for Manganese Bronze Rod, Bar and Shapes (DoD adopted).
ASTM B 139/B 139M	- Standard Specification for Phosphor Bronze Rod, Bar, and Shapes (DoD adopted).
ASTM B 150/B 150M	- Standard Specification for Aluminum Bronze Rod, Bar, and Shapes (DoD adopted).
ASTM B 152/B 152M	- Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar (DoD adopted).
ASTM B 159/B 159M	- Standard Specification for Phosphor Bronze Wire (DoD adopted).
ASTM B 164	- Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire (DoD adopted).
ASTM B 194	- Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar (DoD adopted).
ASTM B 211	- Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire (DoD adopted).
ASTM B 211M	- Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire [Metric] (DoD adopted).
ASTM B 763	- Standard Specification for Copper Alloy Sand Castings for Valve Application (DoD adopted).
ASTM D 1229	- Standard Test Method for Rubber Property - Compression Set at Low Temperatures (DoD adopted).
ASTM D 1430	- Standard Specification for Polychlorotrifluoroethylene (PCTFE) Plastics (DoD adopted).
ASTM D 1710	- Standard Specification for Extruded and Compression Molded Polytetrafluoroethylene (PTFE) Rod and Heavy-Walled Tubing (DoD adopted).
ASTM D 2000	- Standard Classification System for Rubber Products in Automotive Applications (DoD adopted).

ASTM INTERNATIONAL - Continued

ASTM D 4066	-	Standard Classification System for Nylon Injection and Extrusion Materials (PA) (DoD adopted).
ASTM E 18	-	Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials (DoD adopted).
ASTM G 37	-	Standard Practice for Use of Mattsson's Solution of pH 7.2 to Evaluate the Stress-Corrosion Cracking Susceptibility of Copper-Zinc Alloys (DoD adopted).

(Application for copies should be addressed to ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Electronic copies of ASTM publications may be obtained from http://www.astm.org/.)

THE CHLORINE INSTITUTE, INC.

Drawing No. 110	-	Valves for Chlorine Cylinders and Ton Containers Assemblies.
Drawing No. 112	-	Valve and Fusible Plugs for Chlorine Cylinders and Ton Containers Materials and Test Specifications.
Drawing No. 113	-	Valve Details for Chlorine Cylinders and Ton Containers.

(Application for copies should be addressed to the Chlorine Institute, Inc., 2001 L Street NW, Washington, DC 20036-0491. Electronic copies of Chlorine Institute publications may be obtained from http://www.cl2.com/.)

COMPRESSED GAS ASSOCIATION, INC. (CGA)

Pamphlet S-1.1	-	Pressure Relief Device Standards, Part 1 - Cylinders for Compressed Gases.
Pamphlet S-7	-	Method for Selecting Pressure Relief Devices for Compressed Gas Mixtures in Cylinders.
Standard V-1	-	Compressed Gas Cylinder Valve Outlet and Inlet Connections (DoD adopted).

(Application for copies should be addressed to the Compressed Gas Association, Inc., 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923. Electronic copies of CGA publications may be obtained from http://www.cganet.com.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE AMS QQ-C-320	- Chromium Plating (Electrodeposited) (DoD adopted).
SAE AMS QQ-N-290	- Nickel Plating (Electrodeposited) (DoD adopted).
SAE AMS-QQ-P-416	- Plating, Cadmuim (Electrodeposited) (DoD adopted).
SAE AMS QQ-S-763	- Steel Bars, Wire, Shapes, and Forgings; Corrosion Resistant (DoD adopted).

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001. Electronic copies of SAE publications may be obtained from http://www.sae.org.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. The valves furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

3.3 Reliability. The diaphragm valve shall have a reliability of not less than 2000 cycles and all other valves shall have a reliability of not less than 5000 cycles. After having been opened and closed 2000 times or 5000 times as applicable, at the maximum service pressure specified herein: The valve shall not leak; shall not require an opening or closing torque greater than that specified herein; shall show no evidence of cracks, detaching, or failure of the seat disk insert or the stem tang when so equipped; and shall show no evidence of thread failure. The compression packed valve shall not require tightening of the packing nut or bonnet at intervals of less than 100 cycles. The diaphragm valve shall not require tightening of any component at intervals of less than 2000 cycles. The O-ring valve and the pressure sealed valve shall not require tightening of any component at less than 5000 cycles.

3.4 Material. Material shall be as specified herein. Materials not specified shall be selected by the Contractor and shall be subject to all provisions of this specification.

3.4.1 Material deterioration and control. The valves shall be fabricated from materials compatible with the gas or product being used. Materials used shall be treated or processed to provide protection against the various forms of corrosion and deterioration that may be encountered in any of the applicable storage and operating environments to which the item may be exposed.

3.4.1.1 Dissimilar metals. Dissimilar metals, as defined in MIL-STD-889, shall be electrically insulated from one another to minimize or prevent galvanic corrosion. Insulation may be provided by an insulating barrier such as a corrosion inhibiting sealant conforming to MIL-PRF-81733 or chromate tape conforming to A-A-59588. Protection against corrosion could also be obtained by exclusion of the electrolyte if feasible.

3.4.1.2 Identification of materials and finishes. The contractor shall identify the specific material, material finish or treatment for use with components and sub-components, and shall make information available, upon request, to the contracting officer or designated representative (see 6.2).

3.4.2 Recovered materials. For the purpose of this requirement, recovered materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials. The components, pieces and parts incorporated in the valves may be newly fabricated from recovered materials to the maximum extent practicable, provided the valves produced meet all other requirements of this specification. Used, rebuilt or remanufactured components, pieces and parts shall not be incorporated in the valves.

3.4.3 Aluminum.

3.4.3.1 Die castings. Aluminum die castings shall conform to ASTM B 85, Alloy Numbers 413.0, A413.0, or 360.0.

3.4.3.2 Flat stock. Flat aluminum stock shall conform to ASTM B 211 or ASTM B 211M, temper optional.

3.4.4 Brass.

3.4.4.1 Castings. Brass castings shall conform to ASTM B 763, CDA Alloy Numbers C83800, C84200, or C84400.

3.4.4.2 Forging. Forging brass shall conform to ASTM B 124/B 124M, CDA Alloy Number C37700.

3.4.4.3 Free-cutting. Free-cutting brass shall conform to ASTM B 16/B 16M, CDA Alloy Number C36000.

3.4.4.4 Naval. Naval brass shall conform to ASTM B 21/B 21M, CDA Alloy Number 48500.

3.4.4.5 Strainer wire. Brass strainer wire shall conform to ASTM B 134/B 134M, CDA Alloy Number 27400.

3.4.5 Bronze.

3.4.5.1 Aluminum. Aluminum bronze shall conform to ASTM B 150/B 150M, CDA Alloy Number C63000.

3.4.5.2 Aluminum-silicon, alloy B. Aluminum-silicon bronze, alloy B, CDA Alloy Number 64210 shall conform to Chlorine Institute Drawing Number 112, ASTM B 124/B 124M, forging rod, and ASTM B 150/B 150M, rod, bar, and shapes.

3.4.5.3 Aluminum-silicon. Aluminum-silicon bronze, CDA Alloy Number C64200, shall conform to ASTM B 124/B 124M, forging rod, and ASTM B 150/B 150M, rod, bar, and shapes.

3.4.5.4 Manganese. Manganese bronze shall conform to ASTM B 138/B 138M.

3.4.5.5 Phosphor, flat stock. Phosphor bronze flat stock shall conform to ASTM B 139/B 139M, composition A or D, spring or extra spring temper.

3.4.5.6 Phosphor, round wire. Phosphor bronze round wire shall conform to ASTM B 159/B 159M, CDA Alloy Number C51000.

3.4.6 Copper. Copper shall conform to ASTM B 152/B 152M, soft-annealed temper.

3.4.7 Copper alloys.

3.4.7.1 Beryllium. Copper-beryllium alloy shall conform to ASTM B 194, CDA Alloy Number C17200.

3.4.7.2 Silicon. Copper-Silicon alloy shall conform to ASTM B 98/B 98M and ASTM B 99/B 99M, CDA Alloy Numbers C65100, C65500, and C69200.

3.4.8 Nickel-copper alloy. Nickel-copper alloy shall conform to ASTM B 164.

3.4.9 Plastics.

3.4.9.1 Polyamide. Polyamide plastic shall conform to L-P-410 or ASTM D 4066, compositions as specified herein.

3.4.9.2 Polyethylene. Polyethylene plastic shall conform to L-P-390, type 1, class H, grade 5.

3.4.9.3 Polytetrafluoroethylene. Polytetrafluoroethylene plastic shall conform to ASTM D 1710.

3.4.9.4 Polychlorotrifluoroethylene. Polychlorotrifluoroethylene plastic shall conform to ASTM D 1430.

3.4.10 Rubber. Rubber shall conform to ASTM D 2000 M4BA 820 A14C12F19Z1Z2 with Z, or special requirements as follows: Z1-equivalent to suffix letter D of ASTM D 2000, with a load of 20 percent deflection to be 475 +/-100 psig (690 kPa); Z2-compression set after 22 hours at -50 °F (-45 °C) shall be 70 percent (maximum) after 30 minutes recovery at -50 °F (-45 °C) as per ASTM D 1229, with specimens initially compressed 30 percent.

3.4.11 Steel.

3.4.11.1 Carbon. Carbon steel bar stock shall conform to ASTM A 108, UNS G10450.

3.4.11.2 Castings. Steel castings shall conform to ASTM A 27/A 27M and ASTM A 148/A 148M, class 70-36.

3.4.11.3 Corrosion-resisting bar stock. Corrosion-resisting steel bar stock shall conform to SAE AMS QQ-S-763, classes as specified herein.

3.4.11.4 Corrosion-resisting wire. Corrosion-resisting steel shall conform to ASTM A 313/A 313M and ASTM A 580/A 580M, compositions as specified herein.

3.4.11.4.1 Corrosion-resisting sheet and strip stock. Corrosion-resisting sheet and strip stock shall conform to ASTM A 167, ASTM A 176, ASTM A 240, ASTM A 666, and ASTM A 693, classes as specified herein.

3.4.11.5 Forgings. Steel forgings shall conform to ASTM A 181/A 181M, class 70.

3.4.11.6 Steel Alloy. Steel alloy bar stock shall conform to ASTM A 331, UNS G48200.

3.4.11.7 Pipe. Steel pipe shall conform to ASTM A 53/A 53M, type S, grade A, schedule number 40.

3.4.11.8 Medical valves. The material used in all medical valves shall be in accordance with the latest revision of NASA-STD-6001 (see 6.2).

3.4.12 Zinc.

3.4.12.1 Die casting. Zinc die casting shall conform to ASTM B 86, alloy optional.

3.5 Design. The valve shall be of a compression packed, an O-ring, pressure seal, or a diaphragm style. The valve shall consist of a body with inlet and outlet, a PRD as required, internal working parts, valve stem, seat, bonnet or packing nut and packing as required. A handwheel or wrench or key shall be furnished, as specified in the applicable specification sheet. An outlet cap or plug, with chain and retaining ring, shall be supplied when specified. A dip tube or eduction tube shall be furnished installed in accordance with 3.6.1.6 when specified.

3.6 Construction.

3.6.1 Valve components.

3.6.1.1 Valve body. The valve body shall be as specified herein for the applicable valve style, and as follows.

3.6.1.1.1 Inlet. The inlet threads shall conform to FED-STD-H28. The thread symbol shall be as specified in the applicable specification sheet. All valve bodies constructed from aluminum alloy conforming to ASTM B 211 or ASTM B 211M shall have straight threads. Valve bodies having a 0.375-inch (9.525 mm) or a 0.50-inch (12.70 mm) inlet shall have an inlet channel clear opening, from the inlet to the seat, of not less than the cross sectional area of a 0.125-inch (3.18 mm) diameter circle. All other valve bodies shall have an inlet channel clear opening of not less than the cross sectional area of a 0.25-inch (6.35 mm) diameter circle. Unless otherwise specified in the applicable specification sheet, when the valve is equipped with a dip tube the inlet shall be internally threaded to accept the dip tube.

3.6.1.1.2 Outlet. Unless otherwise specified in the applicable specification sheet, the outlet shall conform to FED-STD-H28, outlet number as specified in the applicable specification sheet.

3.6.1.1.3 Pressure relief approach channel. When a PRD is specified in the applicable specification sheet, the approach channel shall be located between the inlet and valve seat. Valve bodies having a 0.375-inch (9.525 mm) or a 0.50-inch (12.70 mm) inlet shall have an approach channel clear opening from the inlet channel to the PRD, of not less than the cross sectional area of a 0.125-inch (3.18 mm) diameter circle. All other valve bodies shall have an approach channel clear opening of not less than the cross sectional area of a 0.1875-inch (4.76 mm) diameter circle. In all cases the minimum flow requirements of CGA Pamphlet S-1.1 must be met.

3.6.1.1.4 Valve seat. The valve seat shall have a clear opening of not less than the cross sectional area of a circle having a diameter as follows:

a. Valves used in liquefied gas service (class 05)	0.25 inch (6.35 mm)
b. Valves having a 0.375-inch or a 0.50-inch inlet	0.0625 inch (1.59 mm)
c. All other valves	0.125 inch (3.18 mm)

3.6.1.1.5 Wrenching surfaces. The body shall have two or more wrench flats. The wrench flats shall be diametrically opposite each other and parallel to a plane determined by the centerlines of the valve inlet and valve outlet. When the valve has a pin index outlet, the dimensions of the wrench flats shall conform to the body dimensions specified in FED-STD-H28. When the valve has a threaded outlet, the wrench flats shall be accessible for the use of conventional cylinder valve wrenches in both manual and power applications without damage or deformation to any components of the valve.

3.6.1.2 Stem. The stem material shall be as specified herein for the applicable valve style (see 3.9). The stem shall have a shank to fit a handwheel, a wrench or a key as specified herein and in the applicable specification sheet. When used with a handwheel, the upper end of the stem shall be designed to transmit handle torque through the wrench flats or a spline and be either threaded externally to mate with a nut, or internally for a machine screw for securing the handwheel. A positive mechanical fastener may be used in lieu of a threaded fastener. When the stem is supplied with a disk insert, the insert shall fit in a counterbore in the bottom of the stem or in the bottom of the lower spindle of a two-piece stem. The inserts shall conform to ASTM D 4066, type 1, for polyamide plastics. Any lubricant applied to stems shall be compatible with the gas of intended use and shall be subject to approval of the qualification activity.

3.6.1.2.1 Stem hardness. Carbon steel, cast steel or nickel steel alloy stems used in compression packed valves shall have a Rockwell C surface hardness of not less than 30, to a depth of not less than 0.020 inch (.508 mm) on the portion of the stem in contact with the packing.

3.6.1.3 Bonnet packing nut and packing washer. The bonnet packing nut and packing washer shall be as specified herein for the applicable valve style. The bonnet packing nut shall be threaded to engage mating threads on the valve body. Bonnet or packing nut surfaces which seal directly against the sealing material shall be machined to provide a leak free seal. The bonnet packing nut shall be provided with wrenching flats.

3.6.1.4 Handwheel. The handwheel shall be a circular, oval or crossed spoke fingergrip type. The handwheel shall be not less than 2.50 inches (63.5 mm) and not greater than 2.75 inches (69.9 mm) in diameter. When used on a pressure seal valve, the handwheel shall bear against a friction reducing thrust washer located between the handwheel and the packing nut or bonnet. The handwheel shall be fabricated of die-cast zinc, die-cast aluminum, or forged brass. Polyamide plastic handwheels 2.00 inches (50.8 mm) in diameter shall be acceptable for valves operating with opening and closing torque less than 60 inch-pounds (6.78 N·m).

3.6.1.5 Strainer. When specified in 6.2, a strainer shall fit over or into a recess in the valve body inlet. The strainer shall not interfere with the inlet threads nor be greater than 60 mesh metal screen. It shall be fabricated of brass, nickel copper alloy, or composition 302 or 304 corrosion-resisting steel wire.

3.6.1.6 Dip tube or eduction tube. The dip tube shall be 0.25-inch (6.35 mm) steel pipe unless otherwise specified. One end of the dip tube shall be externally threaded with 0.25-18 NPT threads conforming to FED-STD-H28. The dip tube inlet shall be cut on a 45 degree angle. The dip tube shall be of sufficient length and shall be bent on a suitable radius so as to empty a cylinder of the specified diameter (see 6.2). When specified (see 6.2), the dip tube shall be furnished assembled to the valve and secured in the opposite direction from the valve outlet by brazing or by silver soldering. When specified, the valve shall be supplied with a hard drawn copper tube of sufficient length (approximately 4 inches) threaded and brazed/silver soldered into the inlet of the liquid port of the valve to enable the installation of a polypropylene eduction tube. If the tube and its securing clamp are to be furnished with the valve, it will be furnished

disassembled and its dimensions will be furnished. The bottom end of the tube shall be cut at a 45 degree angle.

3.6.1.7 PRD. The PRD shall be provided and installed as a unit as required by 49 CFR, with its reference to CGA pamphlet S-1.1 for compressed gases or CGA pamphlet S-7 for compressed gas mixtures. The PRD outlet cross sectional area and the cross sectional area of the approach channel in the valve body shall be as specified in 3.6.1.1.3. The PRD shall be of the type specified in the applicable specification sheet.

3.6.1.7.1 Type 1, rupture disk. The rupture disk PRD shall consist of a rupture disk, a sealing washer, and a cap or plug. Type 1 PRDs shall be provided in valves for cylinders subjected to filling pressures 10 percent above the permanently marked service pressure in accordance with 49 CFR 173.302, (c).

3.6.1.7.1.1 Rupture disk. The rupture disk shall be metal and shall be designed to burst in tension over a radiused burst edge or by shear over a sharp burst edge. The fragments shall not obstruct the radial outlet passages in the cap or plug. At 160 °F (71 °C), the disk shall have a maximum burst pressure of not greater than 1.67 times the marked service pressure on the cylinder and shall not burst at less than 1.50 times the service pressure. Unless otherwise specified, disks shall be provided to conform with table I. When the cylinder service pressure is not specified, the rupture disk shall be supplied for a service pressure of 1800 psig (12400 kPa) and used in combination with a fusible plug.

3.6.1.7.1.2 Sealing washer. The sealing washer shall be aluminum, fully annealed copper, polyamide plastic composition polyhexamethylene adipamide, polyamide plastic composition polyacaprolactam, or polytetrafluoroethylene plastic. The sealing washer shall be a component of an approved PRD provided by the contractor.

TABLE I. Disk required burst range at rated temperature.

Cylinder service pressure psig (kPa)	Disk required burst range	
DOT 3A or 3AA	Minimum psig (kPa)	Maximum psig (kPa)
1800 (12400)	2700 (18620)	3000 (20680)
2015 (13890)	3024 (20850)	3360 (23170)
2216 (15280)	3324 (22919)	3693 (25463)
2265 (15620)	3398 (23428)	3775 (26030)
2400 (16550)	3600 (24820)	4000 (27580)
3000 (20680)	4500 (31026)	5000 (34470)
3500 (24130)	5250 (36200)	5833 (40217)
4500 (31027)	6750 (46541)	7500 (51712)
6000 (41370)	9000 (62055)	10000 (68950)

3.6.1.7.1.3 Caps and plugs for rupture disk PRD. The caps and plugs design for the rupture disks provided by the contractor shall be as required by the 49 CFR with its reference to CGA Pamphlet S-1.1 which refers to caps and plugs as disk holders. Caps shall have internal threads which conform to FED-STD-H28/9 for PRD threads. Caps and plugs with closed ends shall have the number and location of their transverse discharge ports such, that upon operation of the device, thrust forces are balance and the total cross sectional area of these ports is not less than that of the axial relief channel. The relief channel shall be the contractor's qualified size and in accordance with CGA S-1.1. The cap or plug shall not extend from the centerline of the valve to a greater radial distance than the corresponding valve outlet except for pin-index medical valves where clearance of standard yokes shall be the limiting factor. Caps and plugs shall be designed to prevent blockage of relief holes by fragmentation of rupture disks. Wrenching flats of caps or plugs shall be either 0.8125 or 0.9375 inch (20.64 mm or 23.81 mm) diametrically across opposite surfaces.

3.6.1.7.2 Type 2, fusible plug, 165 °F (74 °C) nominal yield point. The type 2, fusible plug shall be fabricated with fusible metal having a yield point between 157 °F (69 °C) and 170 °F (77 °C), (165 °F (74 °C) nominal). The plug body shall be made of a material which is suitable for its intended purpose; this includes such materials as free cutting brass, naval brass, stainless steel, or carbon steel, plated with a corrosion resistant material. The plug body shall be externally threaded in conformance with FED-STD-H28 for 0.125-27 NGT, 0.25-18 NGT, or 0.375-18 NGT threads as specified. The relief channel shall be the contractor's qualified design and in accordance with CGA S-1.1. The external end of the plug shall have a screwdriver slot, hexagonal wrenching flats or a hexagonal wrenching socket. Open ended plugs shall be designed to anchor the fuse metal in place; such as by using a conical bore, threaded bore, or other means. the bore shall be fluxed to ensure a leak type interface with the fusible metal. Plugs with closed ends shall have the number and locations of their transverse discharge ports such, that upon operation of the device, thrust forces are balanced and the total cross sectional area of these ports is not less than that of the axial relief channel.

3.6.1.7.2.1 Fusible metal, (165 °F (74 °C) or 212 °F (100 °C) nominal). The fusible metal shall conform to CGA Pamphlet S-1.1 for fuse metal with yield points in the applicable range.

3.6.1.7.2.2 Valve body with poured fusible plug. The relief channel in the contractor's PRD design shall be drilled, threaded, fluxed, and filled with molten fusible metal effecting a bonded leak-free plug as specified in the applicable specification sheet.

3.6.1.7.3 PRD S-3, fusible plug, 212 °F (100 °C) nominal yield point. The PRD S-3, 212 °F (100 °C) nominal yield point fusible plug PRD shall be as specified for type 2, except that the fusible metal shall have a yield or melting point of not less than 208 °F (98 °C) and not greater than 220 °F (104 °C), (212 °F (100 °C) nominal).

3.6.1.7.4 PRD S-4, combination rupture disk-fusible plug, 165 °F (74 °C) nominal yield point. The PRD S-4 shall be as specified for type 1, except that the cavity beyond the rupture disk shall be filled with fusible metal having a yield or melting point of not less than 157 °F (69 °C) and not greater than 170 °F (77 °C), (165 °F (74 °C) nominal). At 132 °F (55 °C)

±2 °F (1.11 °C) the fusible metal core shall not extrude and shall prevent the disk from bursting at its minimum burst pressure.

3.6.1.7.5 PRD S-5, combination rupture disk-fusible plug, 212 °F (100 °C) nominal yield point. The PRD S-5 shall be as specified for type 4, except that the fusible metal shall have a yield or melting point of not less than 208 °F (98 °C) and not greater than 220 °F (104 °C), (212 °F (100 °C) nominal).

3.6.1.7.6 PRD S-7. The PRD S-7 shall consist of a cap or plug insert, spring, and an insert retainer. Unless otherwise specified (see 6.2), the spring tension shall be adjusted so that the relief device shall start to discharge at not less than 75 percent and shall reseal at not less than 70 percent of the designated cylinder's minimum test pressure. The device shall reach full flow position at not greater than 100 percent of the cylinder's minimum test pressure. The flow capacity of the PRD shall conform to CGA Pamphlet S-1.1 for the water capacity of the cylinder of intended use. The PRD shall not bind or seize while opening and closing. When installed on the valve, the PRD cap or plug shall be soldered, crimped, or otherwise mechanically locked to prevent tampering with the spring tension adjustment.

3.6.1.7.6.1 Pressure relief valve (PRV) cap or plug. The PRV cap or plug shall be fabricated from free-cutting brass. The exterior surface of the cap shall be cylindrical. The cap or plug shall provide a means for securing the cap or plug to the valve body and for adjusting the spring tension. The threads shall be right hand, UNS conforming to FED-STD-H28/2.

3.6.1.7.6.2 PRV spring. The PRV spring shall be helical and shall be fabricated of corrosion-resisting steel wire, conforming to ASTM A 313/A 313M and ASTM A 580/A 580M, compositions 302 or 304, condition B.

3.6.1.7.6.3 Retainer. The retainer shall have a shroud or guide surface to align the spring and a counterbore to retain the insert.

3.6.1.7.6.4 PRV insert. The PRV insert seal shall be polyamide plastic resin laminate or rubber meeting the stability provisions specified herein.

3.6.1.8 Outlet cap and plug. When specified, valves with threaded outlets shall have a permanent metal mating plug or cap in accordance with figure 1. The metal plug or cap shall be supplied with retaining chain and clip to secure the plug or cap to the valve. The metal plug or cap shall effectively seal the valve against leakage when tested as specified herein.

3.6.1.8.1 Outlet cap or plug retaining chain. The valve outlet cap or plug retaining chain shall consist of two bronze wire rings connected by a brass safety chain. The ends of the wire forming the rings shall be formed into eyes without twisting and shall be brazed or clipped together after the chain has been inserted in the eye. One ring shall fit with a sliding fit, in the ring groove of the outlet cap or plug. The other ring shall fit loosely around the valve body immediately above the inlet connection threads in accordance with figure 1. The retaining chain shall be of such length that it does not interfere with the cylinder flange threads when the cap or plug is installed on the valve outlet, but shall be of sufficient length to permit the cap or plug to

hang over the cylinder flange threads when removed. When specified, a disposable dust cap or plug shall be furnished without retaining chain.

3.7 Performance characteristics.

3.7.1 Pressure. The valve shall not leak and shall not deform at the pressures specified in table II. When the valve is fully open, and half open, there shall be no leakage around the stem, between the packing nut or bonnet and the body, at the inlet connection, at the outlet connection, at the PRD connection, nor anywhere through the pressure boundary. There shall be no leakage at the seat when the valve is closed at the specified torque. The valve shall show no evidence of leakage, failure or permanent deformation when subjected to specified pressures.

3.7.1.1 Service pressure. Service pressure shall be as specified for a specific cylinder application. Maximum service pressure shall be as specified for the applicable class (see table II) (see 6.2).

3.7.1.2 Proof pressure. The proof pressure shall be applied hydrostatically. The proof pressure shall not be less than 1.67 times the maximum service pressure specified herein for the applicable class (see table II).

TABLE II. Service and proof pressures.

Valve class	Maximum service pressure		Hydrostatic proof pressure	
	psig	kPa	psig	kPa
05	500	3447	833	5743
30	3000	20680	5000	34470
40	4000	27580	6666	45962
55	5500	37922	9166	63200
75	7500	51712	12500	86187

Note: For testing purposes class 05 valves with type VII PRDs shall have the safety capped or plugged when the maximum service pressures are applied.

3.7.2 Torque. When operated at maximum service pressure, the torque required to open and close the valve shall not be greater than that specified in table III. When opened and closed at the specified torque, and when closed at the specified over-torque the valve shall not leak or deform, the stem shall not bind or gall, and the disk insert shall not crack or flow.

3.7.3 Spring compression. When the valve contains a spring loaded spindle, the spindle shall not check closed from the open position when exposed to an instantaneous service pressure backflow from the outlet.

TABLE III. Opening and closing torque, inch-pounds (N·m).

Valve description	Open	Close	Over-torque
All valves with 0.375-inch outlets	60 (6.78)	60 (6.78)	120 (13.56)
All valves with pin-index outlets	60 (6.78)	60 (6.78)	120 (13.56)
Two-piece stem valves with O-ring or pressure seal, 0.50-inch or larger inlets	60 (6.78)	60 (6.78)	200 (22.60)
Diaphragm seal valves	100 (11.30)	150 (16.95)	200 (22.60)
All one-piece stem valves having seat disk inserts and 0.50-inch or larger inlets	100 (11.30)	100 (11.30)	200 (22.60)
All one-piece stem valves 0.50-inch or larger inlets	150 (16.95)	150 (16.95)	300 (33.90)

3.7.4 Vibration. With the valve at the maximum service pressure, the valve shall withstand vibration for 1 hour at a frequency of 3400 to 3600 vibrations per minute and at an amplitude of 0.0312 to 0.0625 inch (0.79 mm to 1.59 mm). The valve shall withstand vibration in the open position, in the half open position and in the closed position at a closing torque not greater than specified herein. The valve shall not leak, become deformed, or fail; the threaded connections shall not loosen; the seat disk insert, the strainer, and the stem tang shall not become detached; and the stem shall not bind, seize, or gall.

3.7.5 Outlet failure. When torqued to failure, the outlet connection, or the outlet threads shall fail prior to cracking, deformation, or failure of the valve body.

3.7.6 Combustibility. When intended for use with oxygen or oxidative gases, organic components of the valve, such as packing, seals, and lubricants, shall be stable when exposed to oxygen. The material shall not react, discolor, or show any evidence of change in appearance under the following conditions:

a. Exposure for 1 hour to oxygen at a pressure of 2000 psig (13790 kPa) and a temperature of 302 °F (150 °C) ±2 °F (1.11 °C).

b. Instantaneous exposure to oxygen at a pressure of 2000 psig (13790 kPa) while heated to a temperature of 160 °F (71 °C) ±2 °F (1.11 °C).

Polytetrafluoroethylene plastic conforming to ASTM D 1710 and polyamide plastic FM-101 conforming to ASTM D 4066 composition polyhexamethylene adipamide shall be acceptable in valve use.

3.8 Environmental requirements. The valve shall conform to the following environmental requirements.

3.8.1 Low temperature.

3.8.1.1 Operation. The valve shall operate at the maximum service pressure specified herein and at an ambient temperature of 120 °F (49 °C) ±2 °F (1.11 °C), the valve shall not leak,

require an opening or closing torque greater than that specified in table III nor show any evidence of leakage, failure or permanent deformation of any component.

3.8.1.2 Storage. The valve shall withstand storage at the maximum service pressure specified herein, for 8 hours at a temperature of -60 °F (-51 °C) ±2 °F (1.11 °C) without leaking, when closed at a closing torque not greater than that specified in table III and without damage or permanent deformation of any components.

3.9 Detailed requirements. The valve styles and compositions shall be as follows.

3.9.1 Style I valve. Style I valve shall have a compression packed seal and shall be used for service pressures not greater than 500 psig (3450 kPa), class 05, and compositions A, B, or C as specified in the applicable specification sheet.

3.9.1.1 Compression packed valve. Unless otherwise specified in the applicable specification sheet, the compression packed valve shall have a vertical stem and an outlet centerline at 90 degrees to the stem centerline. When specified in the applicable specification sheet, the stem and outlet shall be suitably angled. The compression packed valve shall have a one-piece stem except for medical post application. The stem or upper stem shall backseat in the fully open position. Sealing shall be by compressed packing. The packing shall be compressed by tightening a threaded packing nut or bonnet. The packing shall be compressed inside the valve body. The packing shall effect a seal against the circumferential surface of the stem and against the interior wall of the valve body. The surfaces exerting compressive force against the packing may be angled so that the height of the packing bore is greater than the height at the periphery of the packing. The bottom of the packing shall be seated against a shoulder in the valve body or against a washer. The top of the packing shall be seated against a packing washer or against the end of the packing nut, except that a packing washer shall be used when the packing does not have an inherently low coefficient of friction. When specified in the applicable specification sheet, the compression packed valve shall conform to Chlorine Institute Drawings No. 110, 112, and 113 except the outlet cap shall be supplied with a retaining chain and ring as specified in 3.6.1.8.

3.9.1.1.1 Style I - composition A valve. Style I-A valve bodies shall be made of forging brass as specified herein, with an integral seat to mate with a one-piece stem for a leak-free seal. In the fully open position, the stem shall backseat against the packing to ensure a leak-free seal at the packing-stem interface. The stem shall be made of corrosion-resisting steel, class 302, 303, 304, 416, or 420; carbon steel, nickel-steel alloy, nickel-copper alloy, free-cutting brass, or aluminum bronze; as specified herein. Carbon steel and nickel alloy steel stems shall be chromium plated (as per SAE AMS QQ-C-320, class I) or cadmium plated (as per SAE AMS QQ-P-416, class I, type II) to reduce friction and corrosion. The plating of the stem may be eliminated when either polyethylene, polyamide, or polytetrafluoroethylene plastic is used as a packing material. The packing shall be polyethylene plastic, polyamide plastic, or polytetrafluoroethylene plastic as specified herein for stable control of the gas as specified in the applicable specification sheet. The packing nut or bonnet, packing washer, PRD, and outlet cap or plug shall be made from forging or free-cutting brass.

3.9.1.1.2 Style I - composition B valve. Style I-B valve bodies shall be made of cast steel or forged steel as specified herein. The stem shall be one piece, machined to mate with valve seat to effect a leak-free seal. When specified in the applicable specification sheet, the valve seat shall be an insert of 99.5 percent pure tin firmly anchored to the valve body. When fully open, the stem shall backseat against the packing effecting a leak-free seal at the stem-packing junction. The stem shall be made of carbon steel or corrosion-resisting steel, as specified herein. The class of corrosion-resisting steel shall be class 302, 303, 304, 416, or 420. Packing shall be of materials listed for style I-A valve selected for stable control of the gas service as specified in the applicable specification sheet. The packing nut or bonnet, packing washer, PRD, and outlet cap or plug shall be made from carbon steel, casting steel or forging steel.

3.9.1.1.3 Style I - composition C valve. Style I-C valve bodies shall be made of aluminum-silicon bronze, as specified herein. For chlorine service, the valve body and components shall conform to drawing Nos. 110, 112, and 113 by the Chlorine Institute for chlorine valves. For applications other than chlorine service, aluminum-silicon bronze shall be as specified in 3.4.5.3. The body shall have an integral seat to mate with a one-piece stem. In chlorine service, the stem shall be made of nickel-copper alloy; for all other services the stem shall be made of nickel-copper alloy; for all other services the stem shall be made of nickle-copper alloy or aluminum bronze. The packing shall be of materials listed for style I-A valve selected for stable control of the gas service as specified in the applicable specification sheet. The packing nut or bonnet, packing washer, PRD, and outlet cap or plug shall conform to the Chlorine Institute drawings above.

3.9.1.1.4 Style I - composition D valve. Style I-D valve shall be for medical post (pin-index) applications and shall have a machined brass body. The valve shall have a two-piece stem coupled by a tang and slot or a socket and shank. The lower stem shall be made of free-cutting brass or naval brass and fitted with a polyhexamethylene adipamide plastic disk insert, which shall mate with a machined seat in the valve body. The lower stem shall be threaded to mate threads in the valve body and when turned clockwise, shall close the valve for a leak-free seal. The upper stem shall be made of free-cutting brass, naval brass, or corrosion-resisting steel as specified herein and packed with a polytetrafluoroethylene plastic and compressed with a brass packing nut to effect a leak-free packing to stem junction. The upper stem may be spring loaded against the packing to effect the seal. The packing nut or bonnet, packing washer, and PRD shall be made from free-cutting brass or forging brass.

3.9.2 Style II valve. Style II valve shall be of the O-ring seal design and shall be used for service pressures not greater than 500 psig (3447 kPa).

3.9.2.1 O-ring valve. The O-ring valve shall have a one-piece or a two-piece stem. The stem shall have a groove to retain the O-ring. The groove shall be designed so that the O-ring rolls between the stem and the body as the stem is raised or lowered. The O-ring shall effect a seal against a finished surface inside the valve body or the bonnet. The lower end of the bonnet shall seal against a shoulder inside the valve body by means of a metal-to-metal seal or a sealing washer. The stem shall backseat against the bonnet when in the fully open position.

3.9.2.1.1 Style II - composition A valve. Style II-A valve bodies shall be made of forging brass. The body shall have an integral seat to mate with the disk insert in the lower end of the stem. The O-ring seal shall be of sufficient thickness to create a compressive sealing pressure between the bottom of the stem groove and the interior wall of the valve body or bonnet. The compressive pressure shall cause the O-ring to roll on itself when the stem is raised or lowered in the valve body. The O-ring shall be rubber. The one-piece, O-ring sealed stem shall be threaded to close when turned clockwise. The stem shall have a surface for backseating in the fully open position. The stem shall have a groove to retain the O-ring. The groove shall be designed to permit the O-ring to roll on itself. The stem shall be fabricated of corrosion-resisting steel, nickel-copper alloy, free-cutting brass, or aluminum bronze. Corrosion-resisting steel shall be class 302, 303, 304, 416, or 420. The upper stem of the two-piece, O-ring sealed stem shall be threaded to close the valve when turned clockwise. The upper stem shall backseat against the bonnet when in the fully open position. The upper stem shall be counterbored, internally grooved, and gated to accommodate a mating flanged stub on the lower stem or spindle. Opening and closing action shall be transmitted to the spindle through the flanged stub. The spindle shall not rotate while being opened or closed. The lower stem shall have a groove to retain the O-ring. The groove shall be designed to permit the O-ring to roll on itself in the groove. The spindle shall have a disk insert. The upper stem and the spindle shall be fabricated of corrosion-resisting steel, free-cutting brass, nickel-copper alloy, or aluminum bronze. Corrosion-resisting steel shall be class 302, 303, 304, 416, or 420. The packing nut or bonnet, packing washer, PRD, and outlet cap or plug shall be made from forging or free-cutting brass.

3.9.3 Style III valve. Style III valves shall be of the pressure seal design and shall be used in applications not greater than 7500 psig (51712 kPa).

3.9.3.1 Pressure sealed valve. The pressure sealed valve shall have a two-piece stem. The upper stem shall be spring loaded so that an integral seating surface on the stem is backseated constantly against the packing. The packing shall be seated against a counterbore or a finished surface in the packing nut or bonnet, and against a shoulder in the valve body. The upper stem and the packing shall be designed so that spring-pressure backseating of the upper stem is aided by internal gas pressure when the valve is in service. Style III, class 05, shall further resist leakage when used in low pressure service. The lower stem or spindle shall be threaded to mate with threads in the valve body. The lower stem shall be driven by a tang and slot connection or by a socket and shank connection.

3.9.3.1.1 Style III - composition A. Style III-A valve bodies shall be fabricated of forging brass as specified herein. The body shall have an integral seat to mate with the stem disk insert. The upper stem and the lower stem or plug shall be fabricated of corrosion-resisting steel, aluminum bronze, manganese bronze, copper-silicon alloy, naval brass, or free-cutting brass, as specified herein. Corrosion-resisting steel shall be class 302, 303, or 304. The upper stem spring shall be phosphor bronze wire or corrosion-resisting steel wire. Corrosion-resisting steel wire shall be composition 302 or 304, condition B. The seal shall fit in a counterbore in the bonnet or packing nut. The packing that creates a stem seal shall fit against a shoulder in the valve and against a mating surface in the bonnet or packing nut. The packing shall be polyamide plastic, composition polyhexamethylene adipamide, or shall be polytetrafluoroethylene plastic. The valve shall have a two-piece, pressure sealed stem. The upper stem shall have a backseating

surface which shall seal against the packing. The backseated seal shall be maintained by spring pressure and shall be supplemented by gas pressure when the valve is in service. Spring pressure shall be maintained by a shrouded spring fitted in a counterbore in the top of the handwheel, or by a spring inside the valve body. The upper stem shall drive the lower stem or plug by a slot and tang connection, or by a socket and shank connection. The tang may be integral to a corrosion-resisting steel or naval brass stem or shall be made of corrosion-resisting steel, class 302, 303, or 304. When not integral to the stem, the tang shall be attached to the upper stem. The socket and shank connection shall consist of a square or a prismatic socket in the upper or the lower stem, and a mating shank on the other stem. The lower stem or plug shall be threaded to close when turned clockwise. The lower stem shall have a disk insert. The packing nut or bonnet, packing washer, PRD cap or plug, and outlet cap or plug shall be made from free-cutting brass or forging brass.

3.9.4 Style IV valve. Style IV valves shall be of the diaphragm seal design. The diaphragm shall be used for applications up to 3000 psig (20680 kPa) service pressure.

3.9.4.1 Diaphragm valve. The diaphragm valve shall have a threaded upper stem which, when turned clockwise, shall depress a lower stem or spindle onto a valve seat. Action shall be transferred through a sealed diaphragm located between the upper stem and the spindle. When the upper stem is turned counter-clockwise, the spindle shall be raised from the seat by a spindle spring. The diaphragm shall be compression sealed between a lip or shoulder in the body and a mating surface in the bonnet.

3.9.4.1.1 Style IV - composition A. Style IV-A valve bodies shall be fabricated of forging brass. The body shall have an integral seat to mate with the stem disk insert. During the opening and closing of the valve, the lower stem spring shall not inhibit the lower stem movement and shall not bind in the valve body. The spring shall be aligned and retained in position by the lower stem and the spring bore in the body and, where applicable, machined seats, by a bushing, by a lower stem guide, or by a combination of these. The lower stem shall have a disk insert. The upper stem and the lower stem of the diaphragm sealed valve shall be fabricated of corrosion-resisting steel, aluminum bronze, aluminum-silicon bronze composition 1, manganese bronze, copper-silicon alloy, free-cutting brass or naval brass. Corrosion-resisting steel shall be class 302, 303, or 304. The bushing and the lower stem guide, when applicable, shall be fabricated of free-cutting brass, naval brass, or corrosion-resisting steel. Corrosion-resisting steel shall be class 302, 303, or 304. The lower stem spring shall be phosphor bronze wire or corrosion-resisting steel wire. Corrosion-resisting steel wire shall be composition 302, condition 2, or 304. The diaphragm shall be impervious to gas from inlet service pressure and from outlet back pressure in the fully open position, the half open position, and the closed position. The diaphragm shall consist of one or more plastic, rubber, or metallic elements. Metallic elements shall be corrosion-resisting steel flat wire, phosphor bronze flat stock, copper-beryllium alloy, or nickel silver alloy. Corrosion-resisting steel shall be composition 302, 303, 304, or 316. For valves in class 30 and higher, only metallic diaphragms shall be allowed. The bonnet or packing nut, packing washer, PRD cap or plug, and outlet cap or plug shall be made from free-cutting brass or forging brass.

3.9.4.2 Style IV - composition D. Style IV-D valve bodies shall be fabricated of free-cutting brass. The body shall have an integral seat to mate with the stem disk insert of polyamide plastic for medical post application. The stem, bushing and spring of the style IV-D valve shall be as specified for the style IV-A valve. The bonnet or packing nut, packing washer, PRD, and outlet cap or plug shall be made from free-cutting brass or forging brass. The diaphragm seal shall be as specified for the style IV-A valve, except only metal diaphragms shall be allowed.

3.10 Dimensions. Unless otherwise specified (see 6.2), the overall length of the valve shall not be greater than 5 inches (127 mm). When equipped with a dip tube, the dip tube shall not be included as part of the overall length. When the valve has a pin-index outlet, the maximum projection of the valve from the centerline of its inlet connection shall not be greater than 0.9375 inch (23.81 mm). The maximum projection of a threaded outlet valve, including the outlet cap or plug, from the centerline of the inlet connection shall not be greater than 1.625 inches (41.28 mm), and the maximum overall width of the valve shall not be greater than 3.0625 inches (77.79 mm).

3.11 Weight. When the valve has a pin-index outlet, the weight of the valve shall not be greater than 16 ounces (453.6 grams). When the valve has a threaded outlet, the weight of the valve including the outlet cap or plug shall not be greater than 40 ounces (1134 grams).

3.12 Finish. All valve bodies shall be finished in the base metal of fabrication except that unless otherwise specified (see 6.2), valves for medical use shall be chromium over nickel plated. Chromium plating shall conform to SAE AMS QQ-C-320, class 1, type I and thickness shall be 0.00001 inch (0.00025 mm) minimum. Chromium plating shall be applied over intermediate nickel coatings. Intermediate nickel coating shall conform to SAE AMS QQ-N-290, class 1, grade G for brass and steel valve bodies. When subjected to a salt spray test for 72 hours, the chromium plated valves shall show no evidence of corrosion, pitting, or flaking. The bottom of the valve inlet connection including five to eight threads shall be left unplated.

3.13 Marking. The valve shall be identified as specified below.

3.13.1 Body marking. The valve shall be permanently marked by etching, stamping, embossing, or forging. The use of noncorrosive metal tags or durable plastic tags is not acceptable for valve identification in lieu of marking as specified in CGA Technical Bulletin TB-16 to identify the inlet threads. Marking in the metal shall not be less than 0.0156 inch (0.396 mm) nor greater than 0.0312 inch (0.792 mm) in depth. Markings shall not be less than 0.0937 inch (2.38 mm) high except on valves with 0.375 inch (9.52 mm) inlet when 0.0625 inch (1.59 mm) high lettering will be acceptable. The 0.0625 inch (1.59 mm) high lettering will also be acceptable on those gas mixture valves where number of letters and spaces prevent legible markings with 0.0937 inch (2.38 mm) lettering. Markings in the metal shall be on a plane parallel to a plane determined by the centerlines of the valve inlet and the valve outlet. Markings shall include the following:

a. The manufacturer's identification.

b. Valves required for use with a specific gas shall be marked with the name of the gas on at least one side of the valve body as specified in the applicable specification sheet.

c. Unless otherwise specified (see 6.2), valves required for use with a gas within one of the following groups of compatible gases (LPG, REFRIGERANT, and INERT) shall be marked with the group name instead of the name of the specific gas.

d. The valves shall be marked with the appropriate CGA outlet connection number. They shall also be marked with the appropriate designation as defined in the applicable CGA technical bulletin to identify the inlet threads.

3.13.1.1 Medical valves. All medical valves shall be marked permanently by stamping or embossing the metal surface. Each valve shall carry the full name of the gas of intended use. Each valve shall be marked "MED" not less than 0.125 inch (3.18 mm) high. If there is insufficient area to mark the full name of the gas, the valve shall be stamped or embossed with the CGA connection number.

3.13.2 Handwheel. The direction of rotation for opening the valve shall be marked on the handwheel by embossing or by stamping.

3.13.3 PRD (rupture disk type). Rupture disk PRDs shall be in accordance with CGA S-1.1.

3.13.4 PRD (fusible metal type). Fusible metal PRDs shall be in accordance with CGA S-1.1.

3.13.5 PRD (spring loaded type). Spring-loaded PRDs shall be in accordance with CGA S-1.1.

3.14 Workmanship. All parts, components, and assemblies of the valve including castings, forgings, molded parts, stampings, seals, and machined surfaces shall be clean and free from sand, dirt, fins, pits, spurs, scale, and other harmful extraneous material. All edges shall be rounded or chamfered.

4. VERIFICATIONS

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2 and 6.3).
b. Conformance inspection (see 4.3).
c. Inspection of packaging (see 4.5).

4.2 Qualification inspection. Five valves of each style and composition, as applicable, shall be submitted for qualification inspection (see 6.3). When different forgings are utilized to accommodate various outlet connections, valves shall be submitted for each forging. Identical

valves with varying outlets shall be qualified without need of individual testing. Each valve outlet shall be identified by two scale drawings submitted by the contractor in the Qualification Test Report (see 4.2.3). When the intended use of the valve dictates that it be equipped with a PRD, each valve shall be complete with a PRD. For valve styles III and IV where more than one type of PRD is required to meet all intended uses of the basic valve, two of the additional PRDs shall be submitted. When rupture disks are required for different service pressures, two disks for each of the service pressures shall be submitted for testing in accordance with 3.6.1.7.1.1, as specified in 4.4.2.3. These disks shall be provided with the other parts of the PRD, sealing washers, and caps or plugs, preferably of a unitized design.

4.2.1 Examination. Each valve shall be examined as specified in 4.4.1. Presence of one or more defects shall be cause for rejection.

4.2.2 Tests. Four valves of each classification shall be tested as specified in 4.4.2.1 through 4.4.2.19 as applicable for the style, class and composition. The fifth valve shall be used as a test control. Failure of any test shall be cause for rejection.

4.2.3 Test report. After completing the qualification tests, a test report shall be prepared in accordance with MIL-HDBK-831 and three copies furnished to the qualification activity.

4.3 Conformance inspection.

4.3.1 Examination. Individual valves shall be examined for defects as specified in 4.4.1. Presence of any defect shall be cause for rejection of the valve.

4.3.2 Tests. Samples for inspection and acceptance shall be in accordance with ASQC Z1.4. Any departure from a specified requirement shall be classified as a defect. Any defect shall be cause for rejection of the entire lot.

4.4 Inspection procedures.

4.4.1 Examination. The valve shall be examined as specified herein for the defects in table IV.

TABLE IV. Valve defects.

Requirement number	Defect	Requirement paragraph
101	Material not as specified	3.4
102	Materials not resistant to corrosion and deterioration or treated to be made resistant to corrosion and deterioration	3.4.1
103	Dissimilar metals not in accordance with MIL-STD-889	3.4.1.1
104	Material and material finish or treatment information not available	3.4.1.2
105	Used, rebuilt or remanufactured components, pieces, or parts incorporated in the valves	3.4.2

TABLE IV. Valve defects - Continued.

Requirement number	Defect	Requirement paragraph
106	Parts or components missing or incomplete	3.6.1
107	Inlet threads not as specified	3.6.1.1.1
108	Inlet channel opening not as specified	3.6.1.1.1
109	Outlet not as specific	3.6.1.1.2
110	Outlet channel opening not as specified	3.6.1.1.2
111	Relief approach channel not as specified	3.6.1.1.3
112	Valve seat not as specified	3.6.1.1.4
113	Valve seat opening not as specified	3.6.1.1.4
114	Wrenching surfaces not as specified	3.6.1.1.5
115	Lubricants on stem or body not as specified	3.6.1.2
116	Handwheel, wrench or stem not as specified	3.6.1.4
117	Strainer not as specified	3.6.1.5
118	Dip tube not as specified	3.6.1.6
119	Relief device not as specified	3.6.1.7
120	Dimensions not as specified	3.10
121	Weight not as specified	3.11
122	Finish not as specified	3.12
123	Marking not as specified	3.13
124	Stem rotation open and close not as specified	3.13.2
125	Workmanship not as specified	3.14

4.4.2 Tests.

4.4.2.1 Fusible plug bond. Connect the inlet end of the plug to a suitable pressure source and apply an air or nitrogen pressure of not less than the service pressure specified in 3.7.1.1. Place the plug in an oven or immerse in a liquid and heat to a temperature of 132 °F (55 °C) ±2 °F (1.11 °C). Maintain the pressure and temperature for 8 hours, then examine the outlet end of the plug. Evidence of leakage or extrusion of fusible metal shall constitute failure of this test.

4.4.2.2 Bond test for rupture disk-fusible plug PRD. Connect the inlet end of the device, including rupture disk and sealing washer, to a suitable pressure source. Immerse the device in a liquid bath at a temperature of 132 °F (55 °C); apply air, nitrogen, or hydrostatic pressure equal to the minimum bursting pressure of the rupture disk; maintain the temperature and pressure for 10 minutes, then examine the PRD. Extrusion of fusible metal or bursting of the rupture disk shall constitute failure of this test. As an alternate to this test, the rupture disk may be removed and the fusible plug tested as specified in 4.4.2.1.

4.4.2.3 Rupture disk. This test shall be performed with no fusible metal backing the rupture disk. Close the valve and plug or cap the outlet. Maintain a constant temperature of 160 °F (71 °C) at the valve. Subject the valve to an internal gas pressure, equal to the applicable service pressure of the valve, for 30 seconds. Raise the internal pressure at a rate of 50 psig (345 kPa) every 30 seconds until the rupture disk bursts. Note the pressure at which the disk fails. Examine the cap or plug for obstruction of the outlet passages. Nonconformance to 3.6.1.7.1.1 shall constitute failure of this test. Test may be performed at room temperature, provided that the relation of bursting pressure at room temperature to the bursting pressure at 160 °F (71 °C) has been established by previous tests. After having successfully tested two

rupture disk holders (cap or plug) of like design and dimension, any required additional tests of rupture disks may be performed in a hardened steel fixture having a pressure opening identical in dimensions and configuration to that of the rupture disk holder in which the disk is to be used.

4.4.2.4 Yield temperature test for fusible metal before pouring into PRD. Prepare two sticks from each batch of fusible metal. Each stick shall be 8 inches (203.2 mm) long. Cut 2-inch (50.8 mm) specimens from the sticks and suspend two specimens on knife-edge supports. The supports shall be 1 inch (25.4 mm) apart. The specimens shall overhang the supports by 0.50 inch (12.7 mm). The specimens and supports shall be immersed in a glycerin or oil bath. There shall be clearance of not less than 0.25 inch (6.35 mm) between the specimens and the bottom of the bath. The bath shall be suspended in and the temperature controlled by an outer glycerin or oil bath. A thermometer shall be suspended midway between the two specimens and shall not touch the bottom or the bath. The temperature of the bath shall start at 5 °F below the lower rating of the fusible metal yield point range. From this temperature, raise the temperature of the bath at a rate of 1 °F (0.56 °C) every 3 minutes. The yield temperature shall be taken as that temperature at which the second of the four ends of the specimens loses its rigidity and drops. A yield temperature that does not fall within the rated range of the fusible metal as specified in 3.6.1.7.2.1, 3.6.1.7.4, or 3.6.1.7.5 as applicable, shall constitute failure of this test.

4.4.2.5 Yield temperature test for fabricated PRDs. Remove the rupture disk, if one is present, from the PRD. Suspend the device, with the centerline of the fusible metal vertically in an oil or glycerin bath. The bath shall be equipped with a mechanical stirrer and not less than two thermometers of the bulb-immersion type. At any given time, the temperature of the bath shall be uniform. At the time of immersion, the temperature of the bath shall be 5 °F below the lower rating of the fusible metal yield range. Increase the temperature at the rate of 1 °F (0.56 °C) every 3 minutes. At every increase in temperature, pass the bulb of a thermometer across the surface of the fusible metal. Note the temperature when the bulb dips into the fusible metal. At this temperature, the fusible metal has become fluid. A temperature reading (at which the fusible metal becomes fluid) that does not fall within the yield range specified in 3.6.1.7.2.1, 3.6.1.7.3, 3.6.1.7.4, or 3.6.1.7.5 as applicable shall constitute failure of this test. Where the fusible metal is part of a nonremovable PRD, the test specified in 4.4.2.4 shall be used.

4.4.2.6 Spring-loaded PRD. Cap or plug the valve outlet. Open the valve. Connect the valve inlet to an air source having a thermometer, a pressure gage, and provisions for metering the air flow. Immerse the valve in water, apply 300 psig (2070 kPa) of air at 70 °F (21 °C), and examine the relief device for leaks. Increase the air pressure on the valve until the PRD opens. Determine the air pressure at which the relief device opens. Determine the flow rate of air in cubic feet per minute that escapes through the relief device after the valve internal pressure has been increased to 100 percent of the designated cylinder's minimum test pressure at ambient temperature of 70 °F (21 °C). Decrease the internal pressure until the relief device has resealed. Determine the internal pressure at which the relief device resealed. Nonconformance to 3.6.1.7.6 shall constitute failure of this test.

4.4.2.7 Stress corrosion test for brass forgings. After having been subjected to the hydrostatic test specified in 4.4.2.17, brass forgings shall be subjected to the tests specified per ASTM G 37. Evidence of cracks shall constitute failure of this test.

4.4.2.8 Outlet failure. One valve of each class shall be tested to destruction by this test. Insert a plug with adapter head, or using a heavy duty steel cap, apply sufficient torque to the valve so as to cause failure in the outlet threads. Examine the body of the valve during the test. Fracture or deformation of the body prior to failure of the outlet threads shall constitute failure of this test.

4.4.2.9 Combustibility.

4.4.2.9.1 Contact with oxygen. Place 0.5 gram of the material to be tested in a reaction chamber connected to a source of oxygen that provides a pressure of 2000 psig (13790 kPa). Heat the reaction chamber to a temperature of 302 °F (150 °C) and maintain this applied temperature ±2 °F (1.11 °C) and a pressure of 2000 psig (13790 kPa) for 1 hour. Record the temperature within the reaction chamber at 5-minute intervals. A temperature rise shall be indicative of a reaction. After 1 hour, release the pressure within the chamber and let cool. Open the chamber and examine the material for discoloration or any change in appearance of the material indicating combustion. Three separate tests shall be conducted for each material. Any indication of a reaction or evidence of combustion shall constitute failure of this test.

4.4.2.9.2 Contact with oxygen under surge-pressure conditions. Place 0.5 gram of the material to be tested in a reaction chamber, raise the temperature of the reaction chamber to 160 °F (71 °C) ±2 °F (1.11 °C), and maintain this temperature for 10 minutes. At the end of 10 minutes, apply surge of pressure of 2000 psig (13790 kPa) of oxygen gas instantaneously. Maintain the applied temperature and pressure at a constant level for 5 minutes. At the end of this interval, release the pressure and reapply it instantaneously. A temperature rise during application of pressure or a discoloration or change in appearance of the sample under test shall be considered evidence of combustion and shall constitute failure of this test.

4.4.2.10 Hardness. Test the hardness of the packing seal surface of carbon or nickel steel stems in accordance with ASTM E 18. The stem shall be from the valve used in preceding tests, except that in case of dispute the test shall be performed on the stem from the valve reserved as a test control. A hardness of less than Rockwell C-30 or a hardening depth of less than 0.02 inch (0.50 mm) shall constitute failure of this test.

4.4.2.11 Chromium plating salt spray. Subject the class 1 chromium plating to a salt spray test for 72 hours in accordance with ASTM B 117. Evidence of corrosion, pitting, or flaking shall constitute failure of this test.

4.4.2.12 Service pressure. Half-open the valve, cap or plug the outlet, and subject the valve to an inlet air or nitrogen gas pressure equal to the maximum service pressure specified in table II while the valve is submerged in a suitable liquid. Determine whether the valve leaks. Repeat the test with the valve fully open. Determine whether the valve leaks. Repeat the test with the valve closed with a torque not greater than that specified in table III, and with the outlet cap or plug removed. Keep the valve submerged for not less than 1 minute. Determine whether the valve leaks. Leakage or evidence of deformation, cracks, pits, or fissures shall constitute failure of this test.

4.4.2.13 Torque and over-torque. Connect the valve inlet to a positive, open-and-close test fixture. There shall be no leakage through any of the connections between the valve under test and the test fixtures. The valve under test shall be dry. An air or nitrogen gas pressure of not less than the maximum service pressure specified in table II shall be maintained on the valve inlet during testing. Perform the following operations:

a. Open the outlet of the valve in the test fixture. Determine the torque required to open and close the valve during the opening and closing cycles.

b. Close the outlet of the valve in the test fixture. Cycle the valve twice at the torque determined in (a). Determine whether the valve closes at this torque. If the valve does not close at the torque determined in (a), redetermine the torque required to open and close the valve. Check for leakage around the valve stem and the packing nut or bonnet threads.

c. Subject the valve to the over-torque specified in table III. Check the stem for binding or seizure. Examine the visible components of the valve for permanent deformation or failure. Open the valve and check for leakage around the valve stem and packing nut or bonnet threads.

d. Close the valve, open the outlet of the test fixture, and check for leakage through the valve seat.

Nonconformance to 3.7.2 shall constitute failure of this test.

4.4.2.14 Spindle spring compression. Open the valve fully. With zero psig at the valve inlet, apply an instantaneous gas pressure surge to the valve outlet equal to the maximum service pressure specified in table II. Determine whether flow is interrupted by the spring allowing the spindle to check closed. Interruption of gas flow shall constitute failure of this test.

4.4.2.15 Vibration.

4.4.2.15.1 Vibration test with valve closed. Remove the valve outlet cap or plug. Close the valve with a torque not greater than the closing torque specified in table III. Maintain an air or nitrogen inlet pressure at not less than the maximum service pressure specified in table II. Vibrate the valve at an amplitude of 0.0312 to 0.0625 inch (0.792 to 1.59 mm) with a frequency of 3400 to 3600 vibrations per minute, for 1 hour. At the end of the hour examine the valve. Evidence of leakage, deformation, failure, loosened threaded connections, detached components, wheeling open of the valve; or binding or seizure of the stem shall constitute failure of this test.

4.4.2.15.2 Vibration test with valve open for other than pin-index connection valves. Repeat test specified in 4.4.2.15.1 except that:

a. An outlet cap or plug shall be screwed in tightly.

b. The valve shall be fully open.

Leakage, deformation, loosened threaded connections, detached components, wheeling close of the valve, or binding or seizure of the stem shall constitute failure of this test.

4.4.2.15.3 Vibration test with valve half open. Repeat the test specified in 4.4.2.15.2 except that the valve shall be half open. Leakage, deformation, loosened connections, detached components, or binding or seizure of the stem shall constitute failure of this test.

4.4.2.16 Endurance. Maintain an internal air or nitrogen gas pressure at not less than the maximum service pressure specified in table II during the test. The cycling rate shall not exceed one cycle per minute.

Procedure I for style I, II, and III valves.

Determine the initial opening torque. Determine the initial closing torque to completely seat the valve with no leakage. Cycle the valve at this torque for 1000 cycles. Observe the compression packed valve for leakage around the stem during cycling. If required, tighten the packing nut. At the completion of 1000 cycles, redetermine the closing torque required to completely seat the valve without leakage. Using this redetermined torque, cycle the valve for an additional 1000 cycles. Repeat these procedures until the valve has been cycled 5000 time. Upon completion of 5000 cycles, re-examine the value. Leakage, loose or damaged components, or opening or closing torque greater than that specified in table III or failure to meet the reliability requirements of 3.3 shall constitute failure of this test.

Procedure II for style IV valves.

Procedure II shall be identical to Procedure I except that the valve shall be cycled a total of 2000 cycles in 200-cycle increments.

4.4.2.16.1 Special low pressure cycling for style III valves. When used for low pressure service, style III valves shall be subjected to the following test. With the outlet capped, place each of four valves in a pressurized cycle machine. Set the closing torque as specified for style III valves in table III. The machine should stop on opening just short of back seating. Adjust the inlet pressure to 50 psig (345 kPa) ±5 psig (34 kPa). Cycle the valve continuously for 1000 cycles. Leak test the stem for full cycle at 250 cycles, at 500 cycles, and at 750 cycles. At 1000 cycles, raise the outlet pressure to 600 psig (4150 kPa) and leak test the stem for one full cycle. Repeat procedure for a total of 5000 cycles for each valve. Leakage at any test shall constitute failure of this test.

4.4.2.17 Hydrostatic proof pressure. Remove the outlet cap. Replace the relief device with a solid cap or plug. Close the valve with torque not greater than the closing torque specified in table III. Subject the valve inlet to the hydrostatic pressure specified in table II for a period of 10 minutes. Examine the valve for leakage. After completion of this phase of the test, cap or plug the valve outlet. Open the valve to the same hydrostatic pressure for a period of

10 minutes. Leakage or evidence of deformation, cracks, pits, or fissures shall constitute failure of this test.

Note: The hydrostatic test shall be performed after completion of the endurance test specified in 4.4.2.16.

4.4.2.18 Temperature stability. The valves shall be in a dry condition.

4.4.2.18.1 Low temperature storage and operation. Connect the inlet of the valve to a pressure fixture and close the valve at a torque not greater than specified in table III. Place the valve assembly in an atmosphere stabilized at -65 °F (-54 °C) ±2 °F (1.11 °C) for a period of 8 hours while maintaining an air or nitrogen pressure at the maximum service pressure specified in table II. Examine the valve for leakage. Examine the valve for failure or deformation of components. While maintaining pressure, allow the valve to reach a stabilized temperature of -50 °F (-46 °C) ±2 °F (1.11 °C). Determine the opening and the closing torque. After opening and closing the valve not less than twice, examine the valve for leakage, deformation or damage. Evidence of leakage, deformation or component damage, or requirement for opening or closing torque greater than that specified in table III shall constitute failure of this test.

4.4.2.18.2 High temperature storage and opening. Connect the valve to a pressure fixture in a controlled oven and stabilize the temperature of the valve assembly at 155 °F (68.8 °C) ±2 °F (1.11 °C). Close the valve at a closing torque not greater than specified in table III and pressurize the inlet with air or nitrogen pressure at the maximum service pressure as specified in table II. Maintain the temperature for 8 hours. Examine the valve for leakage, failure, or deformation. Allow the valve to cool to temperature of 120 °F (49 °C) ±2 °F (1.11 °C) while maintaining the pressure. Examine the valve for leakage. Open and close the valve not less than twice and determine the opening and closing torque for the valve. Evidence of leakage, damage of any component or deformation of the valve, or an opening or closing torque greater than specified in table III shall constitute failure of this test.

4.4.2.19 Disassembly inspection. After completion of the tests specified in 4.4.2.12 through 4.4.2.18, disassemble the valve and examine for failures developed during the tests, as specified in table V. Nonconformance to the applicable requirements paragraph shall constitute failure of this inspection.

TABLE V. Disassembly valve failures.

Failure	Requirements paragraph
Deformation of internal components	3.7.1, 3.7.2, 3.7.4, 3.8
Cracked disk insert	3.3, 3.7.2
Thread failure or excessive wear	3.3
Detached components	3.3, 3.7.4
Cracks, pits, or fissures	3.7.1
Galling of the stem	3.7.4
O-ring worn flat, indicating lack of rolling	3.9.2
Spindle spring worn flat, indicating sliding against body or spindle	3.9.4

4.5 Inspection of packing.

4.5.1 Quality conformance inspection of pack.

4.5.1.1 Unit of product. For the purpose of inspection, a complete pack prepared for shipment shall be considered a unit of product.

4.5.1.2 Sampling. Sampling for inspection and acceptance shall be in accordance with ASQC Z1.4. Any departure from a specified requirement shall be classified as a defect. Any defect shall be cause for rejection of the entire lot.

4.5.1.3 Examination. Samples selected in accordance with 4.5.1.2 shall be examined for the defects in table VI.

TABLE VI. Packaging defects.

Requirement Number	Defect
126	Materials, methods and containers not as specified for level A or B. Each incorrect material, method or container shall constitute one defect.
127	Preservation not as specified for level A
128	Containers not as specified for level A or B
129	Strapping not zinc coated as specified for level A
130	Reinforcing tape and closure not as specified for level B
131	Marking illegible, incorrect, incomplete, or missing

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The valves covered by this specification in conjunction with applicable detail specification sheets are intended for installation on compressed gas cylinders containing liquefied or non-liquefied compressed gases or mixtures.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, revision, and date of this specification.
b. Title, number, revision, and date of applicable specification sheet.
c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents reference (see 2.2.1, 2.2.2, and 2.3).
d. Valve type designation (see 1.3).
e. When data desired for the identification of materials and finishes are required (see 3.4.1.2).
f. When specified, components parts for medical valves will be tested for oxygen compatibility in accordance with NASA-STD-6001 (see 3.4.11.8).
g. When a metal outlet cap or plug with chain and retaining ring is required or when a plastic dust cap is acceptable (see 3.5 and 3.6.1.8).
h. Specify when a strainer is required (see 3.6.1.5).
i. Cylinder diameter when a dip tube is specified on applicable specification sheet (see 3.6.1.6).
j. When a dip tube assembled to the valve and secured as specified is required (see 3.6.1.6).
k. Spring tension adjustment, if different (see 3.6.1.7.6).
l. Service pressure required (see 3.7.1.1).
m. When overall length of valve other than as specified is acceptable (see 3.10).
n. When chromium over nickel plated valves are not required for medical application (see 3.12).
o. When marking of valves other than as specified is required (see 3.13.1(c)).
p. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products that are, at the time of award of contract, qualified for inclusion in QPL-2 whether or not such products have actually been so listed by that date. The attention of contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Richmond, ATTN: DSCR-VBD, 8000 Jefferson Davis Highway, Richmond, VA 23297-5610.

6.4 Specification sheets. This specification contains general requirements for gas cylinder valves. Specific requirements by intended use are covered in separate specification sheets as listed in table VII.

6.5 Classification changes and supersession data. Classification changes and supersession data between this revision of the specification and the previous edition is contained in the applicable specification sheets, table IV. Class refers to maximum service pressure in this revision.

6.6 International standardization agreement. Certain provisions of this specification (see 3.6.1.7.1.3, 3.9.1.1.4, 3.10, and 3.11) covering the pin-index system for medical valves are the subject of international standardization agreement QSTAG 236, "Medical Gas Cylinders". When amendment, revision, or cancellation of this specification is proposed that will modify the international standardization agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

6.7 Subject term (key word) listing.

Diaphragm valve
Dip tube
Fusible plug
Handwheel
Inlet
Lubricants
Medical valve
O-ring valve
Outlet
Pressure relief device
Rupture disk
Strainer

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

TABLE VII. Type designation cross listing of valves.

Detail spec number	Type designation	Outlet app	Inlet size	Style	Class	MIL-V-2C type designation	Gas service	Remarks
MIL-DTL-2/1	V1-510-0	510	6	I II III	05	03-511-1	Acetylene	0.75" inlet
MIL-DTL-2/2	V2-510-0	510	8	I II III	05	03-511-2	Acetylene	1.00" inlet
MIL-DTL-2/3	V3-200-1	200	3	I	05	03-201-4	Acetylene	0.375" inlet
MIL-DTL-2/4	Canceled	-	-	-	-	-	-	
MIL-DTL-2/5	V5-346-2 V5-346-3 V5-346-4 V5-346-5 V5-346-6	346	6	III	30	06-581-1	Air for human respiration	
MIL-DTL-2/6	V6-590-2 V6-590-3 V6-590-4 V6-590-5 V6-590-6	590	6	III	30	06-591-2	Air	Oil tolerant; industrial
MIL-DTL-2/7	V7-240-0	240	6	I	05	09-241-1	Anhydrous ammonia	0.75" inlet; dished head
MIL-DTL-2/8	V8-240-0	240	6	I	05	09-241-2	Anhydrous ammonia	0.75" inlet; convex head
MIL-DTL-2/9	V9-240-0	240	8	I	05	09-241-3	Anhydrous ammonia	1.00" inlet; dished head
MIL-DTL-2/10	V10-240-0	240	8	I	05	09-241-4	Anhydrous ammonia	1.00" inlet; convex head
MIL-DTL-2/11	V11-580-2 V11-580-3 V11-580-4 V11-580-5 V11-580-6	580	6	III	30	14-581-1 07-581-1 05-581-1 05-581-2	Argon, helium, nitrogen, neon, and xenon	Inert-oil free
MIL-DTL-2/12	Superseded	-	-	-	-	-	-	
MIL-DTL-2/13	Superseded	-	-	-	-	-	-	
MIL-DTL-2/14	V14-510-14 V14-510-15	510	6	II IV	05	10-511-1 08-511-1	Butane, propane, butane-propane mixture, MAPP Gas, and propylene	
MIL-DTL-2/15	V15-320-3 V15-320-4	320	6	III	30	02-321-1	Carbon dioxide	Industrial
MIL-DTL-2/16	V16-320-4	320	6	III IV	30	02-321-2	Carbon dioxide	Medical
MIL-DTL-2/17	V17-940-4	940	4	I	30	02-941-3	Carbon dioxide	Medical (Pin-index)
MIL-DTL-2/18	V18-350-2	350	6	III	30	25-351-1	Carbon monoxide	
MIL-DTL-2/19	V19-350-3 V19-350-4 V19-350-5	350	6	III	30	21-351-1	Ethylene oxide-carbon dioxide mixture	

TABLE VII. Type designation cross listing of valves - Continued.

Detail spec number	Type designation	Outlet app	Inlet size	Style	Class	MIL-V-2C type designation	Gas service	Remarks
MIL-DTL-2/20	V20-820-1	820	6	I	05	13-661-2	Chlorine	
MIL-DTL-2/21	V21-820-0	820	6	I	05	13-661-4	Chlorine	
MIL-DTL-2/22	V22-660-13 V22-660-14 V22-660-15 V22-660-16 V22-660-17 V22-660-18 V22-660-19 V22-660-20 V22-660-21 V22-660-22	660	6	I II	05	17-621-1 26-621-1 24-621-1 18-621-1 12-621-1	R-11 Trichlorofluoromethane R-12 Dichlorodifluoromethane R-13 Chlorotrifluoromethane R-22 Chlorodifluoromethane R-23 Trifluoromethane R-31 Chlorofluoromethane R-32 Difluoromethane R-113 Trichlorotrifluoroethane R-114 Dichlorotetrafluoroethane R-115 Chloropentafluoroethane R-123 Dichlorotrifluoroethane R-124 Chlorotetrafluoroethane R-125 Pentafluoroethane R-134a Tetrafluoroethane R-143a Trifluoroethane R-152a Difluoroethane R-290 Propane R-401A (R-22/R-125/R-124)(53/13/34) R-401B (R-22/R-152a/R-124)(61/28/11) R-402A (R-22/R-125/R-290)(38/60/2) R-402B (R-22/R-125/R-290)(60/38/2) R-404A (R-125/R-143a/R-134a)(44/52/4) R-500 (R-12/R-152a) (73.8/26.2) R-501 (R-22/R-12) (75.0/25.0) R-502 (R-22/R-115) (48.8/51.2) R-503 (R-23/R-13) (40.1/59.9) R-504 (R-32/R-115) (48.2/51.8) R-505 (R-12/R-31) (78.0/22.0) R-506 (R-31/R-114) (55.1/44.9)	
MIL-DTL-2/23	V23-300-1	300	6	I	05	19-301-1	Ethyl chloride	
MIL-DTL-2/24	V24-510-1	510	6	I	05	22-511-1	Ethylene oxide	
MIL-DTL-2/25	Superseded	-	-	-	-	-	-	
MIL-DTL-2/26	V26-590-2 V26-590-3 V26-590-4 V26-590-5 V26-590-6	590	6	III	30	07-591-2	Helium and nitrogen	Inert-oil tolerant
MIL-DTL-2/27	V27-280-2	280	6	III IV	30	16-541-2	Oxygen-helium mixture	Medical; Helium not over 80 percent

TABLE VII. Type designation cross listing of valves - Continued.

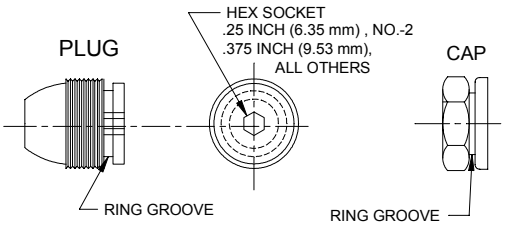
Detail spec number	Type designation	Outlet app	Inlet size	Style	Class	MIL-V-2C type designation	Gas service	Remarks
MIL-DTL-2/28	V28-890-2	890	4	I	30	16-891-2	Oxygen-helium mixture	Medical (pin-index); Helium not over 80 percent
MIL-DTL-2/29	V29-350-2	350	6	III IV	30	04-351-1	Hydrogen	
MIL-DTL-2/30	Superseded	-	-	-	-	-	-	
MIL-DTL-2/31	Superseded	-	-	-	-	-	-	
MIL-DTL-2/32	Superseded	-	-	-	-	-	-	
MIL-DTL-2/33	Canceled	-	-	-	-	-	-	
MIL-DTL-2/34	Superseded	-	-	-	-	-	-	
MIL-DTL-2/35	Superseded	-	-	-	-	-	-	
MIL-DTL-2/36	Superseded	-	-	-	-	-	-	
MIL-DTL-2/37	V37-326-4	326	6	III IV	30	15-321-1	Nitrous oxide	Medical
MIL-DTL-2/38	V38-910-4	910	4	I	30	15-9111-2	Nitrous oxide	Medical (pin-index)
MIL-DTL-2/39	V39-540-2 V39-540-3 V39-540-4 V39-540-5 V39-540-6	540	6	III	30	01-541-1 01-541-2	Oxygen	
MIL-DTL-2/40	Superseded	-	-	-	-	-	-	
MIL-DTL-2/41	V41-540-2	540	6	III IV	30	01-541-4	Oxygen	Medical
MIL-DTL-2/42	V42-870-2	870	4	I	30	01-871-5	Oxygen	Medical (pin-index)
MIL-DTL-2/43	V43-660-12	660	6	I	30	11-641-1	Phosgene	
MIL-DTL-2/44	V44-510-14 V44-510-15	510	6	II IV	05	10-511-1	Butane, propane, butane-propane mixture, MAPP gas, and propylene	
MIL-DTL-2/45	Superseded	-	-	-	-	-	-	
MIL-DTL-2/46	V46-590-2 V46-590-3 V46-590-4 V46-590-5 V46-590-6	590	6	III	30	23-591-1	Sulfur hexafluoride	
MIL-DTL-2/47	V47-950-2	950	4	I	30	-	Air for human respiration	Medical (pin-index)
MIL-DTL-2/48	V48-346-2	346	6	III IV	30	-	Air for human respiration	Medical
MIL-DTL-2/49	V49-920-2	920	4	I	30	-	Cyclopropane	Medical (pin-index)
MIL-DTL-2/50	V50-330-12	330	6	IV	05	-	Methyl bromide	0.50" NPT outlet
MIL-DTL-2/51	V51-677-9	677	6	III	75	-	Argon, helium, nitrogen, neon, xenon and krypton	Inert-oil free

TABLE VII. Type designation cross listing of valves - Continued.

Detail spec number	Type designation	Outlet app	Inlet size	Style	Class	MIL-V-2C type designation	Gas service	Remarks
MIL-DTL-2/52	V52-660-14 V52-660-16 V52-660-17 V52-660-18 V52-660-19	660	6	I IV	30	-	Halon Halon-1202 (Dibromodifluoromethane) Halon-1211 (Bromochlorodifluoromethane) Halon-1301 (Bromotrifluoromethane) Halon-2402 (Dibromotetrafluoroethane)	
MIL-DTL-2/53	V53-660-2 V53-660-3 V53-660-4 V53-660-5	660	6	III	30	-	Hexafluoroethane	
MIL-DTL-2/54	V54-660-1	660	6	I IV	05	-	Sulfur dioxide	
MIL-DTL-2/55	V55-540-2 V55-540-3 V55-540-4 V55-540-5 V55-540-6	540	4	III	30	-	Oxygen	
MIL-DTL-2/56	V56-680-8 V56-680-10 V56-680-11	680	6	III	55	-	Argon, helium, neon, nitrogen, xenon, and krypton	Inert-oil free
MIL-DTL-2/57	V57-621-8 V57-621-10 V57-621-11	621	6	III	55	-	Helium and nitrogen	Inert-oil tolerant
MIL-DTL-2/58	V58-677-9	677	8	III	75	-	Argon, helium, neon, nitrogen, xenon, and krypton	Inert-oil free
MIL-DTL-2/59	V59-347-8 V59-347-10 V59-347-11	347	6	III	55	-	Air	
MIL-DTL-2/60	V60-500-2	500	6	III IV	30	-	Oxygen-helium mixture	Medical; helium over 80 percent
MIL-DTL-2/61	V61-930-2	930	4	I	30	-	Oxygen-helium mixture	Medical (pin-index); helium not over 80 percent
MIL-DTL-2/62	V62-350-2	350	6	III	30	-	Methane	
MIL-DTL-2/63	V63-350-2	350	6	III	30	-	Natural gas	
MIL-DTL-2/64	V64-330-2	330	6	I IV	30	-	Hydrogen chloride	
MIL-DTL-2/65	V65-330-2	330	6	I IV	30	-	Hydrogen sulfide	
MIL-DTL-2/66	V66-590-2 V66-590-3 V66-590-4 V66-590-5 V66-590-6	590	6	III	30	-	Mildly oxidizing mixtures	5 to 23 percent oxygen

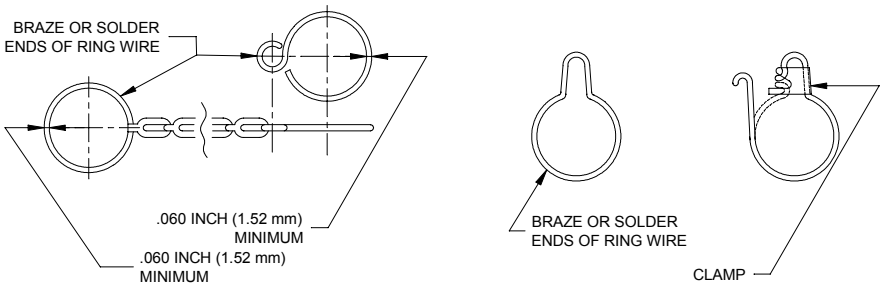
TABLE VII. Type designation cross listing of valves - Continued.

Detail spec number	Type designation	Outlet app	Inlet size	Style	Class	MIL-V-2C type designation	Gas service	Remarks
MIL-DTL-2/67	V67-510-1	510	6	I II	05	-	Low pressure, flammable and toxic mixtures	
MIL-DTL-2/68	V68-580-2 V68-580-3 V68-580-4 V68-580-5 V68-580-6	580	6	III	30	-	Inert-oil free mixtures	Oxygen not over 5 percent
MIL-DTL-2/69	V69-330-12	330	6	IV	30	-	Corrosive (acidic) mixtures	
MIL-DTL-2/70	V70-350-2	350	6	III IV	30	-	High pressure, flammable and toxic mixtures	
MIL-DTL-2/71	V71-660-2 V71-660-3 V71-660-4 V71-660-5 V71-660-6	660	6	III IV	30	-	High pressure, toxic and oxidizing mixtures	
MIL-DTL-2/72	V72-670-12	670	6	I III IV	30	-	Fluorinating compound mixtures	
MIL-DTL-2/73	V73-705-0	705	6	IV	05	-	Corrosive (basic) mixtures	
MIL-DTL-2/74	V74-660-1	660	6	III IV	05	-	Low pressure, toxic and oxidizing mixtures	
MIL-DTL-2/75	V75-577-8 V75-577-10	577	6	III	40	-	Oxygen	
MIL-DTL-2/76	V76-296-2 V76-296-3 V76-296-4 V76-296-5 V76-296-6	296	6	III	30	-	Oxidizing mixtures	
MIL-DTL-2/77	V77-660-13 V77-660-14 V77-660-16	660	6	I IV	05	-	Methyl chloride	



RETAINING RINGS WITH CHAIN

ALTERNATE CONFIGURATIONS



CAPS			PLUGS		
Outlet application	MIL-DTL-2 specification sheet	Outlet connection number	Outlet application	MIL-DTL-2 specification sheet	Outlet connection number
-200	3	200	-240	7, 8, 9, 10	240
-280	27	280	-296	76	296
-300	23	300	-510	1, 2, 14, 24, 44, 67	510
-320	15, 16	320	-580	11, 68	580
-326	37	326	-590	6, 26, 46, 66	590
-330	50, 64, 65, 69	330	-680	56	680
-346	5, 48	346			
-347	59	347			
-350	18, 19, 29, 62, 63, 70	350			
-540	39, 41, 55	540			
-577	75	577	(The part number for a specific cap or plug shall include MIL-DTL-2 plus the applicable outlet application dash number above.)		
-621	57	621			
-660	22, 43, 52, 53, 54, 71, 74	660			
-670	72	670			
-677	51, 58	677			
-705	73	705			
-820	20, 21	820			

NOTES:

1. Materials. The cap or the plug shall be of the material specified for the respective MIL-DTL- / detail specification valve composition classification. The retaining rings shall be of round copper alloy wire, conforming to ASTM B 134/B 134M, Alloy Number C24000, half hard temper. The chain shall conform to RR-C-271, type II, class 5, 6 or 7 brass, with no fewer than 18 links per foot and a breaking load of not less than 30 pounds. Chain length shall be 3.00 inches +0.50, -0.00 inch (76.2 mm +12.7, -00.00 mm).
2. Threads. Cap and plug threads, plug nose, and other connection details as specified herein shall be in accordance with either FED-STD-H28 or CGA Standard V-1.
3. Caps. Caps shall have a hexagonal wrenching surface. The dimension across the hex flats shall not be greater than that for the respective valve outlet connection hex nut specified in the reference of Note 2 above.
4. Length and configuration. The overall length and configuration of the cap or plug shall be such that when tightened to the seal on the respective valve outlet (with any possible orientation of the cap's hexagonal across-corners dimension). The cap or plug does not project more than 1.50 inches (38.1 mm) from the center line of the valve inlet connection threads as specified in the references of Note 2 above.

FIGURE 1. Cap and plug.

NOTES - Continued:

5. Retaining ring. One retaining ring shall be closed around the cap or plug ring groove. The depth and the width of the ring groove and the peripheral clearance between the retaining ring and the bottom of the ring groove shall be such that the retaining ring is not able to slip out of the groove and turns freely in the groove.
6. Second retaining ring. The second retaining ring shall be sized to fit loosely around the valve body immediately above the inlet threads of the largest inlet connection specified for the group of MIL-DTL-2 valves tabulated above. When the cap or plug is supplied separately from a valve, the retaining ring for encircling the valve shall be fastened to the chain and left open with a clamp having provisions for crimping to close the ring after installation on a valve.
7. Fiber disk. The cap shall have a fiber disk insert to seal against the respective valve outlet. The disk shall be installed so as not to be able to fall out of the cap. The disk material shall be compatible with the intended compressed gas usage.
8. O-ring. The plug may be designed for an O-ring seal. The O-ring shall fit in a circumferential groove on the plug nose, and the plug nose shall otherwise be in accordance with Note 2 above.

FIGURE 1. Cap and plug - Continued.

Custodians:
Army - AV
Navy - SH
Air Force - 68

Preparing Activity:
DLA - GS3

(Project 8120-1047)

Review Activities:
Navy - AS, MC, YD

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-DTL-2F	**2. DOCUMENT DATE (YYYYMMDD)** 20020925

3. DOCUMENT TITLE
VALVES, CYLINDER, GAS (FOR COMPRESSED OR LIQUEFIED GASES), GENERAL SPECIFICATION FOR

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE (Include Area Code) (1) Commercial (2) DSN *(if applicable)*	**7. DATE SUBMITTED** (YYYYMMDD)

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c. ADDRESS *(Include Zip Code)* ATTN: DSCR-VBD (C. Hammond) 8000 Jefferson Davis Highway Richmond, VA 23297-5610	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** DEFENSE STANDARDIZATION PROGRAM OFFICE (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, VA 22060-6221 Commercial: (703) 767-6888 DSN: 427-6888