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MILITARY SPECIFICATION

VALVES, CYLINDER, GAS

(FOR COMPRESSED OR LIQUEFIED GASES)

GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers valves for compressed gas cylinders and liquefied gas cylinders.

1.2 Classification. The valves shall be of the following styles, classes, compositions, sizes and safety device requirements:

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

Class 06	- Maximum service pressure 600 psi.
Class 24	- Maximum service pressure 2400 psi.
Class 30	- Maximum service pressure 3000 psi.
Class 36	- Maximum service pressure 3600 psi.
Class 60	- Maximum service pressure 6000 psi.

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

Inlet size 3	- 3/8 inch 18 NGT.
Inlet size 4	- 1/2 inch 14 NGT.
Inlet size 6	- 3/4 inch 14 NGT.
Inlet size 8	- 1 inch 11-1/2 NGT.

Safety device (S-0)	None required.
Safety device (S-1)	Frangible disk.
Safety device (S-2)	Fusible plug, 165° F. nominal.
Safety device (S-3)	Fusible plug, 212° F. nominal.
Safety device (S-4)	Comb. Frangible disk-fusible plug 165° F.
Safety device (S-5)	Comb. Frangible disk-fusible plug 212° F.
Safety device (S-6)	Canceled.
Safety device (S-7)	Safety relief valve.

1.3 Type designation. The type designation of valves for compressed gas service shall be identified by a type designation which shall be formed by the heading V plus the slash number of the applicable specification sheet, followed by a dash and the outlet designation of the valve, followed by a dash and a numerical designator to differentiate valves with different safety requirements.

-1 indicates low pressure applications (600 psi or lower).
-2 indicates a combination frangible disk and fusible plug safety device for cylinder service pressure range 1800 psi through 2400 psi.
-3 indicates a frangible disk safety device for cylinder service pressure 1800 psi.
-4 indicates a frangible disk safety device for cylinder service pressure 2015 psi.
-5 indicates a frangible disk safety device for cylinder service pressure 2265 psi.
-6 indicates a frangible disk safety device for cylinder service pressure 2400 psi.
-7 indicates a frangible disk safety device for cylinder service pressure 3000 psi.
-8 indicates a frangible disk safety device for cylinder service pressure 3500 psi.
-9 indicates a combination frangible disk and fusible plug safety device for cylinder service pressure 6000 psi.

When a service pressure is not specified for high pressure service, -2 shall be substituted and the valve shall be fitted with a combination frangible disk and fusible plug safety device of the S-4 or S-5 type. The safety device shall be marked for 1800 psi service and shall be usable in service to a maximum of 2400 psi.

EXAMPLES:

Acetylene, Outlet 511, Inlet 3/4 inch
V1-511-1

Oxygen, Outlet 541, Inlet 3/4 inch for use with 2015 psi service pressure cylinder
V9-541-4

Oxygen, Outlet 541, Inlet 3/4 inch for use with 1800 psi, 2015 psi, 2265 psi or 2400 psi service pressure cylinder where a combination frangible disk, fusible plug safety device is required
V9-541-2

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

Federal

L-P-410	- Plastic, Polyamide (Nylon), Rigid, Rods, Tubes, Flats, Molded and Cast Parts.
HH-P-46	- Packing; Asbestos, Sheet, Compressed.
QQ-A-225/1	- Aluminum Alloy Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished, 1100.
QQ-A-591	- Aluminum Alloy Die Castings.
QQ-B-626	- Brass, Leaded and Non-Leaded: Rod, Shaped, Forgings, and Flat Products with Finished Edges (Bar and Strip).
QQ-B-637	- Brass, Naval: Rod, Wire, Shapes, Forgings, and Flat Products with Finished Edges (Bar, Flat Wire, and Strip).
QQ-B-728	- Bronze Manganese; Rod, Shapes, Forgings, and Flat Products (Flat Wire, Strip, Sheet, Bar, and Plate).
QQ-B-750	- Bronze, Phosphor; Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections.
QQ-C-320	- Chromium Plating (Electrodeposited).

QQ-C-390	- Copper Alloy Castings (Including Cast Bar).
QQ-C-465	- Copper-Aluminum Alloys (Aluminum Bronze) (Copper Alloy Numbers 606, 614, 630, and 642), Rod, Flat Products with Finished Edges (Flat Wire, Strip, and Bar), Shapes, and Forgings.
QQ-C-533	- Copper-Beryllium Alloy Strip (Copper Alloy Numbers 170 and 172).
QQ-C-576	- Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed, or Machined Edges, (Plate, Bar, Sheet, and Strip).
QQ-C-591	- Copper-Silicon, Copper-Zinc-Silicon, and Copper-Nickel-Silicon Alloys: Rod, Wire, Shapes, Forgings, and Flat Products, (Flat Wire, Strip, Sheet, Bar, and Plate).
QQ-N-281	- Nickel-Copper-Alloy Bar, Plate, Rod, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections.
QQ-N-290	- Nickel Plating (Electrodeposited).
QQ-P-416	- Plating, Cadmium (Electrodeposited).
QQ-S-624	- Steel Bar, Alloy, Hot Rolled and Cold Finished, (General Purpose).
QQ-S-628	- Steel Bars and Forgings, Graphitic.
QQ-S-634	- Steel, Bar, Carbon, Cold Finished, (Standard Quality).
QQ-S-681	- Steel Castings.
QQ-S-763	- Steel Bars, Shapes and Forgings, Corrosion-Resisting.
QQ-S-766	- Steel Plate, Sheets, and Strip - Corrosion Resisting.
QQ-W-321	- Wire, Copper Alloy.
QQ-W-423	- Wire, Steel, Corrosion-Resisting.
WW-P-404	- Pipe, Steel, (Seamless and Welded, Black and Zinc-Coated) (Galvanized).
PPP-B-601	- Boxes, Wood, Cleated-Plywood.
PPP-B-636	- Box, Fiberboard.

Military

MIL-P-116	- Preservation, Methods of.
MIL-P-15047	- Plastic-Material, Laminated Thermosetting Sheets, Nylon Fabric Base, Phenolic-Resin.
MIL-P-19468	- Plastic Rods, Polytetrafluoroethylene, Molded and Extruded.
MIL-M-20693	- Molding Plastic, Polyamide (Nylon), Rigid.

See table V for list of associated detail specification sheets.

STANDARDS

Federal

FED. STD. No. 66	- Steel: Chemical Composition and Hardenability.
FED. TEST METHOD STD. No. 151	- Metals; Test Methods.

Military

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	- Marking for Shipment and Storage.
MIL-STD-417	- Rubber Compositions, Vulcanized, General Purpose, Solid (Symbols and Tests).
MIL-STD-831	- Test Reports, Preparation of.

(Copies of specifications and standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

DEPARTMENT OF TRANSPORTATION

Code of Federal Regulations, Title 49, 171-190.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

B57.1 - Compressed Gas Cylinder Valve Outlet and Inlet Connections.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, N. Y. 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

THE CHLORINE INSTITUTE, INC.

Drawing No. 110	- Valve for Chlorine Cylinders and Ton Containers-Assembly.
Drawing No. 112	- Valve and Fusible Plug for Chlorine Cylinders and Ton Containers--Specifications and General Notes.
Drawing No. 113	- Valve for Chlorine Cylinders and Ton Containers-Parts.

(Application for copies should be addressed to the Chlorine Institute, Inc., 342 Madison Avenue, New York, N. Y. 10017.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification

(Application for copies should be addressed to the American Trucking Associations, Inc., ATTN: Tariff Order Section, 1616 P Street NW, Washington, D. C. 20036.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification

(Application for copies should be addressed to the Tariff Publishing Officer, Room 202, Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Specification sheets. Individual valve requirements shall be detailed in the applicable specification sheets.

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.

3.3 Description. The valve shall be as specified in the applicable specification sheet and as specified herein.

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

3.4.1 Aluminum.

3.4.1.1 Die castings. Aluminum die castings shall conform to QQ-A-591, composition 13, A13, or 360.

3.4.1.2 Flat stock. Flat aluminum stock shall conform to QQ-A-225/1, temper optional.

3.4.2 Asbestos packing. Asbestos packing shall conform to HH-P-46, unlubricated, graphited or ungraphited.

3.4.3 Brass.

3.4.3.1 Castings. Brass castings shall conform to QQ-C-390, class B.

3.4.3.2 Forging. Forging brass shall conform to QQ-B-626, composition 21, alloy number 377.

3.4.3.3 Free-cutting. Free-cutting brass shall conform to QQ-B-626, composition 22, alloy number 360.

3.4.3.4 Naval. Naval brass shall conform to QQ-B-637, composition 3, or QQ-B-626, alloy number 480.

3.4.3.5 Strainer wire. Brass strainer wire shall conform to QQ-W-321, composition 8.

3.4.4 Bronze.

3.4.4.1 Aluminum. Aluminum bronze shall conform to QQ-B-679, composition 2.

3.4.4.2 Aluminum-silicon, alloy B. Aluminum-silicon bronze, alloy B shall conform to Chlorine Institute Drawing Number 112.

3.4.4.3 Aluminum-silicon, composition 1. Aluminum-silicon bronze, composition 1 shall conform to QQ-B-679.

3.4.4.4 Manganese. Manganese bronze shall conform to QQ-B-728.

3.4.4.5 Phosphor, flat stock. Phosphor bronze flat stock shall conform to QQ-B-750, composition A or D, spring or extra spring temper.

3.4.4.6 Phosphor, round wire. Phosphor bronze round wire shall conform to QQ-W-321.

3.4.5 Copper. Copper shall conform to QQ-C-576, soft-annealed temper.

3.4.6 Copper alloys.

3.4.6.1 Beryllium. Copper-beryllium alloy shall conform to QQ-C-533, alloy number 172.

3.4.6.2 Silicon. Copper-silicon alloy shall conform to QQ-C-591, composition 651, 655 or 692.

3.4.7 Nickel-copper alloy. Nickel-copper alloy shall conform to QQ-N-281.

3.4.8 Plastics.

3.4.8.1 Polyamide. Polyamide plastic shall conform to L-P-410 or MIL-M-20693, compositions as specified herein.

3.4.8.2 Polyethylene. Polyethylene plastic shall conform to MIL-P-22748, class A, grade 5.

3.4.8.3 Polytetrafluoroethylene. Polytetrafluoroethylene plastic shall conform to MIL-P-19468.

3.4.8.4 Phenolic resins. Phenolic resin laminates shall conform to MIL-P-15047.

3.4.9 Rubber. Rubber shall conform to MIL-STD-417, type R, class RS, grade RS $820A_1B_1DB_7$.

3.4.10 Steel.

3.4.10.1 Carbon. Carbon steel bar stock shall conform to QQ-S-634, grade 1045.

3.4.10.2 Castings. Steel castings shall conform to QQ-S-681, class 70-36.

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

3.4.10.4 Corrosion-resisting wire. Corrosion-resisting steel wire shall conform to QQ-W-423, compositions as specified herein.

3.4.10.5 Forgings. Steel forgings shall conform to QQ-S-628, class B or E.

3.4.10.6 Nickel alloy. Nickel steel alloy shall conform to QQ-S-624, composition 4820.

3.4.10.7 Pipe. Steel pipe shall conform to WW-P-404, black, seamless, grade A, class A53A S.

3.5 Environmental conditions.

3.5.1 Low temperature.

3.5.1.1 Storage. The valve shall withstand storage at the maximum service pressure specified herein, for 8 hours at a temperature of minus 65° F. plus or minus 2° F. without leaking, when closed at a closing torque not greater than that specified herein and without damage or permanent deformation of any components.

3.5.1.2 Operation. The valve shall operate at the maximum service pressure specified for type and class, and at an ambient temperature of minus 50° F. plus or minus 2° F. without leaking or requiring an opening or closing torque greater than that specified herein and without damage or permanent deformation of any component.

3.5.2 High temperature.

3.5.2.1 Storage. The valve shall withstand storage at a pressure of not less than the proof pressure specified herein, for 4 hours at a temperature of 155° F. plus or minus 2° F. without leaking, when closed at a closing torque not greater than that specified herein, and without failure or permanent deformation to any component.

3.5.2.2 Operation. The valve shall operate at the maximum service pressure specified herein and at an ambient temperature of 120° F. plus

or minus 2° F., the valve shall not leak, require an opening or closing torque greater than that specified herein nor show any evidence of leakage, failure or permanent deformation of any component.

3.6 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 safety device 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 eductor tube shall be furnished installed in accordance with 3.9.6, when specified.

3.7 Reliability. The diaphragm valve shall have a reliability of not less than 2,000 cycles and all other valves shall have a reliability of not less than 5,000 cycles. After having been opened and closed 2,000 times or 5,000 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 2,000 cycles. The O-ring valve and the pressure sealed valve shall not require tightening of any component at less than 5,000 cycles.

3.8 Performance characteristics.

3.8.1 Pressure. The valve shall not leak and shall not deform at the pressures specified in table I. 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, nor at the safety device connection. 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. After having been subjected to the proof pressure the forged brass body shall show no evidence of cracks when subjected to mercurous-nitrate test as specified in QQ-B-626.

3.8.1.1 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 I).

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

Table I. Service and Proof Pressures

Valve Class	Maximum Service Pressure psig	Hydrostatic Proof Pressure psig
06	600*	1000
24	2400	4000
30	3000	5000
36	3600	6000
60	6000	10000

* Note: For testing purposes class 06 valves with type VII safety devices shall have the safety capped or plugged when maximum service pressures are applied.

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

Table II. Opening and Closing Torque, Inch-Pounds

Valve Description	Open	Close	Overtorque
All valves with 3/8-inch inlets.	60	60	120
All valves with pin-index outlets.	60	60	120
Two-piece stem valves with O-ring or pressure seal, 1/2-inch or larger inlets.	60	60	300
Diaphragm seal valves.	100	150	200
All one-piece stem valves having seat disk inserts and 1/2-inch or larger inlets.	100	100	200
All one-piece stem valves 1/2-inch or larger inlets.	150	150	300

3.8.3 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.

3.8.4 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 1/32 to 1/16 inches. 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.

3.8.5 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.

3.8.6 Combustibility. When intended for use with oxygen or oxidative gases, organic components of the valve 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 2,000 psi and a temperature of 302° F. plus or minus 2° F.
(b) Instantaneous exposure to oxygen at a pressure of 2,000 psi while heated to a temperature of 160° F. plus or minus 2° F.

Polytetrafluoroethylene plastic conforming to MIL-P-19468 and polyamide plastic FM-101 conforming to MIL-P-20693 composition polyhexamethylene adipamide shall be acceptable in valve use.

3.8.8 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 on the portion of the stem in contact with the packing.

3.9 Valve components.

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

3.9.1.1 Inlet. The inlet threads shall conform to Handbook H28, thread symbol as specified in the applicable specification sheet. Valve bodies having a 3/8-inch or a 1/2-inch inlet shall have a clear

opening, from the inlet to the seat, of not less than the cross sectional area of a 1/8-inch diameter circle. All other valve bodies shall have an inlet channel clear opening of not less than the cross sectional area of a 1/4-inch 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.

3.9.1.2 Outlet. Unless otherwise specified in the applicable specification sheet, the outlet shall conform to H28, outlet number as specified in the applicable specification sheet.

3.9.1.3 Safety approach channel. When a safety device is specified in the applicable specification sheet, the safety approach channel shall be located between the inlet and the valve seat. Valve bodies having a 3/8-inch inlet or a 1/2-inch inlet shall have a safety approach channel clear opening, from the inlet channel to the safety device, of not less than the cross sectional area of a 1/8-inch diameter circle. All other valve bodies shall have a safety approach channel clear opening of not less than the cross sectional area of a 3/16-inch diameter circle.

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

Valves used in liquefied gas service (class 06).....1/4 inch
Valves having a 3/8-inch or a 1/2-inch inlet.....1/16 inch
All other valves.....1/8 inch

3.9.1.5 Wrenching surfaces. The body shall have not less than two 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 Handbook H28. When the valve has a threaded outlet and the wrench jaws must span the outlet to grip the wrench flats, the distance between wrenching flats shall permit the use of a wrench without interference between the wrench jaws and either the boss of internally threaded outlets or the threads of externally threaded outlets.

3.9.2 Stem. The stem material shall be as specified herein for the applicable valve style (see 3.14). 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 supplied with a handwheel, the shank of the stem shall be threaded to mate with a nut, or 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 seat 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 MIL-M-20693, type I for polyamide plastics or shall conform to MIL-P-15047 for phenolic-resin laminates. Any lubricant applied to stems shall be compatible with the gas of intended use and shall be subject to approval of the qualification activity.

3.9.3 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 or the packing nut shall be provided with wrenching flats.

3.9.4 Handwheel. The handwheel shall be a circular, oval or crossed spoke fingergrip type. The handwheel shall be not less than 2-1/2 inches and not greater than 2-3/4 inches in diameter. The direction of rotation for opening the valve shall be marked on the handwheel by embossing or by stamping. When used on a pressure sealed valve, the handwheel shall bear against a thrust washer located between the handwheel and the packing nut or bonnet. The handwheel shall be fabricated of die-cast white metal, die-cast aluminum, or forged brass. Polyamide plastic handwheels 2 inches in diameter shall be acceptable for valves operating with opening and closing torques less than 60 inch-pounds.

3.9.5 Strainer. The strainer shall fit over or into a recess in the inlet. The strainer shall not interfere with the inlet threads. The strainer shall be not greater than 60 mesh metal screen fabricated of brass wire, nickel copper alloy wire, or composition 302 or 304 corrosion-resisting steel wire and shall be supplied when specified.

3.9.6 Dip tube. The dip tube shall be 1/4-inch steel pipe unless otherwise specified. One end of the dip tube shall be externally threaded with 1/4-18 NPT threads conforming to Handbook 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. When specified 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.

3.9.7 Safety device. The safety device shall be provided and installed as a unit by the supplier and approved by the Bureau of Explosives. The safety device outlet cross sectional area and the cross sectional area of the safety approach channel in the valve body shall be as specified in 3.9.1.3. The safety device shall be of the type specified in the applicable specification sheet.

3.9.7.1 Type 1, frangible disk. The frangible disk safety device shall consist of a frangible disk, a sealing washer, and a cap or plug. Type 1 safety devices shall be provided in valves for cylinders subjected to 10 percent overfill.

3.9.7.1.1 Frangible disk. The frangible disk shall be metal and shall be designed to fail by burst or by shear. The fragments shall not obstruct the radial outlet passages in the cap or plug. At 160° F. the disk shall have a maximum (nominal) burst or shear pressure of not greater than 1.67 times the service pressure, and shall not burst or shear at less than 1.50 times the service pressure. Unless otherwise specified, disks shall be provided to conform with table III. When the cylinder service pressure is not specified, the frangible disk shall be supplied for a service pressure of 1800 psi and used in combination with a fusible plug.

3.9.7.1.2 Sealing washer. The sealing washer shall be aluminum, copper, polyamide plastic composition polyhexamethylene adipamide, polyamide plastic composition polycaprolactam, or polytetrafluoroethylene plastics. The sealing washer shall be a component of an approved safety device provided by the supplier.

Table III. Disk Burst Requirement

Cylinder Rating psi DOT 3A or 3AA	Burst Requirement	
	Minimum psig	Maximum psig
1800	2700	3000
2015	3025	3360
2265	3375	3775
2400	3600	4000
3000	4600	5000
3500	5250	5800

3.9.7.1.3 Caps and plugs for frangible disk safety devices. The caps and plugs for the frangible disks shall conform to the supplier's Bureau of Explosives approved design as applicable. Caps shall have internal threads which conform to Handbook H28 for safety device threads. The closed end of the cap or plug as applicable shall be drilled radially with not less than 4 relief holes having a total cross-sectional area of not less than that of the safety relief channel. The relief channel may be the supplier's approved size but not less than 0.281 inches in diameter. 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 13/16 or 15/16 inches diametrically across opposite surfaces.

3.9.7.2 Type 2, fusible plug, 165° F. nominal yield point. The type 2, fusible plug shall be fabricated with fusible metal having a yield point between 157° F. and 170° F. (165° F. nominal). The plug shall be made of free-cutting brass or carbon steel stock as specified for the valve in the applicable specification sheet. The plug body shall be externally threaded in conformance with Handbook H28 for 1/8 - 27 - NGT, 1/4 - 18 - NGT or 3/8 - 18 - NGT threads as specified. The clear-through opening in the plug shall be not less than 7/32 inches in diameter except for medical post valves when 5/32 inches in diameter shall be acceptable. The external end of the plug shall have a screwdriver slot, hexagonal wrenching flats or a hexagonal wrenching socket. Open ended plugs shall be either cone-bored, or straight-threaded to anchor the fusible metal for a leak-free metal-to-metal juncture. Blind plugs with radially venting shall be straight bored with not less than 4 vent holes having a total cross-sectional area not less than that of the cross-sectional area of the applicable relief channel.

3.9.7.2.1 Fusible metal, (165° F. or 212° F. nominal). The fusible metal shall conform to CGA pamphlet S-4 for fuse metal with yield-points in the applicable range.

3.9.7.2.2 Valve body drilled fusible plug. As specified in the applicable specification sheet a safety device design approved by the Bureau of Explosives allowing a channel not less than 0.073 inches in diameter shall be drilled and threaded into the valve body and filled with molten fusible metal effecting a leak-free plug.

3.9.7.3 Type 3, fusible plug, 212° F. nominal yield point. The type 3, 212° F. nominal yield point fusible plug safety device 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. and not greater than 220° F. (212° F. nominal).

3.9.7.4 Type 4, combination frangible disk-fusible plug, 165° F. nominal yield point. The type 4 safety device shall be as specified for type 1, except that the cavity beyond the frangible disk shall be filled with fusible metal having a yield or melting point of not less than 157° F. and not greater than 170° F. (165° F. nominal). At 132° F. plus or minus 2° F. the fusible metal core shall not extrude and shall prevent the disk from bursting or shearing at its nominal burst or shear pressure. For all medical post (pin-index) valves the external end of the device shall be flush with the valve body, the clear opening in the relief channel shall not be less than 1/8 inch and drilled radial holes will not be required.

3.9.7.5 Type 5, combination frangible disk-fusible plug, 212° F. nominal yield point. The type 5 safety device 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. and not greater than 220° F. (212° F. nominal). For all medical post (pin-index) valves, the external end of the device shall be flush with the valve body, the clear opening in the relief channel shall not be less than 1/8 inch and drilled radial holes will not be required.

3.9.7.6 Type 7, safety relief valve. The type 7, safety relief valve safety device shall consist of a cap or plug insert, spring, and an insert retainer. Unless otherwise specified, the spring tension shall be adjusted and fixed so that the relief device shall start to discharge at not less than 375 pounds per square inch gage (psig) and shall reseal at not less than 336 psig. The device shall reach full-flow position at not greater than 480 psig. The flow capacity of the safety relief device shall conform to the Safety Relief Device Standards pamphlet S-1.1 of the Compressed Gas Association for the water capacity of the cylinder of intended use. The relief device shall not bind or seize while opening and closing. When installed on the valve, the safety relief device cap or plug shall be soldered, crimped, or otherwise mechanically locked to prevent tampering with the spring tension adjustment.

3.9.7.6.1 Safety relief cap or plug. The safety relief 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 Handbook H28.

3.9.7.6.2 Safety relief spring. The safety relief spring shall be helical and shall be fabricated of corrosion-resisting steel wire, composition 302 or 304, condition B.

3.9.7.6.3 Retainer. The retainer shall have a shroud to retain the spring and a counterbore to retain the insert.

3.9.7.6.4 Safety relief insert. The safety relief insert seal shall be polyamide plastic, phenolic resin laminate or rubber meeting the stability provisions specified herein.

3.9.8 Outlet cap and plug. When specified, valves with threaded outlets shall have a permanent metal mating plug or cap. The outlet cap or plug shall effectively seal the valve against leakage when tested as specified herein.

3.9.8.1 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 periphery of the outlet cap or plug. The other ring shall fit loosely around the valve body immediately above the inlet connection threads. 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.

3.10 Overall dimensions. When completely assembled and in the closed position the overall length of the valve shall be not greater than 5 inches. 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 15/16 inch. The maximum projection of a threaded outlet valve, including the outlet cap or plug, from the centerline of the inlet connection shall be not greater than 1-5/8 inches and the maximum overall width of the valve shall not be greater than 3-1/16 inches.

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

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

3.12.1 Body markings. The valve shall be permanently marked by stamping, embossing, or by metal foil decals. Marking in the metal shall be not less than 1/64 inch nor greater than 1/32 inch in depth. Markings shall be not less than 3/32 inch high except on valves with 3/8 inch inlet when 1/16 inch high lettering will be acceptable. 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. Metal decals, when used, shall be placed on the valve body, but never on the wrenching flats. Marking 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) 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.

3.12.1.1 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 1/8-inch high.

3.12.2 Burst pressure. When the valve contains a safety device with a rupture disk, the maximum burst pressure shall be stamped on the face of the cap of the safety device.

3.12.3 Yield temperature. When the valve contains a safety device with fusible metal, the nominal yield temperature of the fusible metal shall be stamped on a face of the safety device except for medical post (pin-index) valves.

3.12.4 Opening pressure. When the valve contains a spring-loaded safety device, the start to discharge pressure and the flow capacity in cubic feet per minute or a representative code shall be stamped on the safety device.

3.13 Finish. All valve bodies shall be finished in the base metal of fabrication except for medical valves which shall be chromium over nickel plated. Chromium plating shall conform to QQ-C-320, class 2, type I and thickness shall be 0.00001 inch minimum. Chromium plating shall be applied over intermediate nickel coatings. Intermediate nickel coating shall be in accordance with QQ-N-290, class 2, type VII (QC) for brass valve bodies and class 2, type IV (QS) for 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.

3.14 Detailing of styles and compositions.

3.14.1 Style I valve. Style I valve shall have a compression packed seal and shall be used for service pressures under 600 psi, class 06, and compositions A, B, or C as specified in the applicable specification sheet. Medical post applications composition D shall be limited to 2400 psi service pressure class 24.

3.14.1.1 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.

3.14.1.1.1 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 insure a leak-free seal at the packing-stem junction. 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 or cadmium plated to reduce friction and corrosion. The packing shall be graphited asbestos, laminated rubber and asbestos washers, 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, safety device and outlet cap or plug shall be made from forging or free-cutting brass.

3.14.1.1.2 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 safety device and outlet cap or plug shall be made from carbon steel, casting steel or forging steel.

3.14.1.1.3 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 composition 1 as specified herein, except iron, nickel, manganese, tin, zinc, and tellurium shall not be required. The body shall have an integral seat to mate with a one-piece stem. The stem shall be made of nickel-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, safety device and outlet cap or plug shall conform to the Chlorine Institute drawings above.

3.14.1.1.4 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 stud and socket. The lower stem shall be made of free-cutting brass or naval brass and fitted with an adipamide plastic seat 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 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 safety device shall be made from free-cutting brass or forging brass.

3.14.2 Style II valve. Style II valves shall be of the O-ring seal design and shall be used for service pressures under 600 psi.

3.14.2.1 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.

3.14.2.1.2 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 seat 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 seat 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, safety device, and outlet cap or plug shall be made from forging or free-cutting brass.

3.14.3 Style III valve. Style III valves shall be of the pressure seal design and shall be used in applications under 6000 psi, class 60.

3.14.3.1 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. 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.

3.14.3.1.1 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 seat disk insert. The upper stem and the seat plug shall be fabricated of corrosion-resisting steel, aluminum bronze, manganese bronze, copper-silicon alloy, naval brass, or free-cutting brass, as specified in the applicable specification sheet and 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 shall seal against a shoulder in the valve body 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 seat disk insert. The

packing nut or bonnet, packing washer, safety device, and outlet cap or plug shall be made from free-cutting brass or forging brass.

3.14.4 Style IV valve. Style IV valves shall be of the diaphragm seal design. The diaphragm shall be used for applications up to 2400 psi service pressure.

3.14.4.1 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 counterclockwise, 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.

3.14.4.1.1 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 seat disk insert. During opening and closing of the valve, the spindle spring shall not inhibit the spindle movement and shall not bind in the valve body. The spring shall be retained in position by machined seats, by a bushing, by a spindle guide, or by a combination of these. The spindle shall have a seat disk insert. The upper stem and the spindle 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 spindle 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 spindle spring shall be phosphor bronze wire or corrosion-resisting steel wire. Corrosion-resisting steel wire shall be composition 302 or 304, condition B. 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 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 or 304. For valves in class 24 and higher, only metallic diaphragms shall be allowed. The bonnet or packing nut, packing washer, safety device and outlet cap or plug shall be made from free-cutting brass or forging brass.

3.14.4.2 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 seat 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, safety device 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.

3.15 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, sprues, scale, and other harmful extraneous material. All edges shall be rounded or chamfered.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Component and material inspection. The supplier is responsible for insuring that components and materials used are manufactured, examined, and tested in accordance with referenced specifications and standards.

4.2 Classification of inspection. Inspection shall be classified as follows:

(a) Qualification inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).
(c) Inspection of preparation for delivery (see 4.6).

4.3 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 supplier in the Qualification Test Report (see 4.3.3). When the intended use of the valve dictates that it be equipped with a safety device, each valve shall be complete with a safety device. For valve styles III and IV where more than one type of safety device is required to meet all intended uses of the basic valve, two of the additional safety devices shall be submitted. When frangible disks are required for different service pressures, two disks for each of the service pressures shall be submitted for testing in accordance with 3.9.7.1.1, as specified in 4.5.2.18.

4.3.1 Examination. Each valve shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.3.2 Tests. Four valves of each classification shall be tested as specified in 4.5.2.1 through 4.5.2.19 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.

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

4.4 Quality conformance inspection.

4.4.1 Examination. Individual valves shall be examined for defects as specified in table IV, column 3. Presence of any defect shall be cause for rejection of the valve.

4.4.2 Tests. Individual valves shall be tested in accordance with 4.4.2.1 and 4.4.2.2. Failure of either of these tests as applicable, shall constitute failure of the valve.

4.4.2.1 Torque and leak test. Place the inlet of the valve in a pressurized test fixture. Style I and style II valves shall be tested at a service pressure not less than 300 psi, and style III and style IV valves shall be tested at a service pressure not less than 2000 psi as applicable. Torque the valve closed with a torque not greater than that specified in table I (see 3.8.2) as applicable. Check the valve stem and outlet for leakage (method optional). The valve outlet shall then be capped or plugged with a leak-tight seal. Open the valve but not against the backseat. Check the valve, stem or bonnet for leakage (method optional). Evidence of leakage in either test or requirement of a torque greater than that specified for closing the applicable valve shall constitute failure of the valve being tested. Retest for failed valves shall be made only after replacement of faulty components and reassembly of the rejected valve.

4.4.2.2 Spring-loaded safety relief device. Each valve equipped with a spring-loaded safety relief device shall be tested for start to discharge and resealing pressures as specified in 3.9.7.6. Failure of a valve to start to discharge or reseal at the specified pressures shall be cause for rejection of the valve.

4.4.2.3 Fusible metal test. Sampling and testing of fusible metal when applicable shall be as specified in 4.5.2.16 and properly identified with specific valve applications. Failure of a specific batch of metal shall constitute failure of all valves containing fusible metal of like alloying and treatment.

4.4.2.4 Frangible disk test. Sampling for the frangible disk test shall be in accordance with MIL-STD-105, inspection level S-3 from each heat of metal of like treatment for application at each service pressure as specified in 1.3. The samples properly identified with specific valve applications shall be tested in accordance with 4.5.2.20. Failure of frangible disks to meet the requirements of 3.9.7.1.1 as applicable shall constitute failure of the frangible disks as well as any valves equipped with disks of the same heat of metal of like treatment.

4.5 Inspection procedure.

4.5.1 Examination. The valves shall be examined for the following defects:

Table IV. Examination Schedule

No.	Defects	QPL	QCI
	1	2	3
101.	Materials not as specified.	X	-
102.	Type not as specified.	X	X
103.	Inlet threads not as specified.	X	X
104.	Inlet channel not as specified.	X	-
105.	Outlet not as specified	X	X
106.	Outlet channel opening not as specified.	X	-
107.	Safety approach channel not as specified.	X	-
108.	Valve seat not as specified.	X	-
109.	Valve seat opening not as specified.	X	-
110.	Wrenching surfaces not as specified.	X	-
111.	Lubricants on stem or body not as specified.	X	X
112.	Handwheel, wrench or stem not as specified.	X	X

Table IV. Examination Schedule (Cont'd)

No.	Defects	QPL	QCI
	1	2	3
113.	Strainer not as specified.	X	X
114.	Dip tube not as specified.	X	X
115.	Safety device not as specified.	X	X
116.	Dimensions not as specified.	X	-
117.	Weight not as specified.	X	-
118.	Marking not as specified.	X	X
119.	Finish not as specified.	X	X
120.	Stem rotation open and close not as specified.	X	-
121.	Parts or components missing or incomplete.	X	X
122.	Workmanship not as specified.	X	X

4.5.2 Qualification tests.

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

4.5.2.1.1 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 II. Place the valve assembly in an atmosphere stabilized at minus 65° F. plus or minus 2° F. for a period of 8 hours while maintaining an air or nitrogen pressure at the maximum service pressure specified in table I. 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 minus 50° F. plus or minus 2° F. 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 II shall constitute failure of this test.

4.5.2.1.2 High temperature storage and operation. Connect the valve to a pressure fixture in a controlled oven and stabilize the temperature of the valve assembly at 155° F. plus or minus 2° F. Close the valve at a closing torque not greater than specified in table II and pressurize the inlet with air or nitrogen pressure at the maximum service pressure as specified in table I. Maintain the temperature for 4 hours. Examine the valve for leakage, failure or deformation. Allow the valve to cool to a temperature of 120° F. plus or minus 2° F. 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 II shall constitute failure of this test.

4.5.2.2 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 I while the valve is submerged in a 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 II, 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.

4.5.2.3 Torque and overtorque. 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 I 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 overtorque specified in table II. 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 the 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 3.8.2 shall constitute failure of this test.

4.5.2.4 Spindle spring compression. Open the valve fully. With zero psig on the valve inlet, apply an instantaneous gas pressure to the valve outlet equal to the maximum service pressure specified in

table I. Determine whether gas flow is interrupted by the spring allowing the spindle to check closed. Interruption of gas flow shall constitute failure of this test.

4.5.2.5 Vibration.

4.5.2.5.1 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 II. Maintain an air or nitrogen inlet pressure at not less than the maximum service pressure specified in table I. Vibrate the valve at an amplitude of 1/32 to 1/16-inch, with a frequency of 3,400 to 3,600 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.

4.5.2.5.2 Vibration test with valve open for other than pin-index connection valves. Repeat the test specified in 4.5.2.5.1 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.

4.5.2.5.3 Vibration test with valve half open. Repeat the test specified in 4.5.2.5.2 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.

4.5.2.6 Endurance. Maintain an internal air or nitrogen gas pressure at not less than the maximum service pressure specified in table I 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 1,000 cycles. Observe the compression packed valve for leakage around the stem during cycling. If required, tighten the packing nut. At the completion of 1,000 cycles, redetermine the closing torque required to completely seat the valve without leakage. Using this

redetermined torque, cycle the valve for an additional 1,000 cycles. Repeat these procedures until the valve has been cycled 5,000 times. Upon completion of 5,000 cycles, re-examine the valve. Leakage, loose or damaged components, or opening or closing torque greater than that specified in 3.8.2 or failure to meet the reliability requirements of 3.7 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 2,000 cycles in 200-cycle increments.

4.5.2.7 Hydrostatic proof pressure. Remove the outlet cap. Replace the safety device with a solid cap or plug. Close the valve with torque not greater than the closing torque specified in table II. 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 4.5.2.6.

4.5.2.8 Disassembly inspection. After completion of the tests specified in 4.5.2.1 through 4.5.2.7, disassemble the valve and examine for failures developed during the tests, as specified below. Nonconformance to the applicable requirements paragraph shall constitute failure of this inspection.

Failure	Requirements Paragraph
Deformation of internal components	3.5.1, 3.5.2, 3.8.1, 3.8.2, 3.8.4
Cracked seat disk insert	3.7, 3.8.2
Thread failure or excessive wear	3.7
Detached components	3.7, 3.8.4
Cracks, pits, or fissures	3.8.1
Galling of the stem	3.8.4
O-ring worn flat, indicating lack of rolling	3.14.2
Spindle spring worn flat, indicating sliding against body or spindle	3.14.4

4.5.2.9 Stress corrosion test for brass forgings. After having been subjected to the hydrostatic test specified in 4.5.2.7, brass forgings shall be subjected to the mercurous-nitrate test as specified in QQ-B-626. Evidence of cracks shall constitute failure of this test.

4.5.2.10 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.

4.5.2.11 Hardness. Test the hardness of the packing seal surface of carbon or nickel steel stems in accordance with ASTM E18. 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 0.020 inch shall constitute failure of this test.

4.5.2.12 Chromium plating salt spray. Subject the class 1 chromium plating to a salt spray test for 72 hours in accordance with FED. TEST METHOD STD. No. 151, method number 811.1. Evidence of corrosion, pitting, or flaking shall constitute failure of this test.

4.5.2.13 Combustibility.

4.5.2.13.1 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 2,000 psig. Heat the reaction chamber to a temperature of plus 302° F. and maintain this applied temperature plus or minus 2° F. and a pressure of 2,000 psi 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.

4.5.2.13.2 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 plus 160° F. plus or minus 2° F.,

and maintain this temperature for 10 minutes. At the end of 10 minutes, apply a pressure of 2,000 psig 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.

4.5.2.14 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 3.8.1.1. Place the plug in an oven or immerse in a liquid and heat to a temperature of 132° F. plus or minus 2° F. 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.

4.5.2.15 Bond test for frangible disk-fusible plug safety device. Connect the inlet end of the safety device, including frangible disk and sealing washer, to a suitable pressure source. Tighten the connection with the torque recommended by the supplier of the safety device. Immerse the safety device in a liquid bath at a temperature of 132° F.; apply air, nitrogen or hydrostatic pressure equal to the nominal bursting pressure of the frangible disk; maintain the temperature and pressure for 10 minutes, then examine the safety device. Extrusion of fusible metal or bursting of the frangible 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 4.5.2.14.

4.5.2.16 Yield temperature test for fusible metal before pouring into safety device. Prepare two sticks from each batch of fusible metal. Each stick shall be 8 inches long. Cut 2-inch specimens from the sticks and suspend two specimens on knife-edge supports. The supports shall be 1-inch apart. The specimens shall overhang the supports by 1/2-inch. The specimens and supports shall be immersed in a glycerine or oil bath. There shall be a clearance of not less than 1/4-inch between the specimens and the bottom of the bath. The bath shall be suspended in and the temperature controlled by an outer glycerine or oil bath. A thermometer shall be suspended midway between the two specimens and shall not touch the bottom of 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. 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 3.9.7.2.1, 3.9.7.4, or 3.9.7.5 as applicable, shall constitute failure of this test.

4.5.2.17 Yield temperature test for fabricated safety devices. Remove the frangible disk, if one is present, from the safety device. Suspend the safety device, with the centerline of the fusible metal vertically in an oil or glycerine 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. 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 3.9.7.2.1, 3.9.7.3, 3.9.7.4, or 3.9.7.5 as applicable shall constitute failure of this test. Where the fusible metal is part of a nonremovable safety device, the test specified in 4.5.2.16 shall be used.

4.5.2.18 Frangible disk. This test shall be performed with no fusible metal backing the frangible disk. Close the valve and plug or cap the outlet. Maintain a constant temperature of 160° F. 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 psi every 30 seconds until the frangible disk bursts or shears. Note the pressure at which the disk fails. Examine the cap or plug for obstruction of the outlet passages. Nonconformance to 3.9.7.1.1 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. has been established by previous tests. After having successfully tested two frangible disk holders (cap or plug) of like design and dimension, any required additional tests of frangible disks may be performed in a hardened steel fixture having a pressure opening identical in dimensions and configuration to that of the frangible disk holder in which the disk is to be used.

4.5.2.19 Spring-loaded safety device. 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 psi of air at 70° F. and examine the safety device for leaks. Increase the air pressure on the valve until the safety device opens. Determine the air pressure at which the safety device opens. Determine the flow rate of air in cubic feet per minute that escapes through the safety device from initial opening to a valve internal pressure of 480 psig at an ambient temperature of 70° F. Decrease the internal pressure until the safety device has resealed. Determine the internal pressure at which the safety device resealed. Nonconformance to 3.9.7.6 shall constitute failure of this test.

4.6 Inspection of preparation for delivery.

4.6.1 Quality conformance inspection of pack.

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

4.6.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the following defects. AQL shall be 2.5 percent defective.

123.	Materials, methods and containers not as specified for level A or B. Each incorrect material, method or container shall constitute one defect.
124.	Preservation not as specified for level A.
125.	Containers not as specified for level A or B.
126.	Strapping not zinc coated as specified for level A.
127.	Reinforcing tape and closure not as specified for level B.
128.	Marking illegible, incorrect or incomplete for level A, B, or C.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified.

5.1.1 Level A.

5.1.1.1 Preservation. Each valve shall be preserved in accordance with MIL-P-116, method IC-1.

5.1.1.2 Intermediate packaging. The valves of like description, preserved as specified in 5.1.1.1 shall be intermediate packaged individually or in multiples of 10 or 12 valves, using boxes conforming to PPP-B-636, W5c or W6c, style optional. The boxes shall be provided with fiberboard separators to prevent the valves from contacting each other.

5.1.2 Level C. The valves shall be preserved and packaged in a manner to afford protection against deterioration and physical damage from the supplier to the initial destination. The suppliers standard practice shall be acceptable when it fulfills these requirements.

5.2 Packing. Packing shall be level A, B, or C as specified.

5.2.1 Level A. Valves of like description preserved and packaged as specified in 5.1 shall be packed in close-fitting cleated plywood boxes conforming to PPP-B-601, overseas type, style I or J. The boxes shall be closed and strapped in accordance with the appendix to the box specification. Strapping shall be zinc coated.

5.2.2 Level B. Valves of like description preserved and packaged as specified in 5.1 shall be packed in close-fitting boxes conforming to PPP-B-636, RSC, V3c. The gross weight shall not exceed the weight limitation of the box specification. After closure the boxes shall be reinforced with bands of reinforced tape in accordance with the appendix to the box specification.

5.2.3 Level C. The valves preserved and packaged as specified in 5.1 shall be packed in containers that will assure carrier acceptance and safe delivery from supplier to the initial destination at the lowest ratings of the carrier in compliance with Uniform Freight Classification rules or National Motor Freight Classification rules.

5.3 Marking. In addition to any special marking required by the contract or purchase order, packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

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

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Title, number and date of applicable specification sheet.
(c) Valve type designation (see 1.3)
(d) Stem wrench or key shall be furnished, when required (see 3.6).
(e) Service pressure when other than a standard pressure is required (see 3.8.1.1).
(f) Cylinder size when a dip tube is specified (see 3.9.6).
(g) That the dip tube shall be assembled to the valve, when required (see 3.9.6).
(h) That outlet cap or plug shall be furnished, when required (see 3.9.8).
(i) When applicable, that the valve is not required to fit under a protective cap (see 3.10).
(j) That the name of the specific gas of intended use shall be marked on the body, when gas group marking is not acceptable (see 3.12.1).
(k) That the valve shall be chromium plated, when required (see 3.13).
(l) Level of preservation and packaging and level of packing required (see 5.1 and 5.2).
(m) Any special marking required (see 5.3).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, 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 orders for the products covered by this specification. The activity responsible for the Qualified Products List is the U. S. Army Mobility Equipment Command, Research, Development, and Engineering Directorate, ATTN: AMSME-RZH-HK, Fort Belvoir, Virginia 22060, and information pertaining to qualification of products may be obtained from that activity.

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 V. Table VI provides a cross listing to valve type designations in MIL-V-2C.

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, tables V and VI. What was referred to in the previous edition as class is referred to as style in this revision. Class refers to maximum service pressure in this revision.

Table V. Type Designation Cross Listing of Valves

Detail Spec. No.	New Type Designation (less safety designator)	Gas Service	Old Type Designation	Remarks
1	2	3	4	5
MIL-V-2/1	V1-511	Acetylene	03-511-1	3/4-inch inlet
MIL-V-2/2	V2-511	Acetylene	03-511-2	1-inch inlet
MIL-V-2/3	V3-201	Acetylene	03-201-4	3/8-inch inlet
MIL-V-2/4	V4-201	Aerosol Insecticide	20-621-1	-
MIL-V-2/5	V5-1341	Air for Human Respiration	06-581-1	-
MIL-V-2/6	V6-591	Air Industrial	06-591-2	-
MIL-V-2/7	V7-241	Anhydrous Ammonia	09-241-1	3/4-inch inlet, dished head
MIL-V-2/8	V8-241	Anhydrous Ammonia	09-241-2	3/4-inch inlet, convex head
MIL-V-2/9	V9-241	Anhydrous Ammonia	09-241-3	1-inch inlet, dished head
MIL-V-2/10	V10-241	Anhydrous Ammonia	09-241-4	1-inch inlet, convex head
MIL-V-2/11	V11-581	Argon	14-581-1	Inert oil free
"	V11-581	Helium	07-581-1	Inert oil free
"	V11-581	Nitrogen	05-581-1 and 05-581-2	Inert oil free
"	V11-581	Neon	None	Inert oil free
"	V11-581	Xenon	None	Inert oil free

MIL-V-2/12 and MIL-V-2/13 superseded.

Table V. Type Designation Cross Listing of Valves (Cont'd)

1	2	3	4	5
MIL-V-2/14	V14-511	Butane	10-511-1	-
"	"	Propane	08-511-1	-
"	"	Butane-Propane Mixture	None	-
"	"	MAPP Gas	None	-
MIL-V-2/15	V15-321	Carbon Dioxide	02-321-1	-
MIL-V-2/16	V16-321	Carbon Dioxide	02-321-2	Medical
MIL-V-2/17	V17-941	Carbon Dioxide	02-941-3	Medical
MIL-V-2/18	V18-351	Carbon Monoxide	25-351-1	-
MIL-V-2/19	V19-351	Ethylene Oxide-Carbon Dioxide Mixture	21-351-1	Carboxide
MIL-V-2/20	V20-661	Chlorine	13-661-2	-
MIL-V-2/21	V21-661	Chlorine	13-661-4	-
MIL-V-2/22	V22-621	Dichlorodifluoro-methane	17-621-1	-
"	"	Bromochlorometnane	26-621-1	-
"	"	Bromotrifluoro-methane	24-621-1	-
"	"	Methyl Chloride	18-621-1	-
"	"	Sulfur Dioxide	12-621-1	-
"	"	Monochlorodifluoro-methane	None	-
"	"	Dichlorotetrafluoro-ethane	None	-
MIL-V-2/23	V23-301	Ethyl Chloride	19-301-1	-
MIL-V-2/24	V24-511	Ethylene Oxide	22-511-1	-
MIL-V-2/25 superseded				
MIL-V-2/26	V26-591	Helium	07-581-1	Inert oil tolerant
"	"	Nitrogen	07-591-2	Inert oil tolerant
MIL-V-2/27	V27-281	Oxygen-Helium Mixture	16-541-1	Medical Helium not over 80 per-cent
MIL-V-2/28	V28-891	Oxygen-Helium Mixture	16-891-2	Medical (Pin-Index) Helium not over 80 per-cent

Table V. Type Designation Cross Listing of Valves (Cont'd)

1	2	3	4	5
MIL-V-2/29	V29-351	Hydrogen	04-351-1	-
MIL-V-2/30, MIL-V-2/31 and MIL-V-2/32 superseded				
MIL-V-2/33	V33-000	Nitrogen	05-000-1-2-3	Recoil Mechanism
MIL-V-2/34, MIL-V-2/35 and MIL-V-2/36 superseded				
MIL-V-2/37	V37-1321	Nitrous oxide	15-321-1	Medical
MIL-V-2/38	V38-911	Nitrous oxide	15-911-2	Medical (Pin-Index)
MIL-V-2/39	V39-541	Oxygen	01-541-1	-
MIL-V-2/40 superseded				
MIL-V-2/41	V41-541	Oxygen	01-541-4	Medical
MIL-V-2/42	V42-871	Oxygen	01-871-5	Medical (Pin-Index)
MIL-V-2/43	V43-641	Phosgene	11-641-1	-
MIL-V-2/44	V44-511	Butane	10-511-1	-
"	"	Propane	08-511-1	-
"	"	Butane-Propane Mixtures	None	-
MIL-V-2/45 superseded				
MIL-V-2/46	V46-591	Sulfur Hexafluoride	23-591-1	-
MIL-V-2/47	V47-951	Air for Human Respiration	None	Medical (Pin-Index)
MIL-V-2/48	V48-1341	Air for Human Respiration	"	Medical
MIL-V-2/49	V49-921	Cyclopropane	"	Medical (Pin-Index)
MIL-V-2/50	V50-621	Metnyl Bromide	"	Also outlet 1/2 NPT
MIL-V-2/51	V51-67U	High Pressure, 6000 psi	"	-

Table VI. Cross Listing of Valves MIL-V-2C to MIL-V-2D

MIL-V-2C Type Designation	Gas Service	MIL-V-2D Type Designation (less safety designator)
01-541-1	Oxygen	V39-541
01-541-2	"	"
01-541-4	"	V41-541
01-871-5	"	V42-871
02-321-1	Carbon dioxide	V15-321
02-321-2	"	V16-321
02-941-3	"	V17-941
03-511-1	Acetylene	V1-511
03-511-2	"	V2-511
03-201-4	"	V3-511
04-351-1	Hydrogen	V29-351
05-581-1	Nitrogen	V11-581
05-581-2	"	"
05-000-2	"	V33-000
05-000-3	"	"
05-000-5	"	"
05-591-4	"	V26-591
06-581-1	Air	V5-1341
06-591-2	"	V6-591
07-581-1	Helium	V11-581
07-591-2	"	V26-591
08-511-1	Propane	V14-511
09-241-1	Ammonia, anhydrous	V7-241
09-241-2	"	V8-241
09-241-3	"	V9-241
09-241-4	"	V10-241
10-511-1	Butane	V14-511 and V44-511
11-641-1	Phosgene	V43-641
12-621-1	Sulphur dioxide	V22-621
13-661-2	Chlorine	V20-661
13-661-4	"	V21-661
14-581-1	Argon	V11-581
15-321-1	Nitrous Oxide	V37-1321
15-911-2	"	V38-911
16-541-1	Oxygen-Helium	V27-281
16-891-2	"	V28-891

Table VI. Cross Listing of Valves MIL-V-2C to MIL-V-2D (Cont'd)

MIL-V-2C Type Designation	Gas Service	MIL-V-2D Type Designation (less safety designator)
17-621-1	Dichlorodifluoromethane	V22-621
18-621-1	Methyl chloride	"
19-301-1	Ethyl chloride	V23-301
20-621-1	Aerosol insecticide	V4-621
21-351-1	Ethylene oxide-carbon dioxide	V19-351
22-511-1	Ethylene oxide	V24-511
23-591-1	Sulphur hexafluoride	V46-591
24-621-1	Bromotrifluoromethane	V22-621
25-351-1	Carbon monoxide	V18-351
26-621-1	Bromochloromethane	V22-621

Custodians:

Army - ME
Navy - SH
Air Force - 68

Review activities:

Army - MI, MU
Navy - AS

User activities:

Army - AV
Navy - YD, MC

Preparing activity:

Army - ME

Project No. 8120-0199