

INCH-POUND

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SUPERSEDING
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(See 6.11)

MILITARY SPECIFICATION

EXTINGUISHER, FIRE, BROMOTRIFLUOROMETHANE (HALON 1301) SYSTEM COMPONENTS (FIXED PIPE, PNEUMATICALLY ACTUATED, NAVAL SHIPBOARD USE)

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers chemical (Halon 1301) fire extinguisher system components, including local and remote actuation devices of the fixed (stationary) type whereby Halon 1301 (liquefied and pressurized with nitrogen to 600 pounds per square inch (psi) at 70 degrees Fahrenheit (°F) (21 degrees Celsius (°C)) and stowed in containers) is expelled by remote control through a fixed piping system and with discharge nozzles to a predetermined space, compartment, or area.

1.2 Classification. Halon 1301 fire extinguisher systems are of the following classes, as specified (see 6.2):

- Class I. Systems in which magnetic materials are permitted.
- Class II. Systems in which all materials are nonmagnetic.

1.2.1 Halon cylinders are of the following sizes, as specified (see 6.2):

- Size 1. 10-pound capacity Halon 1301 cylinders.
- Size 2. 15-pound capacity Halon 1301 cylinders.
- Size 3. 60-pound capacity Halon 1301 cylinders.
- Size 4. 95-pound capacity Halon 1301 cylinders.
- Size 5. 125-pound capacity Halon 1301 cylinders.
(Size 5 available in class I only)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 4210

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks 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 supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

- BB-C-101 - Carbon Dioxide (CO₂): Technical and U.S.P.
- BB-N-411 - Nitrogen, Technical.
- QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting.
- RR-C-901 - Cylinders, Compressed Gas: High Pressure, Steel DOT 3AA, and Aluminum Applications, General Specification for.
- TT-P-1757 - Primer Coating, Zinc Chromate, Low-Moisture Sensitivity.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

MILITARY

- MIL-P-116 - Preservation, Methods of.
- MIL-T-704 - Treatment and Painting of Materiel.
- MIL-S-901 - Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for.
- MIL-E-2036 - Enclosures for Electric and Electronic Equipment.
- MIL-M-12218 - Monobromotrifluoromethane (Liquefied) Technical Grade for Fire Extinguisher.
- MS16142 - Boss, Gasket Seal Straight Thread Tube Fitting, Standard Dimensions for.
- MIL-C-16310 - Cylinder Compressed Gas Compressed Air and Carbon Dioxide, Nonshatterable and Nonmagnetic.
- MIL-I-17214 - Indicator, Permeability; Low-Mu (Go-No Go).
- MIL-V-17360 - Valves, Cylinder, Gas, Carbon Dioxide Fire Extinguisher.
- MIL-E-17555 - Electronic and Electrical Equipment; Accessories, and Provisioned Items (Repair Parts): Packaging of.
- MS18229 - Plug for "O" Ring Gasket.
- MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.
- MIL-S-22473 - Sealing, Locking, and Retaining Compounds: (Single-Component).
- MS33656 - Fitting End, Standard Dimensions for Flared Tube Connection and Gasket Seal.
- MS51531 - Nut, Tube Coupling, 37° Flared.
- MS51532 - Fittings, Hydraulic Tube, Flared 37 Degree and Flareless, Steel; Cap, Tube, 37 Degree Flared.
- MS51533 - Sleeve, Compression, Tube Fitting, 37° Flared.

STANDARDS

FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services.
- FED-STD-151 - Metals; Test Methods.

MILITARY

- MIL-STD-101 - Color Code for Pipelines and for Compressed Gas Cylinders.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-130 - Identification Marking of U.S. Military Property.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-278 - Welding and Casting Standard.
- MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Waterproofing; with Appropriate Test Methods.
- MIL-STD-2073-1 - DOD Materiel Procedures for Development and Application of Packaging Requirements.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, BLDG. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

NAVAL SEA SYSTEMS COMMAND (NAVSEA)
810-1385782 - Hangers, Pipe for Submarines.

(Application for copies should be addressed to: Commander, Portsmouth Naval Shipyard, Code 202.2, Portsmouth, NH 03801.)

PUBLICATIONS

DEPARTMENT OF TRANSPORTATION (DOT)
Code of Federal Regulations (CFR)
49 CFR 100-199 - Hazardous Material Regulations.

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

DEPARTMENT OF COMMERCE

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
Handbook 44 - Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices.

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

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- B16.11 - Forged Steel Fittings, Socket-Welding and Threaded.
(DoD adopted)
- B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
(DoD adopted)

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 276 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes. (DoD adopted)
- A 403 - Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings. (DoD adopted)
- A 479 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels. (DoD adopted)
- B 16 - Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines. (DoD adopted)
- B 21 - Standard Specification for Naval Brass Rod, Bar, and Shapes. (DoD adopted)
- B 124 - Standard Specification for Copper and Copper-Alloy Forging Rod, Bar, and Shapes. (DoD adopted)
- D 3951 - Standard Practice for Commercial Packaging. (DoD adopted)

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

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

- SP 10 - Surface Preparation Specification No. 10, Near White Blast Cleaning.

(Application for copies should be addressed to the Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specifications, specification sheets or MS standards), 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 Qualification. Class I fire extinguisher system components furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.6).

3.1.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.7) in accordance with 4.3.2.

3.2 Construction. The fire extinguishing system components covered by this specification shall consist of cylinders, cylinder valves, pneumatic actuation devices, vent fittings, flexible discharge hoses, check valves, time delay bypass valves, pressure switches, actuation line filters, discharge nozzles, cylinder clamps and saddles, and scales, as specified herein (see 3.2.16 and 6.3). Equipment shall operate in accordance with the requirements of this specification in the range of ambient temperatures from 50 to 200°F (10 to 93°C), except carbon dioxide (CO₂) actuator cylinder and valve assemblies which shall operate from 50 to 150°F (10 to 65.5°C). Charged Halon cylinders shall withstand extended storage at ambient temperatures between 0°F and plus 120°F (minus 18°C and plus 49°C). Unless otherwise specified herein, threads shall be in accordance with FED-STD-H28. Class 2 threads are acceptable in lieu of class 3 threads required by specifications referenced herein. Unless otherwise specified herein, corrosion resisting steel (CRES) specified herein shall be class WP304 or WP304L, or class WP316 or WP316L, in accordance with ASTM A 403 and ANSI B16.11 for welded fittings or type 304, 304L, 316, or 316L in accordance with ASTM A 276 or ASTM A 479 for bar stock forms or shapes.

3.2.1 Halon cylinders, class I, sizes 1, 2, 3, 4, and 5. Class I Halon 1301 cylinders shall be nonshatterable steel in accordance with RR-C-901, except as specified herein. The neck of the cylinders shall have internal threads 2-1/2-12UN-2B with provision for an O-ring seal in accordance with MS16142. The neck of the cylinders shall have 6-1/2-8UN-1A external threads for a cylinder valve protective cap which shall be furnished with each cylinder. The minimum internal height of the cap shall be 10 inches from the cylinder neck facing. Cylinder dimensions, weights and service pressure shall be as specified in table I. A closed top anti-recoil side vented protective cap shall be furnished with each cylinder. Side vents shall be closed to the weather by means of tape or plugs which will blow out if Halon is released.

TABLE I. Class I cylinder dimensions, weight, and service pressure.

Size	Outside diameter (inches)	Height (inches)	Halon 1301 capacity (pounds)	Minimum volume (in ³)	Approximate weight (empty) (pounds)	Service pressure (psi)
1	8.50 ± 0.187	17 ± 1	10	500	40	2015
2	8.50 ± 0.187	17 ± 1	15	500	40	2015
3	8.50 ± 0.187	35 ± 1	60	1480	75	2015
4	8.50 ± 0.187	51 ± 1	95	2350	110	2015
5	9.25 ± 0.187	56 ± 1	125	3090	150	2015

3.2.2 Halon cylinders, class II, sizes 1, 2, 3, and 4. Class II Halon 1301 cylinders shall be in accordance with MIL-C-16310, except as modified herein. Cylinder necks shall be modified as specified in 3.2.1. Cylinder valve protective caps as specified in 3.2.1 shall be furnished. Cylinder dimensions, weight, and service pressure shall be as specified in table II.

TABLE II. Class II cylinder dimensions, weight, and service pressure.

Size	Outside diameter (inches)	Height (inches)	Halon 1301 capacity (pounds)	Minimum volume (in ³)	Approximate weight (empty) (pounds)	Service pressure (psi)
1	8.50 ± 0.187	17 ± 1	10	500	45	2015
2	8.50 ± 0.187	17 ± 1	15	500	45	2015
3	8.50 ± 0.187	35 ± 1	60	1480	100	2015
4	8.50 ± 0.187	54 ± 1	95	2350	142	2015

3.2.3 Halon cylinder valves. Material for the Halon cylinder valve body shall be CRES or brass. If CRES-material is used, it shall be in accordance with QQ-S-763, except that types 202, 302, or 303 shall not be acceptable. If brass material is used, alloy number 377 of ASTM B 124 or alloy number 482 of ASTM B 21 shall be used for forged parts, and alloy number 360 of ASTM B 16 or alloy number 482 of ASTM B 21 shall be used for non-forged parts. Parts within the cylinder valve shall be of a material suitable for the purpose intended, and shall meet the valve operational requirements as well as environmental requirements specified herein. The internal parts of the cylinder valve need not conform to the same material specification as the valve body. Valve inlets shall have male threads 2-1/2-12UN-2A with provisions for a static O-ring seal in accordance with MS18229. Maximum valve height, including removable valve actuator (see 3.2.3.2) shall be 9-1/2 inches above the cylinder neck facing. A safety vent relief hole, 0.062 inch in diameter shall be placed in the first full thread below the O-ring. The threaded connection for the valve actuator shall be located on the valve top on the vertical axis of the valve assembly. Cylinder valves shall be such that the valves will not open when pressure equal to that within the cylinder is exerted on the valve spool through the valve outlet. Cylinder valves and actuation

devices for all cylinder sizes shall be functionally and dimensionally identical. Cutter-disc type or squib (detonator) actuated valves shall not be acceptable. The threads between the Halon cylinder and Halon cylinder valve shall be restrained from movement by application of a sealing compound in accordance with MIL-S-22473, or an anaerobic sealant with equal locking torque. The cylinder valve shall be torqued to the cylinder at a minimum of 80 foot-pounds, and shall withstand the breaking torque test specified in 4.6.6.2. The connection shall withstand the test specified in 4.6.6.1.

3.2.3.1 Valve outlet. The valve outlet shall be horizontal and located on the side of the valve with the centerline located $2\text{-}1/4 \pm 1$ inch above the cylinder neck facing. Outlets shall have male threads 1-7/8-12UN-3A in accordance with MS33656. An anti-recoil cap shall be installed on the valve outlet. The anti-recoil cap shall be attached to the valve by a length of chain and shall have a CRES, brass, or durable plastic warning label which shall be permanently attached to the chain or cap. The durable plastic material shall not be structurally weakened by temperatures less than 140°F (60°C). The warning label shall have red letters on a white background, stating: "This cap must be in place while cylinder is in transit or in stowage and at any time discharge hose is detached".

3.2.3.2 Valve actuator. The cylinder valve shall include a removable pneumatic actuator positioned on the valve top on the vertical axis of the valve assembly. The actuator inlet shall be vertical. The inlet connection shall be male 7/16-20UNF-3A threads in accordance with MS33656. The actuator inlet connection shall be provided with a threaded, vented cap with 7/16-20UNF-2B threads in accordance with MS51532 attached to the actuator by a short length of chain. When supplied with CO₂ from the pneumatic actuation device specified in 3.2.4 at 50°F (10°C), the valve actuator shall open the cylinder valves on the cylinders pressurized to 3000 psi when tested as specified in 4.6.15. The CO₂ pressure required to open the Halon valves in the system actuation test (see 4.6.15) shall not exceed 600 psi. The materials for class I and II actuators shall be brass or CRES, similar to the Halon cylinder valve body. Valve actuators for all cylinder sizes shall be functionally and dimensionally identical (see 6.2).

3.2.3.3 Siphon tube. The cylinder valve inlet shall be drilled, tapped and fitted with a metallic, other than aluminum, siphon tube. The tube shall extend to within approximately 1-1/2 inches of the cylinder bottom when the valve is installed in the cylinder.

3.2.3.4 Safety release device. The cylinder valve shall be fitted with a safety disc assembly dimensionally and functionally equal to that specified in MIL-V-17360, except that the visual indicator shall not be provided. The safety release device shall be located on the side of the valve with the centerline located $1 \pm 1/4$ inch above the cylinder neck and facing 90 ± 5 degrees to the left when viewed from the cylinder valve outlet.

3.2.3.5 Pressure gauge. The cylinder valve shall have a 1-1/2 inch minimum diameter, back connected, Bourdon Tube type pressure gauge with a range of 0 to 1500 psi as specified (see 6.2). The graduated scale shall be 270 degrees. The gauge shall be in accordance with ANSI B40.1, grade B. The gauge shall have the capability to be pressurized to at least 3000 psi without rupture. Gauge cases shall be vented and closed with an elastomeric grommet or equipped with a blow-out section. The gauge shall be located on a side of the valve with the centerline $1 \pm 1/4$ inch above the cylinder neck face and 90 ± 5 degrees to the right when viewed from the cylinder valve outlet. The gauge shall be installed so that the 600 psi marking is oriented vertically upwards. If the gauge is attached to the valve by taper pipe threads, the threads shall be sealed by Teflon tape or equivalent.

3.2.3.6 Cylinder valve and siphon tube flow rate. The cylinder valve and siphon tube assembly shall have an equivalent length of not greater than 20 feet of 1-1/4 inch schedule 80 steel pipe when tested as specified in 4.6.4.

3.2.4 Pneumatic actuation devices. Systems shall be actuated pneumatically from separately located CO₂ cylinders equipped with safety pinned and seal wired quick-opening valves which shall deliver CO₂ to all Halon cylinder valve actuators. Each actuation device shall be furnished with a mounting bracket (see 3.2.4.3).

3.2.4.1 CO₂ cylinder. Class I CO₂ cylinders shall be nonshatterable steel in accordance with RR-C-901. Class II cylinders shall be in accordance with MIL-C-16310 modified as specified herein. The neck of the cylinders shall be tapped with 1/2-14NGT internal threads. All cylinders shall contain 80 ± 1 ounces of CO₂ at a fill density sufficiently low as to meet the high temperature requirement of 3.2.

3.2.4.2 Actuation cylinder valves. Valves shall be fitted with self-engaging lock-open devices and shall be manually operated by a lever requiring a maximum of 180 degrees movement. When specified (see 6.2), actuation cylinder valves shall be provided with electric solenoid operation in addition to the manually operated lever. The valve shall be equipped with a safety release device in accordance with MIL-V-17360 which releases the cylinder contents to atmosphere in the event of overpressurization. Connection to the cylinder shall be male 1/2-14NGT threads. The outlet connection shall be male 7/16-20UNF-3A threads in accordance with MS33656 and fitted with an anti-recoil cap attached to the valve by a length of chain. Materials shall be as specified in 3.2.3. Cutter-disc type or squib (detonator) actuated cylinder valves shall not be acceptable. Valve operators shall be fitted with lead and wire seals. Actuating cylinder valve lock-open devices shall conform to the requirements specified herein following 1000 cycles of operation (see 4.6.5).

3.2.4.3 Mounting bracket. The bracket shall mount on a bulkhead and shall be other than a quick release type. The bracket shall consist of a saddle assembly, two saddle clamps, and bolts and nuts required for securing the saddle clamps to the saddle assembly (see 6.2). The saddle assembly shall have a clip to support the cylinder when the clamps are loosened.

3.2.5 Flexible discharge hoses and end connections. Flexible discharge hoses shall be CRES corrugated hose with at least two CRES heavy wire braid reinforcements, and shall have a minimum burst pressure of 5000 psi (see 6.2). Nominal inside diameter (id) shall be 1-1/2 inches. The free length (exclusive of end connections) shall be $36 \pm 1/2$ inch. The minimum centerline bend radius shall not exceed 22 inches. End connections shall be CRES, except swivel nuts, which shall be CRES or brass similar to the Halon cylinder valve. One end shall be 1-1/2 inch nominal 37-degree flare female connection with swivel nut in accordance with MS51531 and sleeve in accordance with MS51533. The other end shall be 1-1/2 inch nominal 37-degree flare male connection in accordance with MS33656. Fabrication and inspection of welds shall be in accordance with class P-1 of MIL-STD-278 (see 4.6.3).

3.2.6 Discharge check valves. Check valves shall be other than the swing check type (see 6.2). Check valve body, end connections, and other external parts shall be type 316 or 316L CRES. Internal components shall be of material suitable for its intended purpose. Pressure-temperature rating shall be 3000 psi in accordance with ANSI B16.11, except that the maximum temperature shall be 200°F (93°C). The following markings shall be stamped on the check valve body: "INLET" and "OUTLET" near the applicable end, and an arrow designating the direction of flow. The check valves shall function normally when installed in any position. Discharge check valves shall be 1-1/2 inch nominal pipe size (nps) with the inlet port having female 1-7/8-12UN-2B threads in accordance with MS51532. The outlet port shall be 1-1/2 inch nps female for socket welding, in accordance with ANSI B16.11. Weight of the check valve shall not exceed 4 pounds. Non-metallic materials shall not be used in the discharge check valve. The pressure drop through check valves shall not exceed the equivalent length of 25 feet of 1-1/2 nps schedule 80 steel pipe (see 4.6.4).

3.2.7 Vent fitting. The CO₂ actuating manifold vent fittings shall consist of CRES hexagon head 1/4NPT pipe plugs drilled through the long axis with a 1/32-inch diameter hole and counterbored on the exposed end to a 3/16-inch diameter and a depth of $5/16 \pm 1/16$ inch (see 6.2). A vent fitting shall be installed in the dead end of the actuating manifold.

3.2.8 Time delay bypass valve. The time delay bypass valve shall be 1/4-inch nps nonlubricated, two port, two position, 90-degree turn, ball type (see 6.2). Flow passage through the valve shall be not less than 75 percent of the area of 1/4-inch schedule 80 pipe. Inlet and outlet ports shall be in line. Pressure rating shall be 3000 psi. The end connections shall be unions with tail pieces machined for 1/4-inch nps female socket welding. The socket weld fitting dimensions shall be in accordance with ANSI B16.11. The tail pieces shall be type 316L CRES. Externals, body bolts, nuts, follower, adjusting nut, handle and handle nut shall be CRES 316L or 316. Internal components shall be of material suitable for its intended purpose. Operating torque with the valve pressurized to 1000 psi shall not exceed 50 inch-pounds. Lever length of the valve handle shall not exceed 6 inches. Valve shall be open with lever in line with inlet-outlet connections and closed with the lever 90 degrees to inlet-outlet connections. Stops shall be provided at full open and full closed lever

positions. A ring pin shall be provided with a chain attached to the exterior of the valve. Ring pin and chain shall be either or both series 300 CRES or brass. The pin shall be inserted through the handle in such a way as to prevent opening the valve unless the pin is removed. A wire seal shall hold the ring pin in place. The valve shall meet the requirements of 4.6.2. A name plate shall be attached to the valve body. An arrow showing the direction to turn the operating lever, the word "OPEN" adjacent to the arrow, and the phrase "TIME DELAY OVERRIDE" shall be printed on the name plate.

3.2.9 Actuation line filter.

3.2.9.1 Overall construction. The overall construction of the filter shall be an in-line, straight-through design rated for a minimum of 3000 psi gauge design pressure (see 6.2). The filter element shall be removable from the filter body for cleaning or replacement. O-ring type seals shall be used to maintain the integrity of the filter body threaded connections. No tapered pipe thread connections are permitted in the filter construction. Machined flat or hex surfaces shall be provided in order to facilitate disassembly. The filter element shall be so constructed that the upstream surface of the filter can be visually inspected when the filter element is removed from the filter body. The construction of the filter shall permit replacement of the filter element without replacement of the filter body. The filter shall be constructed from type 304 or 316 CRES. The filter shall be provided with a mounting bracket to permit stand-off mounting of the filter to a flat panel.

3.2.9.2 End connections. The end fittings for both the inlet and outlet connections shall be 1/4-inch male 37 degree flare fittings in accordance with MS33656.

3.2.9.3 Marking. Permanent marking which indicates the proper direction of flow shall be provided on the filter body. The location of the mark shall be such that the marking is readily visible when the filter is mounted via the mounting bracket.

3.2.9.4 Filter element. The filter element medium shall be a woven wire mesh fabric constructed of a suitable material as specified in 3.2.9.1 above. The filter medium shall be cleanable by reverse flushing with compressed air. The filter medium shall be formed into an element which has a collapse pressure greater than 2000 psi gauge. The edges of the filter medium shall be welded or otherwise sealed to preclude bypass of the filter medium by contaminants. The filter element shall contain an element area of not less than 6.0 in². The filter medium may be pleated to provide adequate surface area within the filter body. The filter medium shall have a nominal rating of 10 micrometers, and an absolute rating of not more than 25 micrometers.

3.2.9.5 Capacity. The filter shall provide a substantial reservoir between the filter body and the upstream surface of the filter element in order to prevent clogging of the filter by coarse granular or flaky contaminants. The volume of the reservoir shall be sufficient to contain at least 15 grams of black granular iron oxide (magnetite). The density of the magnetite shall not exceed 3.30 grams/cm³.

3.2.10 Pressure switches. Pressure switches shall be three-pole, single-throw for 600 volts alternating current (Vac), 20-ampere, 15-horsepower (hp), 3-phase and 120 Vac, 3-hp, 3-phase service (see 6.2). Pressure switches shall be provided with a means of manual operation for testing the electrical circuits without disconnecting piping. Inlet pressure connections consisting of male 7/16-20UNF-3A threads in accordance with MS33656 shall be furnished with each pressure switch. Electrical conduit connections shall be 3/4-14NPT female pipe threads. The enclosure shall be watertight and shall withstand the watertightness test of MIL-E-2036. Closed contacts may open momentarily but shall not remain open or be damaged when switches are tested as specified in 4.6.10. Open contacts may close for up to 10 milliseconds (ms) but shall not remain closed or be damaged when switches are tested as specified in 4.6.10. Not more than 100 psi shall be required to operate the switches. The pressure switches shall function satisfactorily when tested as specified in 4.6.18.

3.2.11 Discharge nozzles. Discharge nozzles shall be single lateral or 360-degree discharge patterns as specified (see 6.2). Single lateral nozzles shall have a 180-degree discharge pattern producing a 25-foot throw and shall be suitable for mounting against a bulkhead. The 360-degree pattern nozzles shall produce a uniform Halon air mixture at all points within a 15-foot radius, 8 feet below the nozzle. Material shall be type 316 CRES or type CF-8M if cast. The orifice size (code number) of the nozzles shall be that which produces the required flow rate (see 6.2). The orifice code number shall be in accordance with table III and shall be stamped on the nozzle body in two places approximately 135 degrees apart or on the outlet end. The nozzle inlet connection shall be 1-inch nps male NPT threads. A blowout cover or cap shall be furnished with each nozzle having orifice or discharge openings with a diameter or minimum dimension of 1/8 inch or less. Nozzles shall be of the orifice type. Baffle type nozzles shall not be provided.

TABLE III. Discharge nozzle orifice size. 1/

Orifice code no.	Equivalent single orifice diameter (inches)	Equivalent single orifice area (square inches)
3	3/32	0.0069
3+	7/64	.0094
4	1/8	.0123
4+	9/64	.0155
5	5/32	.0192
5+	11/64	.0232
6	3/16	.0276
6+	13/64	.0324
7	7/32	.0376
7+	15/64	.0431
8	1/4	.0491
8+	17/64	.0554
9	9/32	.0621

See footnote at end of table.

TABLE III. Discharge nozzle orifice size. 1/ - Continued

Orifice code no.	Equivalent single orifice diameter (inches)	Equivalent single orifice area (square inches)
9+	19/64	.0692
10	5/16	.0767
11	11/32	.0928
12	3/8	.1105
13	13/32	.1296
14	7/16	.1503
15	15/32	.1725
16	1/2	.1964
18	9/16	.2485
20	5/8	.3068
22	11/16	.3712
24	3/4	.4418
32	1	.785
48	1-1/2	1.765
64	2	3.14

1/ The orifice code number indicates the equivalent single orifice diameter in 1/32 inch increments. A plus sign following this number indicates equivalent diameters 1/64 inch greater than that indicated by the numbering system.

3.2.12 Cylinder clamps and saddles. Halon cylinders will be fastened to the ship structure by two clamping devices, each made up of a saddle and a clamp which shall be furnished by the equipment manufacturer. Installation instructions contained in the technical manual (see 6.4) contain minimum strength requirements for the members to which the saddles are to be attached. Nonmagnetic (other than aluminum) cylinder clamps and saddles shall be furnished when class II equipment is specified (see 6.2).

3.2.13 Scales. A platform type scale shall be furnished to determine, in the marine environment, the weight of Halon charges contained in Halon cylinders (see 6.2). The scale shall be class III in accordance with NIST Handbook 44 and shall be covered by a Certificate of Conformance under the National Type Evaluation Program (NTEP): the scale shall be provided with scale divisions of either 0.1 pounds or 2.0 ounces (maximum) and shall be correct when weighing items up to 330 pounds. The scale shall be of steel construction. When a mechanical platform scale is furnished, it shall be of weighbeam type with sliding weights (poise) permanently attached to the scale's weighbeam bars to provide quick and easy operation: weighbeam bars shall be of stainless steel. The scale's platform shall be suspended so as to absorb loading shocks, protecting the scale's works. A positive locking device shall be provided to lock the scale while being transported. The dimensions of the platform shall not exceed 17 by 22 inches. Maximum weight of the scale shall not exceed 45 pounds. The scale shall be fitted with a handle for ease of transport. The scale shall have demonstrated Acceptance Tolerance Values of NIST Handbook 44 preparatory to delivery (see 6.3).

3.2.14 Cylinder charges. Unless otherwise specified herein, all Halon cylinder assemblies shall be charged with the required weight plus or minus 1 pound of Halon 1301, in accordance with MIL-M-12218 (see tables I and II). The charged Halon cylinder assemblies shall be super-pressurized with dry nitrogen in accordance with BB-N-411 to a total pressure of 600 to 675 psi at 70°F (21°C) and verified as specified in 4.6.17. The order of charge of the agents is optional. The CO₂ actuating cylinders shall be charged with 80 ± 1 ounces of CO₂ in accordance with grade B of BB-C-101.

3.2.15 Forgings. Where a forging process is used to fabricate pressure containing parts, the forgings shall conform to the requirements specified in the applicable material specification (see 3.2.3).

3.2.16 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.3 Hydrostatic pressure. The check valves, cylinder valves, flexible discharge hoses, time delay bypass valves, actuation line filters, and pressure switches shall withstand a hydrostatic pressure of 3250 psi (1750 for flexible discharge hoses) for 90 seconds with no signs of leakage, evidence of porosity, permanent distortion, or structural failure when tested as specified in 4.6.1. Flexible discharge hoses shall be provided with a CRES tag stamped with the test pressure and date of test.

3.4 Valve seat tightness. Discharge valve leakage shall not exceed 7 cubic centimeters per 90 seconds per inch nps when subjected to a hydrostatic pressure of 100 psi at the outlet (see 4.6.2).

3.5 Cylinder and valve assembly leakage.

3.5.1 Halon cylinder and valve assembly. The Halon cylinder valve assembly shall be free of evidence of leaks when tested as specified in 4.6.6.

3.5.2 CO₂ actuating cylinder and valve assembly. The CO₂ actuating cylinder valve assembly shall show no signs of leakage of CO₂ gas from the cylinder or valve during or following submergence in water at a temperature of 32 to 43°C for a period of 1 hour (see 4.6.7).

3.6 High-impact (H.I.) shock. Items specified in 3.2, except flexible hoses and scales shall meet the grade A, class I, type A, medium weight shock requirements of MIL-S-901 when tested as specified in 4.6.9.

3.7 Vibration. Items requiring high impact shock test (see 3.6) shall also meet the vibration requirements of type I of MIL-STD-167-1 (see 4.6.10).

3.8 Magnetic permeability. Class II items, except scales, shall have a magnetic permeability not to exceed 2.0 after complete fabrication (see 4.6.11).

3.9 Safety disc. The safety discs shall withstand a pressure of 2000 psi for 30 seconds at 21°C. The disc shall burst at a pressure of not less than 2650 psi and not in excess of 3000 psi (see 4.6.12).

3.10 Salt spray. All items, except scales, shall withstand a salt spray test of 480 hours with no signs of corrosion or change in condition which would adversely affect or tend to affect the operation of the equipment (see 4.6.13).

3.11 Halon cylinder valve opening and discharge. When the Halon cylinder and valve assembly is filled with water and subjected to the opening and discharge test (see 4.6.15) the Halon valve shall open at not more than 600 psi and shall remain in the open position until a minimum of 90 percent of the water is discharged. After discharge, the valve shall close automatically.

3.12 Recharging. The cylinders shall be rechargeable without replacement of any valve part, except failed safety discs. Cutter disc or squib (detonator) actuated cylinder valves shall not be acceptable.

3.13 Weight stamping. The actual empty (tare) weight of the cylinder and valve, the full weight (actual weight of the cylinder, valve, nominal Halon 1301 charge and nitrogen charge), and the nominal weight of the Halon 1301 charge shall be stamped on the cylinder dome with a round bottom stamp. Stamped cylinder weights shall include anti-recoil cap (see 3.2.3.1) and CO₂ valve actuator with thread protective cap (see 3.2.3.2). Cylinder valve protective shipping cap (see 3.2.1) weight shall not be included.

3.13.1 Halon liquid level. The level of the liquid Halon in the fully charged size 3, 4, and 5 cylinders at 70°F (21°C) shall be determined and shown on the cylinder by means of a label. The label shall be affixed to the cylinder directly below the pressure gauge. The label shall be a decal of the self-sticking type with an arrow and the words "Full Mark 70°F" printed thereon.

3.14 Painting. CO₂ and Halon cylinders shall be cleaned, treated, and painted in accordance with type A of MIL-T-704, except as follows:

- (a) Blast cleaning shall be to near white metal in accordance with SSPC SP 10.
- (b) Treatment after cleaning shall be solely with an organic pretreatment primer.
- (c) Primer shall be in accordance with TT-P-1757.
- (d) Finish coat shall be in accordance with MIL-STD-101 and MIL-T-704, type A.
- (e) Cylinder marking and stenciling materials shall be compatible with the cylinder paint system and shall meet applicable durability requirements.

3.14.1 Color bands. The cylinder color band requirements of MIL-STD-101 may also be met by the use of 2-mil vinyl strips with permanent adhesive backing, affixed over the finish coat of 3.14(d).

3.14.2 Markings. CO₂ and Halon cylinders shall be marked and color coded in accordance with MIL-STD-101. The title shall be painted on two diametrically opposite sides of the cylinders. The title of the CO₂ cylinders shall be as follows:

"HALON SYSTEM
ACTUATOR
CARBON DIOXIDE"

The title for the Halon cylinders shall be as follows:

"BROMOTRIFLUOROMETHANE
(HALON 1301) (FIRE ONLY)
(NON-SHAT)"

Letter sizes may be reduced from those specified in MIL-STD-101 so as to fit the cylinder size.

3.14.3 Paint repair. Painted surfaces on which the paint is damaged or defective shall be cleaned and repainted with the original specified paint of the same quality and color.

3.15 Special tools. No special tools other than scales and a liquid level instrument shall be required for normal maintenance of equipment covered by this specification. Special tools are defined as those tools not listed in the Federal Supply Catalog (copies of this catalog may be consulted in the office of the Defense Contract Management Area Operations (DCMAO)).

3.16 Marking. Halon cylinders, valves, pneumatic valve actuators, pneumatic actuation devices, flexible hoses, check valves, vent fittings, time delay filters, pressure switches, discharge nozzles, cylinder clamps and saddles, pneumatic actuation device, scales, and time delay bypass valves shall be marked in accordance with MIL-STD-130, except that attachment of a metal tag, stamped with the Commercial and Government Entity (CAGE) number and the part number, is acceptable for marking pneumatic valve actuators, flexible hoses, vent fittings, vented caps for the pneumatic valve actuator inlet, and anti-recoil caps for the Halon cylinder valve outlet. The carton containing seal wires shall be marked in accordance with MIL-STD-130. Seal wires need not be marked.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

- (a) Qualification inspection (see 4.3).
- (b) First article inspection (see 4.3.2).
- (c) Quality conformance inspection (see 4.5).

4.3 Qualification inspection. Qualification inspection shall be conducted at a laboratory satisfactory to NAVSEA. Qualification inspection shall consist of the tests shown in table IV. Failure of any test shall constitute failure to qualify.

4.3.1 Samples for qualification and first article. Unless otherwise specified herein, two samples of each of the items specified shall be subjected to the qualification inspection of 4.3, and the first article inspection of 4.3.2.

4.3.1.1 Extension of qualification approval for class I only. If a manufacturer desires qualification approval for all sizes of class I cylinders, class I, size 5 cylinders shall be subjected to the qualification inspection (see 4.3). If the class I, size 5 cylinders conform to this specification, qualification approval will be extended to cover class I, size 1 through 4 cylinders.

4.3.2 First article inspection for class II only. First article inspection shall consist of the examination and tests specified in table IV, conducted in the order shown, or as acceptable to NAVSEA.

TABLE IV. Qualification, first article and quality conformance inspection.

Test	Requirement	Test	Class I	Class II	Quality conformance
			Quali- fication	First article	
Halon cylinder pressurization	3.2.14	4.6.17	x	x	x
Visual and dimensional examination	---	4.5.1	x	x	x
Hydrostatic	3.3	4.6.1	x	x	<u>2/</u>
Valve seat tightness	3.4	4.6.2	x	x	x
Discharge hose flow	3.2.5	4.6.3	x	x	
Valve flow	3.2.6 and 3.2.3.6	4.6.4	x	x	
CO ₂ actuating cylinder valve lock open device	3.2.4.2	4.6.5	x	x	x
Halon cylinder valve assembly leakage	3.5.1	4.6.6	x	x	x
Halon cylinder valve torque	3.2.3	4.6.6.1	x	x	
Halon cylinder valve breaking torque	3.2.3	4.6.6.2	x	x	
CO ₂ actuating cylinder valve assembly leakage	3.5.2	4.6.7	x	x	
Forgings	3.2.15	4.6.8	x	x	x
High impact shock	3.6	4.6.9	<u>1/</u>	<u>1/</u>	
Vibration	3.7	4.6.10	<u>1/</u>	<u>1/</u>	
Magnetic permeability	3.8	4.6.11	x	x	x
Safety release device bursting	3.9	4.6.12	x	x	x
Salt spray	3.10	4.6.13	x	x	
Actuation line filter	3.2.9	4.6.14	x	x	
Halon cylinder valve opening and discharge	3.11	4.6.15	<u>1/</u>	<u>1/</u>	
Enclosure (pressure switch)	3.2.10	4.6.16	x	x	
Pressure switch cycle	3.2.10	4.6.18	<u>1/</u>	<u>1/</u>	<u>1/</u>

See footnotes at top of next page.

1/ These tests shall be conducted on only one sample.

2/ These tests shall be conducted only on flexible hoses and shall be conducted on 100 percent of production.

4.3.2.1 Extension of first article approval for class II only. If a contractor desires first article approval for all sizes of class II cylinders, class II, size 4 cylinders shall be subjected to the first article inspection of 4.3.2. If the class II, size 4 cylinders conform to this specification, first article approval will be extended to cover class II, size 1 through 3 cylinders.

4.4 Sampling for quality conformance inspection.

4.4.1 Lot. For the purpose of sampling, a lot shall consist of all individual components of the same type (such as CO₂ cylinders, pressure switches and pressure hoses) manufactured on the same equipment during a single production run and offered for delivery at one time.

4.4.2 Sampling of forgings. Where forging process is used to fabricate pressure containing parts, one sample shall be selected at random from each 500 forgings, or a fraction thereof, of any one heat for tests to determine conformance with the applicable specification specified herein. Samples or sample drillings shall be obtained from each individual sample part for chemical analysis to ensure that the material conforms to the applicable specification specified herein. Samples shall be extracted in accordance with method 111.2 of FED-STD-151 and tested as specified in 4.6.8.

4.4.3 Sampling. Sampling shall be performed in accordance with tables V and VI.

TABLE V. Visual and dimensional examination (minor defects).

Lot size	Sample size
2 - 8	<u>1</u> /
9 - 90	8
91 - 150	12
151 - 280	15
281 - 500	18
501 - over	21
<u>1</u> / Entire lot shall be inspected.	

TABLE VI. Visual and dimensional examination (major defects) and other tests.

Lot size	Sample size
2 - 20	<u>1</u> /
21 - 280	20
281 - 500	25
501 - over	30
<u>1</u> / Entire lot shall be inspected.	

4.5 Quality conformance inspection.

4.5.1 Visual and dimensional examination. Each sample item selected as specified in 4.4 shall be visually and dimensionally examined to determine conformance with this specification. Major and minor defects shall be classified as shown in table VII (see 6.8).

TABLE VII. Classification of defects.

<u>Critical</u>	None defined
<u>Major</u>	
101	Size not as specified.
102	Missing or incorrect parts.
103	Parts loose or damaged so as to interfere with proper operation.
104	Threads not as specified.
105	Time delay period not stamped as specified.
106	Component identification not as specified.
107	Dimensions incorrect affecting proper operation.
108	Weights not as specified.
<u>Minor</u>	
201	Parts loose or damaged but not interfering with operation.
202	Dimensions incorrect but not interfering with operation.
203	Identification markings missing, incorrect, or illegible.
204	Paint coverage incomplete; evidence of cracking, peeling, or blistering of paint.

4.5.2 Quality conformance tests. The sample items selected as specified in 4.4 shall be subjected to the quality conformance tests shown in table IV. Detection of any nonconforming characteristic (including visual and dimensional) in any sample shall result in the rejection of the entire lot. The contractor has the option of correcting the discrepancy, retesting, and resubmitting a conforming lot or submitting a new lot which shall be inspected and tested as specified herein.

4.6 Test procedures.

4.6.1 Hydrostatic test. To determine conformance with 3.3, check valves, cylinder valves, actuation line filters and pressure switches shall be hydrostatically tested for strength with water at ambient temperature at a minimum of 3250 psi for 90 seconds. Flexible discharge hoses shall be tested as above, except that the pressure applied shall be 1750 psi. There shall be no leakage or evidence of porosity, permanent distortion, or structural failure.

4.6.2 Valve seat tightness tests. Discharge check valves and time delay bypass valves shall be tested for at least 90 seconds with 100 psi applied at the outlets. The inlet shall be open. Valve leakage shall not exceed 7 cubic centimeters per 90 seconds per inch nps. Tests shall be performed with water at ambient temperature.

4.6.3 Discharge hose flow. Equivalent length of discharge hoses (bent to 90 degrees on approximate 22-inch radius) shall be determined by flow tests with water while the Reynolds number is maintained at greater than 10^5 during the tests. The equivalent length of discharge hose shall not exceed 20 feet of 1-1/2 inch schedule 80 steel pipe.

4.6.4 Valve flow tests. Equivalent length of discharge check valves and Halon cylinder valves with siphon tube attached shall be determined by flow tests with water while the Reynolds number is maintained at greater than 10^5 during the tests. The equivalent length of the cylinder valve and siphon tube assembly shall not exceed that specified in 3.2.3.6. The equivalent length of check valves shall not exceed that specified in 3.2.6.

4.6.5 CO₂ actuating cylinder valve lock-open device test. Actuating cylinder valves shall be cycled at least 1000 times to determine proper function of the locking device (see 3.2.4.2).

4.6.6 Halon cylinder and valve assembly leakage. Each fully charged Halon cylinder shall be tested with an electronic halide leak detector with the detector leak index sensitivity set at 1/2 ounce per year to determine conformance with 3.5.1.

4.6.6.1 Halon cylinder and valve torque test. With the Halon cylinder restrained, a counterclockwise torque of 150 foot-pounds shall be applied to the valve. There shall be no evidence of movement of the valve in reference to the cylinder. In order to determine whether movement occurs, the cylinder valve shall be match marked to the cylinder prior to the test.

4.6.6.2 Halon cylinder and valve breaking torque test. With the Halon cylinder restrained, counter clockwise torque shall be applied to the valve until valve movement occurs. The torque which results in valve movement shall be not greater than 300 foot-pounds. To determine whether movement occurs, the cylinder valve shall be match marked to the cylinder prior to the test.

4.6.7 CO₂ actuating cylinder and valve assembly leakage. Each fully charged CO₂ actuator shall be submerged in deaerated water at a temperature of not less than 32°C nor more than 43°C for a period of 1 hour. During the test, each actuator shall be inspected for leaks. Any signs of escape of CO₂ gas from the cylinder or valve shall be cause for rejection. Following completion of testing, all traces of moisture shall be removed from the operating portion of the valve and the safety-release mechanism (see 3.5.2).

4.6.8 Chemical analysis of forging. Samples of forgings shall be chemically analyzed in accordance with method 111.2 of FED-STD-151.

4.6.9 Shock test. The following items shall be subjected to the grade A, class I, type A, medium weight shock test of MIL-S-901:

- (a) An assembly of one class I, size 5 (125-pound) or class II, size 4 (95-pound) cylinder with valve and siphon tube restrained by the clamps specified in 3.2.12 filled with 125 pounds or 95 pounds, as applicable, of Halon 1301 and pressurized to 600 psi at 70°F with nitrogen. As an alternative (for safety considerations) the cylinder may be filled with 125 pounds (class I, size 5) or 95 pounds (class II, size 4) of a noncorrosive liquid having a specific gravity in the range of 1.25 to 1.60 (such as glycerin or an aqueous solution of potassium carbonate) and pressurized to 600 psi at 70°F with nitrogen.
- (b) One unpressurized, discharge check valve mounted on the side outlet of a tee between two lengths of pipe which are secured to the shock table by two pipe supports in accordance with Drawing 810-1385782.
- (c) One unpressurized actuation line filter secured to the shock table with the mounting bracket specified in 3.2.9.1.
- (d) One unpressurized pressure switch.
- (e) One complete pneumatic actuation device of each type at operating pressure secured to the shock table with the mounting bracket specified in 3.2.4.3. As an alternative (for safety considerations) the cylinder may be filled with 5 pounds of a noncorrosive liquid having a specific gravity in the range of 1.25 to 1.60 (such as glycerin or an aqueous solution of potassium carbonate) and pressurized to 850 psi at 70°F with nitrogen.
- (f) One unpressurized discharge nozzle of each pattern, with orifice number 24, secured by a rigidly mounted pipe coupling.
- (g) One unpressurized time delay bypass valve mounted between two lengths of pipe which are secured to the shock table by two pipe supports in accordance with Drawing 810-1385782.

4.6.9.1 Failure criteria. Post shock examination shall reveal no change in condition which will adversely affect or tend to affect the operation of the component or system. Minor distortion of mounting brackets, clamps, and fixtures incurred during shock and vibration testing (see 4.6.10) is acceptable. However, visible cracks or breakage of mounting clamps, brackets, or fixtures shall be cause for rejection.

4.6.9.2 Pressure switch and electric solenoid operated pneumatic actuation device. Pressure switches shall be tested with the switch in both positions. Contacts shall be monitored during the shock test. A contact is considered monitored when, during the shock test, the contact is part of an energized circuit where malfunction of the contact would cause the monitor circuit to indicate occurrence of the malfunction. Closed contacts shall be monitored by a means that will determine if a contact momentarily opens. Open contacts shall be monitored by a means that will determine if a contact momentarily closes. Contact monitoring may be done by calibrated relay (for closed contacts only)

oscilloscope, oscillograph, or other appropriate means that is consistently repeatable with plus or minus 10 percent deviation. Any change of state that would require restarting of equipment if the equipment was operating, or that would cause application of power if the equipment was not in operation, shall constitute failure.

4.6.9.3 Cylinders (CO₂ actuating and Halon). When subjected to the shock test, cylinders shall not become airborne. Cylinders shall be re-aligned and brackets shall be re-tightened after each blow, as required for safety.

4.6.9.4 Combination manual and electric operated actuation devices. Combination manual and electric operated actuation devices shall be shock tested with the solenoid energized in both positions. Any change of state that would result in actuation of the Halon system if the actuation device was initially in the ready position, or that would result in shut off of CO₂ flow that would require manual operation of the device if it was in the operated position, shall constitute failure.

4.6.10 Vibration test. All items shock tested as specified in 4.6.9 shall also be subjected to the type I vibration tests of MIL-STD-167-1.

4.6.10.1 Pressure switches and electric solenoid operated pneumatic actuation device. Pressure switches and electric solenoid operated pneumatic actuation device shall withstand the vibration tests without mechanical damage, contact chatter, or other electrical malfunctioning.

4.6.11 Magnetic permeability tests. For class II equipment, one of each item, except scales (see 3.15), shall be selected and tested for magnetic properties. Class II cylinders and cylinder valves with siphon tubes shall be tested as an assembly. The magnetic permeability of each item or assembly shall be determined by means of a permeability indicator of the go-no go type conforming to or equal to that specified in MIL-I-17214. The magnetic permeability shall conform to 3.8.

4.6.12 Safety release device bursting test. The sample discs selected for tests shall be secured in an adapter having a pressure opening of a size identical to that of the valves and held in place by the washers and safety nuts taken from valves or others having identical dimensions. Tests shall be conducted at room temperature (approximately 70°F (21°C)). A high pressure hydrostatic test line shall be applied to the adapter for the purposes of this test. The test pressure may be raised rapidly to 2,000 psi, held there for at least 30 seconds, and thereafter shall be raised at a rate not in excess of 100 psi per minute, until the disc bursts. The actual bursting pressure shall not be in excess of 3,000 psi nor less than 2650 psi (see 3.9).

4.6.13 Salt spray test. All items, except scales, shall be tested in accordance with method 509.2 of MIL-STD-810. Duration of the salt spray test shall be 480 hours. Subsequent examination shall reveal no change in condition which will adversely affect or tend to affect the normal operation of the item or system (see 3.10).

4.6.14 Actuation line filter pressure drop. One filter shall be tested to verify that the pressure drop across a dirty filter does not exceed 10 psi gauge when 8.0 SCFM of air at 100 psi gauge inlet pressure is flowing through the filter. Prior to measuring the pressure drop, the filter shall be contaminated by pouring 15.0 grams of unsorted black granular iron oxide (magnetite) into the filter inlet. The iron oxide shall contain a range of particle sizes from not larger than 0.030 inches to fines at or below 10 micrometers.

4.6.15 Halon valve opening and discharge. One Halon valve, actuator and cylinder assembly shall be tested as follows: A source of nitrogen, a pressure regulator, and a stop valve and pressure gauge installed in the lateral of a pipe tee shall be installed in series with a class I, size 5 or class II, size 4 Halon valve actuator and cylinder assembly. The halon cylinder shall be half filled with water and pressurized to 3000 psi gauge with nitrogen and the safety disc replaced with one that will rupture at approximately 3300 psi gauge. The nitrogen actuation pressure shall be raised from 0 psi at a rate not to exceed 50 psi per second. The actuation pressure at the instant of the Halon cylinder valve opening shall not exceed 600 psi. At the instant of the Halon valve opening, the nitrogen flow shall be held for 10 seconds and then the stop valve opened rapidly to bleed the actuation pressure to 0 psi. The halon valve shall sustain itself in an open position until at least 90 percent of the water is discharged. After discharge the valve shall close automatically.

4.6.16 Enclosure (pressure switch). The pressure switch shall be subjected to the watertight enclosure test of MIL-E-2036.

4.6.17 Halon cylinder pressurization. The actual fill pressure, temperature corrected to 70°F (21°C), shall be verified with a gauge of at least 1 percent of scale accuracy, marked in 5 psi or smaller increments. If valve unseating or reseating pressure is required, dry nitrogen in accordance with BB-N-411 shall be used.

4.6.18 Pressure switch cycle test. The pressure switch shall be test operated by nitrogen at a pressure of 2225 ± 50 psi at least 100 times, and shall be manually closed each time. During the tests, the pressure switch shall be connected to a power source and indicating lamp. The indicating lamp shall operate each time the pressure switch is operated by the nitrogen. Failure of the lamp to operate shall be cause for failure of this test.

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the packaging (preservation, packing, and marking) for shipment, stowage, and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

4.7.1 Rough handling test. When specified (see 6.2), and when level A preservation and level A or B packing are required, prior to beginning package production, a pack of the systems shipping container shall be subjected to the rough handling tests of MIL-P-116.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging or preparation for delivery requirements of referenced documents listed in section 2, see 6.9.)

5.1 General.

5.1.1 Navy fire-retardant requirements.

5.1.1.1 Lumber and plywood. Unless otherwise specified (see 6.2) all lumber and plywood including laminated veneer materials used in shipping container and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant tested materials conforming to MIL-L-19140 as follows:

- Level A and B - Type II - weather resistant
 - Category 1 - general use.
- Level C - Type I - non-weather resistant
 - Category 1 - general use.

5.1.1.2 Fiberboard. Fiberboard used in the construction of interior (unit and intermediate) and exterior fiberboard boxes including interior packaging forms shall conform to class-domestic/fire retardant or class-weather resistant/fire retardant materials requirements as specified (see 6.2) in PPP-F-320 and amendments thereto.

5.2 Preservation. Preservation shall be level A or commercial as specified (see 6.2).

5.2.1 Level A. Systems equipment shall be cleaned and dried by a process and procedure in accordance with MIL-P-116 that will ensure removal of corrosion, dirt, grease, and all forms of foreign material. Metal surfaces subject to corrosion shall be coated with preservative, in accordance with P-2 or P-19 of MIL-P-116. P-2 preservative shall be used where its removal is required prior to placing the equipment part in use. Greaseproof wraps, when required, shall be applied in accordance with MIL-P-116. Petroleum base solvents, preservations and lubricants shall not be applied to any part of the gas cylinders, valves, or other pressure-containing assemblies. Openings, pipe terminations, hose ends, inlet and outlet connections, valve flanges, and similar items shall be sealed with covers, plugs, or with a noncorrosive, greaseproof, waterproof barrier material and secured in a manner to prevent entrance of any foreign material. Nonelectrical preserved parts shall meet the requirements of method I and unpreserved parts method III of MIL-P-116. Electrical parts of each system shall be preserved in accordance with the methods and criteria of MIL-E-17555. Each individual part shall be separately packed (unit protected) in a unit container or cushioned, anchored, blocked, and braced within the system shipping container.

5.2.1.1 Cushioning and wrapping materials. The use of excelsior, newspaper, shredded paper (all types, including wax paper) and similar hygroscopic or nonneutral materials and all types of loose-fill materials, for applications such as cushioning, fill, stuffing, and dunnage is prohibited. Materials selected for cushioning and wrapping shall have properties (characteristics) resistant to fire. MIL-E-17555 provides guidance for fire retardant materials.

5.2.2 Commercial. Preservation of parts and equipment shall be in accordance with ASTM D 3951.

5.3 Packing. Packing shall be level A, B, C, or commercial as specified (see 6.2).

5.3.1 General requirements.

5.3.1.1 Levels A, B, and C. Each extinguisher system of the same class and size preserved as specified in 5.2 shall be packed in a shipping container of minimum weight and cube consistent with the protection required. Shipping containers with a gross weight of 200 pounds or over and those with length and width dimensions of 48 by 24 inches or more weighing more than 100 pounds shall be provided with skids of minimum size nominal 3- by 4-inch lumber laid flat and attached in such a manner as to permit the use of lifting devices and material handling equipment. The skids may be attached crosswise or longitudinally as best suited for the use of material handling equipment, except that where boxes and crates conform to Federal or Military specifications, the skids shall be as specified therein. In addition to specification requirements, 4-way entry shall be provided to material handling equipment on containers 60 inches or more in length or width. Further provisions shall be made to ensure that load-bearing members are provided in areas subject to contact with lifting devices. Crates shall be used for the shipment of individual systems exceeding the weight limitations specified for the wooden container specification. Open crates may be used in conjunction with wood boxes as a shipping media for systems with several gas cylinders wherein the balance of the system parts could be readily placed in a smaller wood container to be secured within the open crate. Systems shipped in open crates shall be shrouded with flexible waterproof barrier material as specified in MIL-STD-1186 or polyethylene minimum 0.006 inch thick. When used, triple-wall corrugated containers exceeding 250 pounds gross weight shall be modified with reinforcing strength members and shall have wooden skids.

5.3.1.2 Clearance. A clearance of not less than 1 inch shall be allowed between the item and the closest member of the sides, ends, and top of the container. Fragile items or items within floating bag barriers shall be protected with clearances of 2 to 4 inches. Protruding parts at the top may be allowed to extend between joists and spacing of joists may be adjusted slightly to accommodate projections.

5.3.1.3 Anchoring, blocking, bracing, and waterproofing. Anchoring, blocking, bracing, and waterproofing of container contents shall be in accordance with MIL-STD-1186 and the applicable container specification and appendix thereto.

5.3.2 Shipping containers.

5.3.2.1 Levels A, B, and C. Exterior shipping containers, for the level of packing specified (see 5.3), shall be in accordance with the exterior container requirements of MIL-STD-2073-1, table VII, appendix C. Unless otherwise specified (see 6.2), container selection shall be at the contractor's option.

5.3.2.1.1 Crate tops. Alternatively, in lieu of the outer lumber sheathing for crate tops, 3/8-inch plywood may be used. Plywood shall be of the exterior grade specified in the crate specification.

5.3.2.2 Closure and reinforcement. Exterior containers shall be closed, reinforced or banded in accordance with the applicable container specification or appendix thereto, except that PPP-B-636 fiberboard boxes shall be closed method V for class-weather resistant/fire-retardant grade boxes and reinforced with non-metallic banding or pressure sensitive filament tape in lieu of metal straps or wire banding. Closure for PPP-B-636 class-domestic fire-retardant boxes shall conform to method I.

5.3.3 Commercial. Each extinguisher system of the same class and size, preserved as specified in 5.2, shall be packed in accordance with ASTM D 3951.

5.4 Marking. In addition to any special marking required (see 6.2), or herein, level A, B, and C interior packs and exterior shipping containers shall be marked including bar coding in accordance with MIL-STD-129. Commercial packs and shipping containers shall be marked including bar coding in accordance with ASTM D 3951.

5.4.1 Special marking.

5.4.1.1 Hazardous materials. Gas cylinders and, where applicable, shipping containers with gas cylinders packed within, shall be marked as required by DOT 49 CFR.

5.4.1.2 Warranty marking. Warranty markings shall be applied in accordance with the figures for interior and exterior warranty marking, as applicable, of MIL-STD-129.

5.5 Technical manuals. Technical manuals which accompany shipments shall be packed in minimum 4-mil transparent plastic bags. Bag closure shall be by heating sealing. Technical manuals shall not be placed within any flexible sealed barrier enclosing components. The copies of the manual shall be placed in the shipping container housing the main unit. Packing lists shall indicate which container contains the technical manuals and shall also state the approximate location therein. For ease of removability, the location of the manuals shall be such that they are readily accessible when the container is opened. Technical manuals, when shipped in bulk quantities, shall not be individually wrapped, but shall be packed in accordance with the requirements of the applicable technical manual specification or packed in containers conforming to the requirements for level A, B, or C, as specified (see 6.2).

5.6 Charged gas cylinders. When specified (see 6.2), the required number of gas cylinders shall be packaged in accordance with RR-C-901 in lieu of packing the cylinders with the system parts as specified in 5.2.

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 equipment covered by this specification is intended for use in on board chemical (Halon 1301 liquefied and pressurized with nitrogen to 600 psi at 70°F (21°C)) fire extinguisher systems of the fixed (stationary) type. The basic system arrangements are shown on Drawing 803-5773930 and Drawing 803-5959326.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Class of system required (see 1.2).
- (c) Quantity and size of Halon cylinders required (see 1.2.1).
- (d) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (e) When first article inspection is required (see 3.1.1).
- (f) Quantity of pneumatic valve actuators required in addition to those assembled to Halon cylinder valves (see 3.2.3.2).
- (g) Quantity of pressure gauges required in addition to those assembled to Halon cylinder valves (see 3.2.3.5).
- (h) Quantity of combination manually and electrically operated actuation cylinders (see 3.2.4.2).
- (i) Quantity of actuation cylinder brackets (see 3.2.4.3).
- (j) Quantity of flexible discharge hoses (see 3.2.5).
- (k) Quantity of discharge check valves (see 3.2.6).
- (l) Quantity of vent fittings (see 3.2.7).
- (m) Quantity of time delay bypass valves (see 3.2.8).
- (n) Quantity of actuation line filters (see 3.2.9.1).
- (o) Quantity of pressure switches (see 3.2.10).
- (p) Quantity, discharge pattern, and orifice code of discharge nozzles (see 3.2.11).
- (q) Quantity of Halon cylinder clamps and saddles (see 3.2.12).
- (r) Quantity of scales (see 3.2.13).
- (s) When rough handling test is required (see 4.7.1).
- (t) When fire-retardant lumber and plywood is not required (see 5.1.1.1).
- (u) Class of fire-retardant fiberboard required (see 5.1.1.2).
- (v) Level of preservation and level of packing required (see 5.2 and 5.3).
- (w) Container selection if other than contractor's option (see 5.3.2.1).
- (x) Special marking required (see 5.4).
- (y) When gas cylinders shall be packed in accordance with RR-C-901 (see 5.6).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DoD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.2	DI-DRPR-81002	Developmental design drawings and associated lists	----
3.2.13	DI-MISC-80678	Certification/data report	10.3.1 does not apply

The above DID's were those cleared as of the date of this specification. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4.1 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards that have been cleared and listed in DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.5 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

6.5.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.5.2 Repair parts. On board repair parts should be furnished as specified for each end user and should consist of the following:

- | | |
|---|---|
| (a) Seal wires | 10 per CO ₂ actuating cylinder. |
| (b) Flexible discharge hose | 5 percent or a minimum of three, whichever is greater. |
| (c) Halon cylinder valve actuator | 5 percent or a minimum of four, whichever is greater. |
| (d) CO ₂ actuating cylinder and valve assembly (charged), manual | Equal in quantity to 1/6 times the number of time delay devices ordered (rounded up to the nearest whole number), plus one. |
| (e) Fully charged replacement Halon cylinders and valve assemblies | 5 percent or a minimum of one, whichever is greater, for each class and size of cylinder ordered. |
| (f) Pressure switch | One per ship (minimum). |
| (g) Discharge nozzle | One for each orifice size and pattern required. |
| (h) Cap, valve actuator | 2 percent or a minimum of one, whichever is greater. |
| (i) Cap, anti-recoil (Halon cylinder valve outlet) | 2 percent or a minimum of one, whichever is greater. |

6.6 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 24572 whether or not such products have actually been so listed by that date. The attention of the 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. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 51222, Department of the Navy, Washington, DC 20362-5101 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests must be made in accordance with "Provisions Governing Qualification SD-6" (see 6.6.1).

6.6.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.7 First article. When a first article inspection is required, the items should be a first article sample. The first article should consist of two units. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.8 Lot acceptance and rejection criteria. Lot acceptance and rejection criteria are as specified in tables VIII and IX. Defective items must be replaced with acceptable items prior to lot acceptance. Inspect sample size until reject criteria is reached. If any sample is rejected, reject the lot or inspect the entire lot. If all samples are inspected and none are rejected, accept the lot.

TABLE VII. Visual and dimensional examination (minor defects).

Lot size	Sample size	Accept	Reject
2 - 8	1/	0	1
9 - 90	8	0	1
91 - 150	12	0	1
151 - 280	15	0	1
281 - 500	18	0	1
501 - over	21	0	1
1/ Entire lot must be inspected.			

TABLE IX. Visual and dimensional examination (major defects) and other tests.

Lot size	Sample size	Accept	Reject
2 - 20	1/	0	1
21 - 280	20	0	1
281 - 500	25	0	1
501 - over	30	0	1
1/ Entire lot must be inspected.			

6.9 Sub-contracted material and parts. The packaging or preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.10 Subject term (key word) listing.

Chemical fire extinguisher
 Fixed (stationary) system
 Remote control expelled
 Stationary actuation

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

Preparing activity:
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 (Project 4210-N449)

