

MIL-P-24589(SH)
30 January 1979

MILITARY SPECIFICATION

PROPORTIONERS, BALANCED PRESSURE, AQUEOUS FILM-FORMING FOAM (APFF)
LIQUID CONCENTRATE (FOR SURFACE SHIP FIREFIGHTING SERVICE)

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 the requirements for balanced pressure proportioners for use with aqueous film-forming foam (APFF) liquid concentrate.

1.2 Classification. Proportioners shall be of the following types as specified (see 6.2.1):

- Type I - Usable flow range of 40 to 250 gallons per minute (gal/min).
- Type II - Usable flow range of 40 to 500 gal/min.
- Type III - Usable flow range of 50 to 1000 gal/min.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. 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

- FF-B-171 - Bearings, Ball, Annular (General Purpose).
- QQ-C-390 - Copper Alloy Castings (Including Cast Bar).
- QQ-N-281 - Nickel-Copper-Alloy Bar, Plate, Rod, Sheet, Strip, Wire Forgings, and Structural and Special Shaped Sections.
- QQ-N-286 - Nickel-Copper-Aluminum Alloy, Wrought.
- QQ-N-288 - Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings.
- QQ-W-390 - Wire, Nickel-Chromium-Iron Alloy.

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- MIL-S-901 - Shock Tests, H.I. (High Impact); Shipboard, Machinery, Equipment and Systems, Requirements for.
- MIL-F-1183 - Fitting, Tube, Cast Bronze, Silver Brazing.
- MIL-C-2212 - Controllers, Electric Motor, AC or DC, and Associated Switching Devices, Naval Shipboard.
- MIL-P-15024 - Plates, Tags, and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-V-15508 - Valves, Remote Control, Diaphragm Actuated (Fluid Systems, 150 and 250 P.S.I. W.P. 140°F Maximum).
- MIL-T-16420 - Tube, 70-30 and 90-10 Copper-Nickel Alloy, Seamless and Welded.
- MIL-P-16789 - Packaging of Pumps, Including Prime Movers and Associated Repair Parts.
- MIL-M-17060 - Motors, 60-Hertz, Alternating Current, Integral-Horsepower, Shipboard Use.
- MIL-V-17501 - Valves, Globe, Hydraulically Operated, Piston and Diaphragm Type, Magazine and Hangar Deck Sprinkling.
- MIL-E-17555 - Electronic and Electrical Equipment Accessories and Repair Parts, Packaging and Packing of.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Ship Engineering Center, SEC 6124, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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- MIL-V-18030 - Vavles, Control, Air - Diaphragm-Operated (Complete with Instrumentation).
- MIL-P-19131 - Pumps, Rotary, Power Driven, Miscellaneous.
- MIL-F-20042 - Flanges, Pipe, Bronze (Silver Brazing).
- MIL-G-22050 - Gasket and Packing Material, Rubber, for use with Polar Fluids, Steam and Air at Moderately High Temperatures.
- MIL-F-24385 - Fire Extinguishing Agent, Aqueous Film Forming Foam (AFFF) Liquid Concentrate, Six Percent, for Fresh and Sea Water.
- MIL-I-45208 - Inspection System Requirements.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-278 - Fabrication Welding and Inspection; and Casting Inspection and Repair for Machinery, Piping and Pressure Vessels in Ships of the United States Navy.
- MIL-STD-810 - Environmental Test Methods.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Waterproofing with Appropriate Test Methods.
- MIL-STD-1472 - Human Engineering Design Criteria for Military Systems, Equipment and Facilities.
- MS16142 - Boss, Gasket Seal Straight Thread Tube Fitting, Standard Dimensions for.
- MS18229 - Plug for "O" Ring Gasket.
- MS90363 - Box, Fiberboard, with Cushioning for Special Minimum Cube Storage and Limited Reuse Applications.

DRAWING

NAVAL SEA SYSTEMS COMMAND

803-1385714 - Valves, Composition, Union End Gate.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B61 - Steam or Valve Bronze Castings.

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

3. REQUIREMENTS

3.1 Qualification. Proportioners furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.4 and 6.3).

3.2 General requirements.

3.2.1 Design and construction. The proportioners as shown on figure 1 shall consist of an electric motor, associated motor controller; positive displacement AFFF concentrate pump; pressure relief, check, manual and electric control solenoid operated and back pressure regulating valves; and interconnecting piping mounted on foundation(s). The system shall be light and compact consistent with the requirements of reliability, accessibility to repair, resistance to corrosion and erosion, and economy. The requirement for reliability, however, is paramount and no compromise of reliability shall be made with the other basic requirements of design. Types I and II proportioners shall be identical except for the proportioning assembly of 3.2.2 and the AFFF orifice of 3.2.4 as noted therein.

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3.2.2 Proportioning assembly. The proportioning assembly used to mix AFFF with seawater shall consist of a modified venturi in which the seawater inlet, which constitutes the primary inlet to the throat of the venturi, is separated from the throat section by an annular secondary inlet to the throat. The throat section shall be slightly enlarged to accommodate the AFFF entering through the secondary inlet and merging into the diverging or recovery (outlet) section of the venturi. The inlet nozzle shall be capable of being replaced with hand tools and the method of retention shall be by threading or capture by the proportioning assembly inlet flange and sealed by a flat gasket or a circular section static seal ring. Proportioning assembly body materials shall be bronze in accordance with alloy No. 836 or 922 of QQ-C-390 or ASTM B61. The inlet nozzle shall be nickel-copper alloy in accordance with composition E of QQ-N-288. Type I, II, and III proportioning assembly seawater connections shall be integral 250 pound (lb), class 2-1/2 inch, 3-1/2 inch, and 5-inch flanges, respectively, in accordance with MIL-F-20042 with bolt holes straddling the vertical line and the overall length shall be $18 + 1/32$ inches. Proportioning assembly AFFF inlet connections shall be integral 250 lb class MIL-F-20042 1-inch flanges for types I and II, and 1-1/2 inch flanges for type III, positioned with the concentrate flow line at right angles to the direction of seawater flow centered on the vertical line and up (with the proportioning assembly water flow line horizontal). The seawater inlet to the proportioning assembly shall be provided with a size 3/8-inch IPS union connection conforming to MIL-F-1183 on a silver brazed short nipple for attaching the seawater sensing line from the pressure regulating valve of 3.2.5. Proportioning assemblies shall contain no moving parts and shall be designed for installation in a horizontal run of pipe as a component rather than inserted or partially inserted within a pipe section.

3.2.3 AFFF pump. The AFFF pump shall be of the sliding vane, positive displacement type, in accordance with type X of MIL-P-19131, fitted with an integral relief valve. Types I and II pump capacity shall be 35 ± 5 gal/min and type III capacity shall be 65 ± 5 gal/min as determined with AFFF concentrate at 200 pounds per square inch gage (lb/in^2 , gage) discharge pressure (flooded section at atmospheric pressure) with a relief valve setting of 210 lb/in^2 , gage at full flow with a fluid viscosity in the range of 2 to 30 centistokes (cSt). Speed reduction where necessary shall be accomplished via a flat timing belt. End connections shall be flanged in accordance with MIL-F-20042 of 1-inch size for types I and II, and 2-inch for type III. Pump materials shall be as shown in table I.

TABLE I. Pump materials.

Name of parts	Materials
Pump body .	Bronze, alloy number 903 or 922 of QQ-C-390.
Mechanical seals:	
Springs	Nickel-chromium-iron alloy wire conforming to QQ-W-390.
Seal ring	Tungston carbide.
Stationary ring	Corrosion resistant steel.
Shaft	Corrosion resistant steel (17-4PH) or nickel-copper alloy conforming to QQ-N-281.
Rotor	Bronze, alloy number 903 or 922 of QQ-C-390.
Bearings and housings	Annular ball - FF-B-171 single seal, provided with lubrication and grease relief fittings.
Relief valve spring	Nickel chromium iron alloy wire conforming to QQ-W-390.
Relief valve disc, guide, adjusting screw	Nickel copper alloy of QQ-N-281
Vanes	Melamine plastic or graphite impregnated bronze.

3.2.4 AFFF orifice. The AFFF orifice assembly shall consist of a nominal 1/8-inch thick sharp-edged single orifice plate (with handle) mounted between the MIL-F-20042 flanges of the proportioning assembly AFFF inlet flange and a mating flange. The orifice shall be cylindrical with inlet and outlet edges deburred (but without inlet or outlet beveled and without drain or vent holes) of the diameter necessary to produce the required foam concentration (see 3.3) and concentric with the outside diameter to not more than 0.025 inch total run out. The handle width and length shall be $1 + 1/32$ -inch and $2 + 1/32$ -inches, respectively, and the outside diameter (O.D.) of types I and II orifice plates shall be $2-9/16 + 1/32$ -inches and of type III shall be $3-3/16 + 1/32$ -inches. The

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orifice diameter (tolerance not to exceed plus or minus 0.003 inch) shall be stamped in 1/4-inch high numbers on both sides of the handle approximately 5/8-inch from the end. Orifice plates shall be nickel copper alloy in accordance with QQ-N-281.

3.2.5 Back pressure regulating valve. The back pressure regulating valve shall be double seated and balanced in accordance with composition E, of MIL-V-18030, except as follows: Valve pressure rating shall be 250 lb/in², gage designed for direct operation (rather than air/pilot controlled) without springs by AFFF concentrate pressure (applied directly to the lower side of the diaphragm through a sensing line) from the AFFF pump of 3.2.3 and seawater pressure (applied directly to the upper side of the diaphragm from the firemain at the proportioning assembly inlet (through sensing lines) and shall not incorporate any balancing devices (for example, piston), valve stem packings, separate yokes, auxiliary pilot or control valves, orifices or strainers. Diaphragm case control line connections shall be 3/8-inch IPS size integrally cast silver brazing union type conforming to MIL-F-1183 (supplied with nuts, tailpieces, retainers, and O-rings). End connections shall be 1-inch size for types I and II proportioners and 1-1/2 inch for type III proportioners integrally cast 250 lb/in², gage flanges in accordance with MIL-F-20042. Removable seat rings and guide bushings shall be used. Stem assembly (including diaphragm supports), seat rings, guide bushings and bolting shall be nickel-copper alloy conforming to QQ-N-281, nickel-copper-aluminum alloy conforming to QQ-N-286 or nickel-copper-silicon alloy conforming to QQ-N-288^{1/}. Non-metallic valve trim (static and dynamic seals and diaphragms shall be ethylene propylene terpolymer conforming to MIL-G-22050. A rising stem valve position indicator capable of withstanding full hydrostatic test pressure shall be positioned on the upper end of the valve stem through the centerline of the upper diaphragm case. The indicator shall show full stem travel and shall be calibrated with 1/16-inch spacing on an adjustable scale reading from closed to full open. Scale setting on the valve as delivered shall indicate actual valve stem position to within one-half of one division. Indicator connection to the upper diaphragm case shall be by straight thread O-ring seal in accordance with MS16142 and MS18229. National Pipe Thread (NPT) fittings shall not be used. Regulator operation shall be stable without the use of orifices or other restrictive devices in control piping or valves, and shall be capable of recirculating the total output of the AFFF pump specified in 3.2.3 when the system is operating under a no-flow condition.

3.2.6 Check valve. The check valve shall be of the diaphragm actuated type in accordance with type I, Class 2 of MIL-V-17501, except that all nonmetallic trim materials (diaphragms, O-rings, and disc inserts) shall be ethylene propylene terpolymer conforming to MIL-G-22050. For type I and II proportioners, check valve size shall be 1-inch and for type III, size shall be 1-1/2-inch. End connections shall be union type in accordance with MIL-F-1183 for 1-inch valves and integrally cast flanges in accordance with class 250 of MIL-F-20042 for 1-1/2 inch valves.

3.2.7 Pressure gage root and AFFF stop valves. Root valves shall be a 3/8-inch IPS bronze and nickel copper alloy gate type in accordance with Drawing 803-1385714 for 0°F to 140°F/400 lb/in² gage service, installed in the laterals of pipe "T's" with valve stems arranged vertical and up. AFFF stop valves shall be 1-inch IPS for type I and II proportioners and 1-1/2 inch IPS for type III, in accordance with Drawing 803-1385714 for 0°F to 140°F/400 lb/in², gage service. Stop valves shall be installed in horizontal runs of pipe with the stems vertical and up.

3.2.8 Electric control valve. The electrically operated valve for proportioner control shall be of the bi-stable solenoid type in accordance with class B of MIL-V-15508, 3/8-inch IPS, 250 lb/in², gage working pressure. Solenoid coils shall be rated for 440 volts alternating current (V.a.c.) 60 hertz (Hz), continuous duty with one pair of coils provided for valve opening only. Valve closure shall be local manual. A switch shall be installed on the operating linkage for the purpose of energizing the concentrate pump motor starting relay of 3.2.12 and shall function in such a manner as to require control valve opening prior to concentrate pump motor start (and "run" light indication).

^{1/}The guiding surfaces on the stem (guide posts) and the guide bushings shall have a minimum hardness differential of 50 Brinell hardness numbers. The softer of the two cooperating surfaces shall have a minimum hardness of 200 Brinell.

3.2.9 Manual control valve. The manual valve for hydraulically operated stop valve control shall be in accordance with the requirement for "pilot control valve" of MIL-V-15508 and shall be 3/8-inch IPS, 250 lb/in², gage working pressure, without a neutral position.

3.2.10 Interconnecting pipe and fittings. Interconnecting pipe shall be in accordance with MIL-T-16420, composition 90-10, type I or II, 200 lb pressure class and fittings shall be in accordance with type A of MIL-F-1183.

3.2.11 Electric motor. The electric motor shall be in accordance with MIL-M-17060 and shall have the following classification:

- (a) Service: A.
- (b) Application: Surface ships.
- (c) Ambient temperature: 50°C.
- (d) Voltage: 440 volts, three phase 60 Hz.
- (e) Duty: Continuous.
- (f) Enclosure: Totally enclosed, fan cooled with non-rubbing labyrinth seal at both ends.
- (g) Horsepower:
 - Types I and II: 7-1/2.
 - Type III: 15.
- (h) Rev/min: 1750.
- (i) Type: Squirrel cage.
- (j) Design: B.
- (k) Mounting: Horizontal.
- (l) Bearings: Ball.
- (m) Insulation: Sealed insulation system.
- (n) Mechanical balance: Precision.
- (o) Line filter: Not required.
- (p) Non-magnetic requirement: Not applicable.
- (q) Structureborne noise requirement: Not applicable.
- (r) Shock test: Grade A, class I, type A, medium weight of MIL-S-901.

3.2.11.1 The motor shall drive the pump via a timing belt if speed reduction is required (see 3.2.3) or a flexible coupling for direct drive.

3.2.12 Motor controller. The AFFF pump motor controller shall be in accordance with MIL-C-2212, and the following:

- (a) Duty cycle: Continuous.
- (b) Voltage and phase rating: 440 Va.c. three-phase 60 Hz.
- (c) Current rating:
 - Types I and II: 27 amperes (A) maximum (max).
 - Type III: 45 A, max.
- (d) Operation and protective features:
 - Protection, low voltage protection (LVP); function, motor starting.
- (e) Motor horsepower:
 - Types I and II: 7.5.
 - Type III: 15.
- (f) Control voltage: 440 Volts (V).
- (g) Motor field isolation: Not applicable.
- (h) Emergency-run feature: Required.
- (i) Local transfer switch: Required.
- (j) Indicating lights: Required. (The color coding scheme shall conform to the requirements specified in MIL-STD-1472).
- (k) Enclosure: Watertight.
- (l) Motor start: The motor of 3.2.11 shall be energized via an auxiliary relay controlled by the switch of 3.2.8.

3.2.13 Mounting and installation attitude. AFFF pump motor and pump assemblies shall be on a common deck-mounted foundation. Types I and II configurations shall be motor and pump horizontal on a single bedplate with the dimensions of the unit (including foundation) not to exceed 18 inches (width) by 30 inches (length) by 18 inches (height). Type III pump and motor mounting configuration shall be as above, except that the motor shall be located above the pump and the overall dimensions shall not exceed 30 inches (length) by 24 inches (width) by 40 inches (height). Belt guards shall be of the hinged quick-opening type to facilitate belt change, if timing belts are used (see 3.2.11.1). The remaining proportioner equipment and interconnecting pipe and fittings (except for motor controllers, electric and manual control valves, and proportioning assemblies, which shall be provided unmounted) shall be mounted on a second foundation, with types I and II assemblies (including foundation) dimensions not exceeding 24 inches (length) by 18 inches (width) by 18 inches (height), and

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type III assemblies not exceeding 24 inches (length) by 24 inches (width) by 24 inches (height). Valves shall be mounted in horizontal runs of pipe and upright so that any valve may be dismantled leaving the main body in place or removed (at the user's option) from the interconnecting piping without loosening, dismantling, or removing any other. Motor, controllers, electric, and manual control valves shall be for bulkhead mounting directly or using brackets. Proportioning assemblies will be supported by inlet and outlet fire main piping. Foundations shall be sufficiently rigid to permit handling, shipment and installation of the units onboard ship, without disturbing the alinement of the assembled units; and such that the normal distortion, weaving or vibration of the supporting structure onboard ship will not cause misalignment between foam pumps and motors or exert undue strain on valves and interconnecting piping. Shock (resilient) mounts shall not be used.

3.2.14 Welding. Welding shall be in accordance with MIL-STD-278.

3.2.15 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and shall 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 Proportioning characteristics. The proportioners shall be designed such that the nominal volumetric ratio of the AFFF concentrate, conforming to MIL-F-24385, pumped, to the sum of the water flowing through the proportioning assembly plus the AFFF pumped, shall fall within the shaded area of figures 2, 3, or 4, as applicable.

3.4 Pressure drop. When tested in accordance with 4.8.1, the pressure drop across the water flow line of proportioning assemblies shall not exceed 18 lb/in², gage at any point within the range of flowrates of 40 to 250 gal/min for type I proportioners, 40 to 500 gal/min for type II proportioners and 50 to 1000 gal/min for type III proportioners.

3.5 Inclined operation. In addition to operation in a horizontal attitude, the proportioners shall be capable of operation when inclined as follows (see 4.8.3):

- (a) With the ship permanently inclined up to 15 degrees to both major axes.
- (b) With the ship rolling up to 45 degrees from the vertical to either side.
- (c) With the ship pitching 10 degrees up and down from the normal horizontal plane.

During the inclined operation test of 4.8.3, the proportioner shall stabilize within 1 minute and shall maintain the applicable volumetric ratio of 3.3 without adjustment, excessive noise, vibration, or valve oscillation.

3.6 High impact (H.I.) shock. All components and interconnecting pipe and fittings described in 3.2 (assembled on the foundations of 3.2.13 or separately mounted, as applicable) shall conform to the grade A, class I, type A, medium weight requirements of MIL-S-901 without evidence of the following (see 4.8.4):

- (a) Breakage of any parts, including mounting bolts.
- (b) Distortion or dislocation of any part, such as, but not limited to, mounting feet, bearings, interconnecting pipe, diaphragm chambers, and valve position indicators which will affect operation of the proportioner.
- (c) A mechanical unbalance (applying to the motor of 3.2.11 and pump of 3.2.3) of more than twice the amplitude of unbalance measured prior to tests at rated speed.

3.7 Vibration. All components and interconnecting pipe and fittings described in 3.2 (assembled on the foundations of 3.2.13 or separately mounted, as applicable) shall meet the requirements of type I of MIL-STD-167-1 (see 4.8.4). Failure criteria shall be the same as specified in 3.6.

3.8 Salt fog. All components, except motors, and motor controllers and electric control valve shall be capable of withstanding a salt fog test of 240 hours without deterioration which would affect operation (see 4.8.5).

3.9 Hydrostatic pressure. The proportioner shall not leak or sweat at any part of the surfaces or joints and there shall be no rupture or permanent deformation when subjected to a hydrostatic pressure of 315 lb/in², gage, for a period of 2 minutes (see 4.8.6).

3.10 Endurance.

3.10.1 At rated capacity. The proportioner shall be capable of withstanding an endurance test of 500 hours at an operating pressure of 175 lb/in², gage and at the rated capacity shown in table II without adjustment, excessive noise, leakage or erratic operation or failure of any part. During the endurance test of 4.8.7.1, the proportioner shall maintain the volumetric ratios shown on figures 2, 3, or 4, as applicable.

TABLE II. Capacity.

Type	Capacity (gal/min)	
	Rated	Overload
I	250	375
II	500	750
III	1000	1500

3.10.2 At overload capacity. Following the 500-hour endurance test of 4.8.7.1 at rated capacity, the proportioner shall be capable of operation for 1 hour at an operating pressure of 200 lb/in², gage at the overload capacity shown in table II without failure of any part (see 4.8.7.2).

3.11 Identification plates. Identification plates shall be fixed on each proportioner in a readily accessible location and shall be type A, or B of MIL-P-15024, except that identification plates of plastic, aluminum, or carbon steel are not acceptable. The plates shall be in accordance with the normal service requirements of MIL-P-15024/5. Identification plates shall be secured to equipment with corrosion resistant metallic screws and shall contain the following information:

- (a) Manufacturer's name.
- (b) Proportioner manufacturer's model, type, and size.
- (c) Service application.
- (d) Manufacturer's serial number.
- (e) Salient design characteristics:

(1) Capacity usable flow range gal/min:

Min. _____, Max. _____.

(2) Operating pressure range (lb/in², gage):

Min. _____, Max. _____.

Hydrostatic test 315 lb/in², gage

(3) Motor/pump rev/min: 1750

- (f) Contract number.
- (g) Nine-digit CID number.
- (h) National stock number.
- (i) Section for inspector's stamp.
- (j) Year of manufacture _____.
- (k) APFF orifice diameter (in.) _____.

3.12 Onboard repair parts. Onboard repair parts shall be furnished in accordance with table III.

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TABLE III. Onboard repair parts.

Component	Repair parts	Allowance
Automatic valves	Diaphragms, springs, seat rings and discs or disc inserts, single-piece stem/disc assemblies, compression rings, seals, gaskets.	100 percent installed or three sets whichever is less ^{1/}
AFFF orifice	Orifice plate	One each size installed per ship
AFFF pump	Bearings, mechanical seal assemblies and vanes Drive belts, if used	One set per ship ^{1/}
AFFF motor		One of each size installed per ship In accordance with MIL-M-17060
Motor controller		In accordance with MIL-C-2212

^{1/} One set equal 100 percent per valve or pump.

3.13 Special tools. No special tools other than those that may be required for removal of the proportioning assembly inlet nozzle shall be required nor supplied for maintenance of equipment covered by this specification. Special tools are defined as those tools which are not listed in the Federal Supply Catalog (copies of this catalog may be consulted in the Office of the Defense Contract Administration Service (DCAS)).

3.14 Technical data. The contractor shall prepare technical data in accordance with the data ordering documents included in the contract (see 6.2.2).

3.14.1 Final drawings. Final drawings and certification data sheets shall be submitted to the Naval Ship Engineering Center within 60 days after date of contract. These drawings shall be in accordance with the data ordering document specified (see 6.2.2).

3.14.2 Technical manual. Two system technical manuals in accordance with the data ordering documents specified (see 6.2.2) shall be furnished with each proportioner.

3.15 Workmanship. Components shall be free from defects which affect their appearance or which may affect their operation. Castings shall be clean, sound, and free from blow holes, hard spots, porosity, cracks, and other injurious defects. They shall be smooth and well cleaned, both inside and outside, and all fins and roughness shall be removed. Castings shall not be plugged, brazed, or burned nor otherwise repaired without prior approval of the Naval Ship Engineering Center.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection system. The contractor shall provide and maintain an inspection system acceptable to the Government for supplies and services covered by this specification. The inspection system shall be in accordance with MIL-I-45208 (see 6.2.2).

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

- (a) Qualification inspection (see 4.4).
- (b) Quality conformance inspection (see 4.6).

4.3 Test conditions. Unless otherwise specified (see 4.8.1 and 4.8.7.1) all tests requiring operation of the proportioner shall be conducted using fresh water and AFFF in accordance with MIL-F-24385 at a viscosity of 2 to 30 cSt. A recirculating or nonconsuming piping arrangement may be used to conserve AFFF concentrate. However, when data is being

recorded, foam/water solution shall be discharged in a normal manner. An equivalent length of 35 feet of pipe between points A to B, C to D, and E to F, as shown on figure 1, shall be employed in the test piping arrangement used for discharging foam/water solution for the purpose of recording data.

4.3.1 Characteristic curves. Data shall be taken during the tests and characteristic curves prepared showing the relationship between the total flow through proportioner assembly and the following:

- (a) Proportioner assembly inlet and outlet pressures.
- (b) Percent foam liquid concentration downstream of the proportioner assembly.
- (c) Back pressure regulator differential control pressures.

4.3.1.1 At rated capacity. The characteristic curves specified in 4.3.1 shall be prepared at inlet ratings of 40, 75, 100, 150, 175, and 200 lb/in², gage at the following capacity ratings for the applicable type:

Type I: 40, 80, 125, 175, and 250 gal/min.
 Type II: 40, 100, 200, 325, and 500 gal/min.
 Type III: 50, 150, 300, 500, 750, and 1000 gal/min.

4.3.1.2 At overload capacity. The characteristic curves specified in 4.3.1 shall be prepared at an inlet pressure of 200 lb/in², gage at the following capacity ratings for the applicable type:

Type I: 250, 300, and 375 gal/min.
 Type II: 500, 600, and 750 gal/min.
 Type III: 1000, 1250, and 1500 gal/min.

4.4 Qualification inspection. Qualification inspection shall be conducted at a laboratory satisfactory to the Naval Ship Engineering Center (NAVSEC). Qualification inspection shall consist of the tests shown in table IV. The tests shall be conducted in the order shown in table IV. Failure of any test shall constitute failure to qualify.

TABLE IV. Qualification inspection.

Test	Requirement paragraph	Test paragraph
Visual and dimensional examination, external	3.15	4.7.1
Operating	3.4	4.8.1
Pump capacity	3.2.3	4.8.2
Inclined operation	3.5	4.8.3
Shock	3.6	4.8.4
Vibration	3.7	4.8.4
Salt fog	3.8	4.8.5
Hydrostatic	3.9	4.8.6
Endurance	3.10	4.8.7
Visual and dimensional examination, internal	3.15	4.7.2

4.4.1 Sample for qualification. The sample unit shall be one complete proportioner assembly of each type being submitted for qualification.

4.4.1.1 Information to be furnished with the application for qualification. In addition to the information required in SD-6, drawings shall be forwarded. The drawings shall be sufficient in detail to permit evaluation of the design and identification of materials. The drawing shall show but shall not be limited to the following:

- (a) Assembly views of foundation mounted units.
- (b) Sectional assemblies of each component (except pipe and fittings) including foundations.
- (c) Complete details of all replaceable internal trim of automatic valves, pump (except for bearings), proportioning assembly (including orifice plate) and electric motor sufficient to permit manufacture or repair by ship or tender.
- (d) Dimensions and concentricity, parallelism, squareness and roundness, finishes and hardnesses of guiding and sealing surfaces required to evaluate the guiding alignment and running clearance limits of automatic valves.
- (e) Installation dimensions.
- (f) End connection details and clearance dimensions required for disassembly.

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- (g) Required assembly torques, stack-up or exploded views or other equivalent assembly instructions for all parts (except adjustments).
- (h) Tables of spring data.
- (i) Estimated weight of complete proportioner.
- (j) Reference to any previous shock and vibration approval and test report numbers.

4.4.2 Extension of qualification. Qualification of a type II proportioner may be extended to a type I providing the type I proportioner assembly meets the configuration and size and the material requirements of 3.2.2, the applicable proportioning characteristics of 3.3 and the pressure drop of 3.4. The type III proportioner shall be tested for QPL approval separately.

4.5 Sampling for quality conformance inspection.

4.5.1 Inspection lot. For purposes of sampling, a lot shall consist of all proportioners of the same type which are manufactured under essentially the same conditions and offered for delivery at one time.

4.5.2 Sampling for visual and dimensional examination. A random sample of proportioners selected from each lot in accordance with inspection level S-4 of MIL-STD-105 for the visual and dimensional examination of 4.7.1. The AQL shall be 2.5 percent defective.

4.5.3 Sampling for performance test. A random sample of proportioners shall be selected from each lot in accordance with inspection level III of MIL-STD-105 for the performance tests specified in 4.6.1. The AQL shall be 0.65 percent defective.

4.6 Quality conformance inspection. Quality conformance inspection shall consist of the following:

Visual and dimensional examination - see 4.7.1
 Performance acceptance test - 4.6.1
 Production inspection - 4.6.2

4.6.1 Performance acceptance test. The sample proportioners selected in accordance with 4.5.3 shall be subjected to the performance acceptance test of 4.8.8. Any sample which fails the performance acceptance test shall be rejected and if the rejection number of defectives exceeds the acceptance number of defectives, the lot represented by the sample shall be rejected.

4.6.2 Production inspection (100 percent of production). Each proportioner shall be subjected to the following tests in the order listed:

Hydrostatic - see 4.8.6
 Operating - see 4.8.1

4.6.3 Quality conformance inspection report. A quality conformance inspection report shall be prepared as specified (see 6.2.2).

4.7 Visual and dimensional examination.

4.7.1 External. Each proportioner selected in accordance with 4.5.2 shall be visually and dimensionally examined to determine conformance with this specification. Any sample failing to conform to the visual and dimensional examination shall be rejected and if the rejection number exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

4.7.2 Internal. All parts of the proportioner shall be dismantled and thoroughly examined for evidence of malfunction, distortion, and dislocation or breakage of parts.

4.8 Tests.

4.8.1 Operating. Using only fresh water as the working fluid, the proportioner shall be operated for not less than 15 minutes at a proportioning assembly inlet pressure of 175 lb/in², gage. Motor and pump speed, motor current, and proportioned concentration downstream of the proportioning assembly shall be recorded at the following flow rates for the applicable type:

Type I: 40, 125, and 250 gal/min.
 Type II: 40, 250, and 500 gal/min.
 Type III: 50, 500, and 1000 gal/min.

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A pressure drop (at any of the applicable capacities and 175 lb/in², gage) exceeding 18 lb/in², gage (see 3.2.2), unusual noises, leakage, or failure to maintain the volumetric ratios of 3.3 for the applicable type, or failure to maintain motor current (see 3.2.11) shall be cause for rejection.

4.8.2 Pump capacity. The pump capacities shall be determined with an output head of 200 lb/in², gage (and flooded section) with APFP concentrates using appropriate flowmeters or collection tanks. The pressure at which the relief valve unseats and the maximum pressure which develops against a blocked outlet shall be determined by a pressure gage.

4.8.3 Inclined operation. A proportioner consisting of the items specified herein shall be erected and tested as follows: The proportioner shall be inclined at angles of 15 degrees (parallel to the pump and motor axes) and 10 degrees (perpendicular to the pump and motor axes). Proportioner piping and valves downstream of the pump shall be drained and thoroughly dried prior to start of this test. The proportioner shall be started and shall stabilize within 1 minute (at the lowest rated flowrate) and shall maintain the volumetric ratios of 3.3 without adjustment, excessive noise, vibration, or valve oscillation. All data required by 4.3.1.1 for the specified conditions shall be recorded. Failure of the proportioner to stabilize within the time specified in 3.5 and without adjustment, excessive noise, vibration or valve oscillation, or, failure to maintain the applicable volumetric ratios specified in 3.3 shall be considered as failure of the proportioner.

4.8.4 Shock and vibration. The proportioner shall be subjected to the grade A, class I, type A medium weight shock test of MIL-S-901 and the type I vibration tests of MIL-STD-167-1 to determine conformance with 3.6 and 3.7, respectively. The proportioner is not required to be operating during these tests. Minor deformations will be permitted. Minor deformations are defined as those which are not in excess of the design dimensional tolerances specified on the applicable drawings.

4.8.5 Salt fog. All components, except motors, motor controllers, and electric control valves shall be tested in accordance with method 509 of MIL-STD-810. Duration of the salt fog test shall be 240 hours. During the test, open pipe connections (which are closed when the proportioner is in service) shall be closed. Deterioration affecting operation of the proportioner shall be cause for rejection.

4.8.6 Hydrostatic. Following final assembly, the proportioner shall be hydrostatically tested with fresh water at a pressure of 315 lb/in², gage for a period of not less than 2 minutes. Under hydrostatic pressure, the proportioner shall not leak or sweat at any part of the surfaces or joints and there shall be no rupture or permanent deformation. Leakage, sweating, rupture, or permanent deformation of any part shall constitute failure of the hydrostatic test.

4.8.7 Endurance.

4.8.7.1 At rated capacity. The proportioner shall be placed in a horizontal attitude and subjected to an endurance test of not less than 500 hours duration, with the unit operating at a pressure of 175 lb/in², gage and rated capacity (see table II). Prior to beginning the test (as a data base), the data required by 4.3.1.1 shall be recorded. Also at the end of each 50 hours of operation, the data shall be taken, except that the capacities shall be as follows:

Type I: 40, 125, and 250 gal/min.
 Type II: 40, 200, and 500 gal/min.
 Type III: 50, 500, and 1000 gal/min.

Base data shall also be recorded using only fresh water as the operating fluid. The proportioner shall complete the endurance test without adjustment, excessive noise, leakage, erratic operation, excessive wear or breakage of parts, or failure of the proportioner to maintain the applicable volumetric ratio specified in 3.10.1. Characteristic curves shall be prepared as specified in 4.3.1.

4.8.7.2 At overload capacity. Following the test of 4.8.7.1, the operating pressure of the proportioner shall be increased to 200 lb/in², gage with the flow rate at overload capacity (see table II), for a period of 1 hour. At the end of this time, the data required in 4.3.1 shall be recorded at the flow rates specified in 4.3.1.2. If any part of the proportioner fails during this test, the proportioner shall be considered to have failed. The proportioner is not required to conform to the volumetric ratios of 3.10.1 during this portion of the test. Characteristic curves shall be prepared in accordance with 4.3.1.2.

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4.8.8 Performance acceptance. The proportioner shall be tested under operating conditions, including foam liquid (see 4.3), for sufficient time to develop the characteristic curves specified in 4.3.1.1, except that data shall be taken only at the following flow rates for the applicable type:

- Type I: 40 and 250 gal/min.
- Type II: 40 and 500 gal/min.
- Type III: 50 and 1000 gal/min.

4.9 Inspection of preparation for delivery. Sample packages and packs and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government acquisitions. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.4.)

5.1 Preservation-packaging, packing and marking (PPPM). The equipment and accessories shall be preserved-packaged level A or C, packed level A, B, or C as specified (see 6.2.1) and marked in accordance with MIL-P-16789 and the following shall apply:

- (a) The equipment shall be prepared for delivery in a two container concept as follows:
 - (1) Container number one shall consist of the motor and pump assembly mounted as specified in 3.2.13.
 - (2) Container number two shall consist of the second foundation plus the remaining loose equipment specified in 3.2.13.
- (b) The preserved-packaged loose equipment shall be:
 - (1) Placed in an intermediate (interior) container or
 - (2) Anchored, blocked, and braced within the shipping container in accordance with the guidelines of MIL-STD-1186.

5.2 Repair parts and spares. Repair parts and spares shall be preserved-packaged, packed and marked in accordance with MIL-P-16789 or MIL-E-17555, as applicable, and in accordance with the level specified for the intended use and destination as shown in table V. Unless otherwise specified (see 6.2.1) repair parts and spares shall be packaged one part per unit package, except that all parts comprising a single set or assembly shall be individually protected and packaged together. When unit packaged as a set, assembly, or quantities greater than one, each item shall be wrapped or cushioned to prevent direct surface contact with surfaces of adjacent parts.

TABLE V. Level of preservation-packaging and packing for repair parts and spares.

Destination	Level	
	Preservation-packaging	Packing
Onboard	A	C
Stock	A	B
Immediate use	C	C

5.2.1 Spares. Spare parts subject for return to a repair facility for restoration and reissue shall be packaged and packed in materials and containers capable of reuse. Packaging shall be in accordance with MS90363. The reusable containers shall be in accordance with the guidelines of MIL-E-17555. Containers shall be marked - "REUSABLE DO NOT DESTROY". Packaging and Transportation Support Data as specified (see 6.2.2) shall be furnished for items falling in this category.

5.3 Cushioning, filler, dunnage, and wrapping materials.

5.3.1 Level A preservation-packaging and levels A and B packing. Use of all types of loose-fill materials for packaging and packing applications such as cushioning, filler, or dunnage is prohibited for materials destined for shipboard installation/stowage.

5.3.2 Level C preservation-packaging and packing. When loose fill type materials are used for packaging and packing applications such as cushioning, filler, and dunnage, all containers (unit, intermediate, and shipping) shall be marked or labelled with the following information:

"CAUTION

"Contents cushioned with loose-fill material shall not be taken onboard ship. Remove and discard loose-fill material. If required, recushion with cellulosic material, bound fiber, fiberboard, or transparent flexible cellular material."

5.3.3 Cushioning, filler, dunnage and wrapping materials selected, whenever available, shall exhibit improved performance for resistance to fire.

5.4 Talcum used in the packaging process of item(s) shall be free of asbestos and asbestiform like materials.

5.5 Level C marking (see 5.1 and table V). Unless otherwise specified (see 6.2.1) unit, intermediate (when provided) and exterior packs shall, as a minimum, be marked as follows by any means which provides legibility and durability:

- (a) National Stock Number (NSN) or part number when NSN is not available.
- (b) Noun nomenclature.
- (c) Quantity and unit of issue.
- (d) Contract, purchase order or delivery order number.
- (e) Additional markings as may be required by the contract.
- (f) Exterior shipping containers shall be marked with the appropriate address and caution marking except for full carloads or full truckloads which are shipped to a single consignee within the continental limits of the United States.
- (g) One copy of the shipping documents and contract or order documentation shall be attached to the outside in an envelope or placed inside the container.
- (h) Department of Transportation (DOT) markings as applicable.
- (i) Date of manufacture, month, and year.
- (j) Shelf life when required, shall be as specified in MIL-STD-129.

6. NOTES

6.1 Intended use. Proportioners covered by this specification are intended for use on surface ships in permanently-installed shipboard fire extinguishing systems for introducing aqueous film forming foam (AFFF) and seawater into fire mains at controlled rates depending on the flow of seawater through the proportioning assembly. The fire extinguishing systems are for use in combating class "A" fires (such as wood, paper, textiles and so forth), class "B" fires (flammable liquid and grease) and for class "C" fires (electrical) up to 250,000 volts at a distance of 10 feet or more.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type of foam proportioner required (see 1.2).
- (c) Quantity of repair parts required (see 3.12).
- (d) Levels of preservation-packaging and packing required (see 5.1).
- (e) Quantity of repair parts per package (see 5.2).
- (f) Level C marking, if other than specified (see 5.5).

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6.2.2 Data requirements. When this specification is used in a contract which invokes the provision of the "Requirements for Data" of the Defense Acquisition Regulation (DAR), the data identified below, which are required to be developed by the contractor, as specified on an approved Data Item Description (DD Form 1664), and which are required to be delivered to the Government, should be selected and specified on the approved Contract Data Requirement List (DD Form 1423) and incorporated in the contract. When the provisions of the "Requirements for Data" of the DAR are not invoked in a contract, the data required to be developed by the contractor and required to be delivered to the Government should be selected from the list below and specified in the contract.

<u>Paragraph</u>	<u>Data requirements</u>	<u>Applicable DID</u>	<u>Option</u>
3.14.1	Production drawings	DI-E-7031	Level 3
3.14.2	Technical manuals	DI-M-2044	Type I of MIL-M-15071
4.1.1	Inspection system	UDI-R-23574	
4.6.3	Quality conformance inspection report	UDI-T-23473	
5.2.1	Packaging and Transportation Support Data	UDI-P-23508	

(Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.)

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of the specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List QPL 24589 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 orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Ship Engineering Center, Department of the Navy, Washington, DC 20362, and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

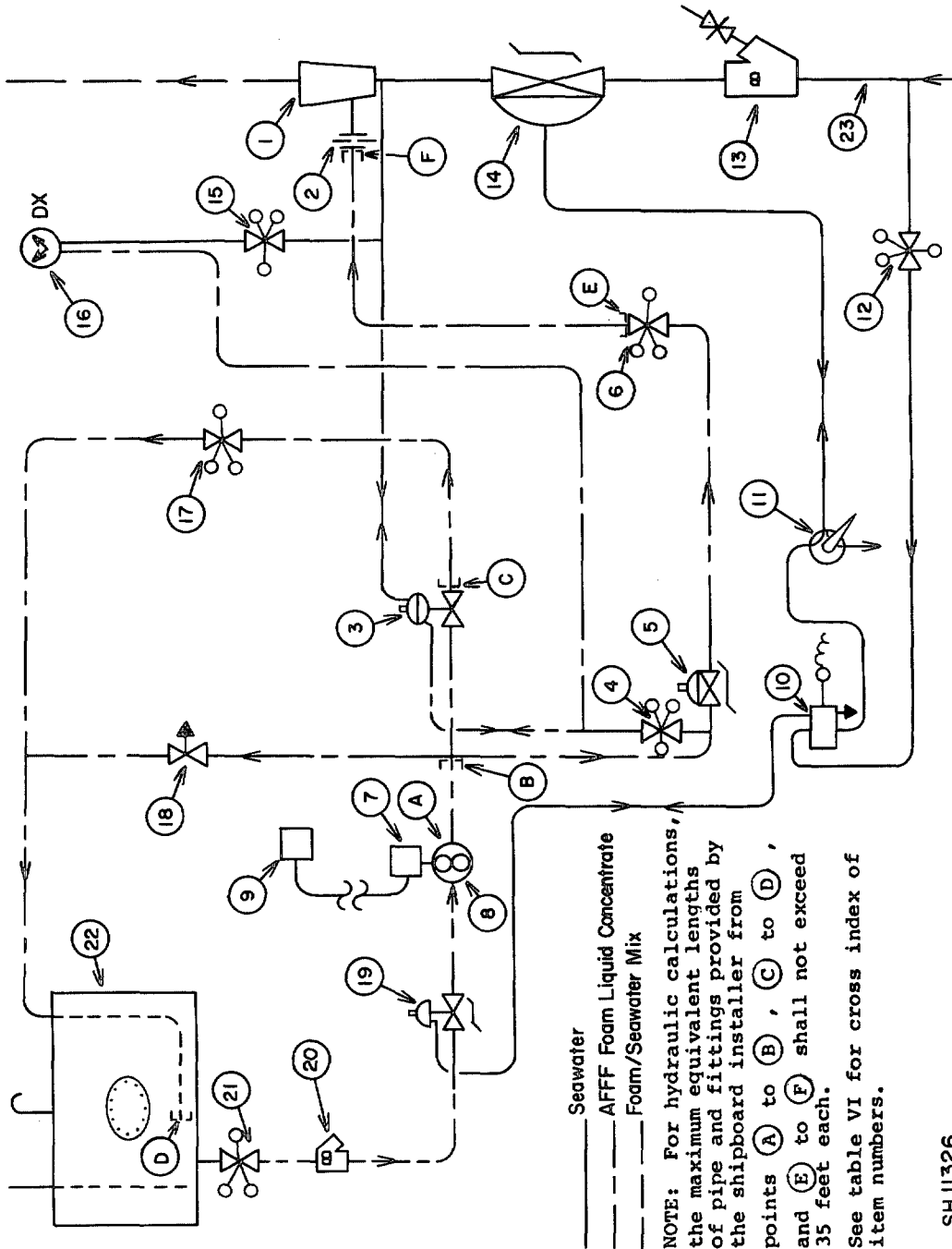
6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

6.4 Sub-contracted material and parts. The 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.

Preparing activity:
Navy - SH
(Project 4210-N156)

TABLE VI. Cross index of item numbers for figure 1.

Item	Description	Paragraph reference
1	Proportioning assembly	3.2.2
2	Orifice	3.2.4
3	Pressure regulating valve	3.2.5
4	Gage root valve (AFFF)	3.2.7
5	Check valve	3.2.6
6	Stop valve	3.2.7
7	Pump motor	3.2.11
8	Pump	3.2.3
9	Motor controller	3.2.12
10	Electric control valve	3.2.8
11	Manual control valve	3.2.9
12	Control cut-out valve	Items 12 through 23 shall not be supplied. Shown for information only. ↓
13	Y-strainer	
14	Hydraulically operated stop valve	
15	Gage root valve (seawater)	
16	Duplex pressure gage (0 - 300 lb/in ² (gage))	
17	Recirculation cut-out valve	
18	Manual control valve	
19	Pump suction valve - hydraulically operated	
20	Suction strainer	
21	Suction cut-out valve	
22	Storage tank	
23	Firemain (seawater)	



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FIGURE 1. Navy shipboard balanced pressure proportioner.

FIGURE 2. Type I Proportioner Characteristics.
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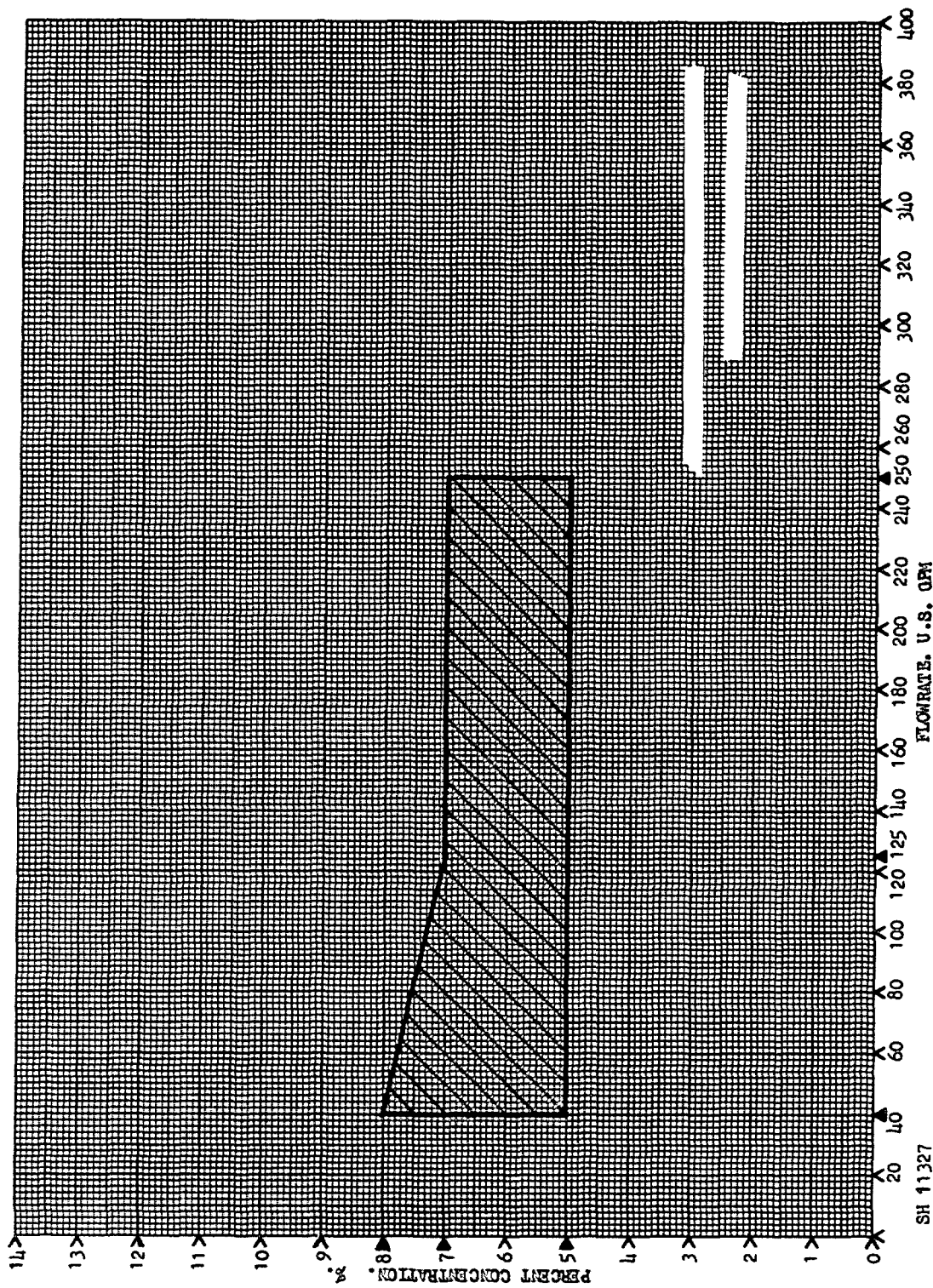
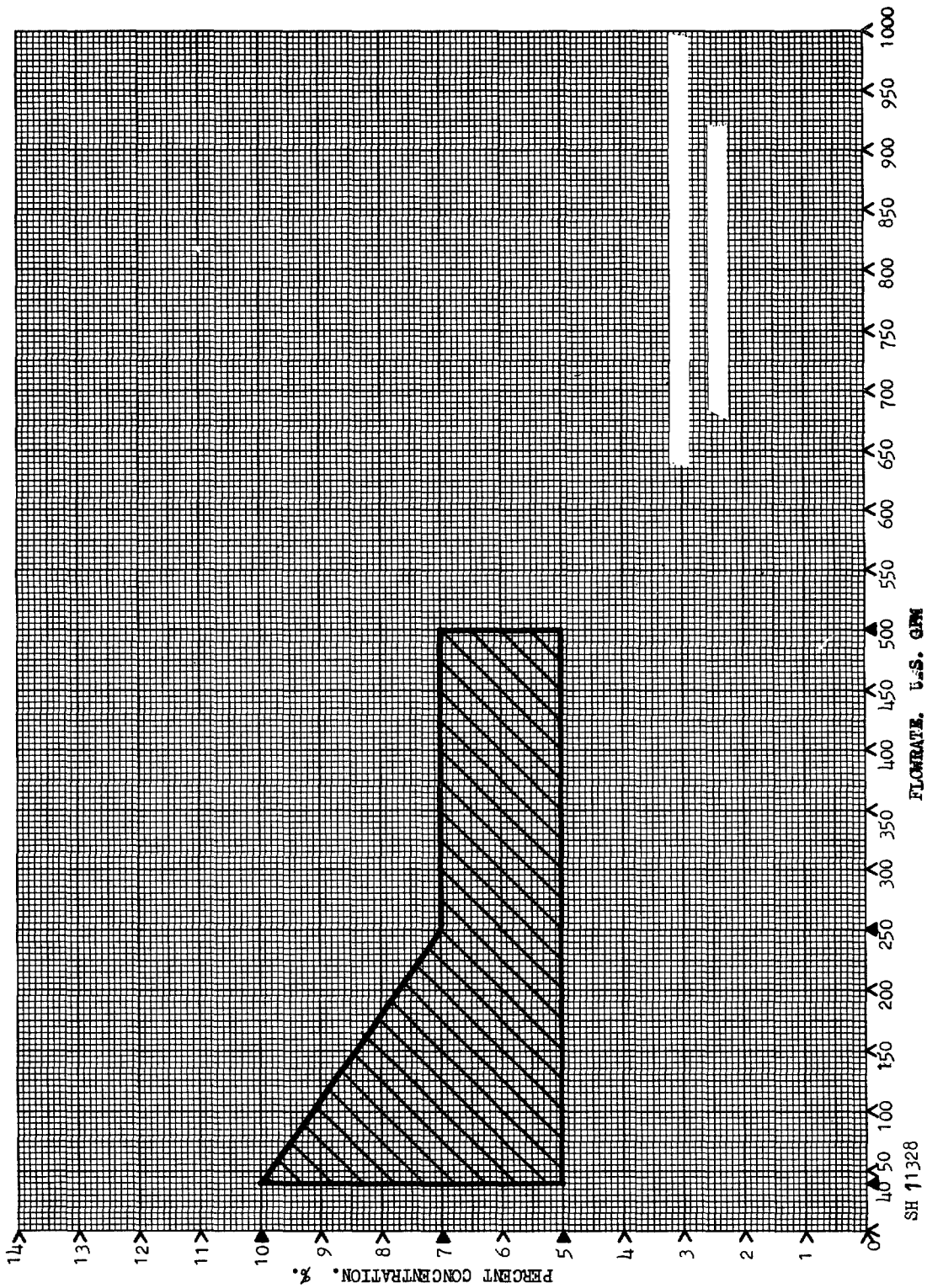


FIGURE 2. Type I Proportioner Characteristics.

EPHLOW-20, X 20, TO 1/4 INCH
5TH, 10TH AND 20TH LINE PROGRESSIVELY ACCENTED



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FIGURE 3. Type II proportioner characteristics.

FIGURE 4 IS A 10 X 10 CM
PRINT AND NOT FOR PRODUCTION ACCORD

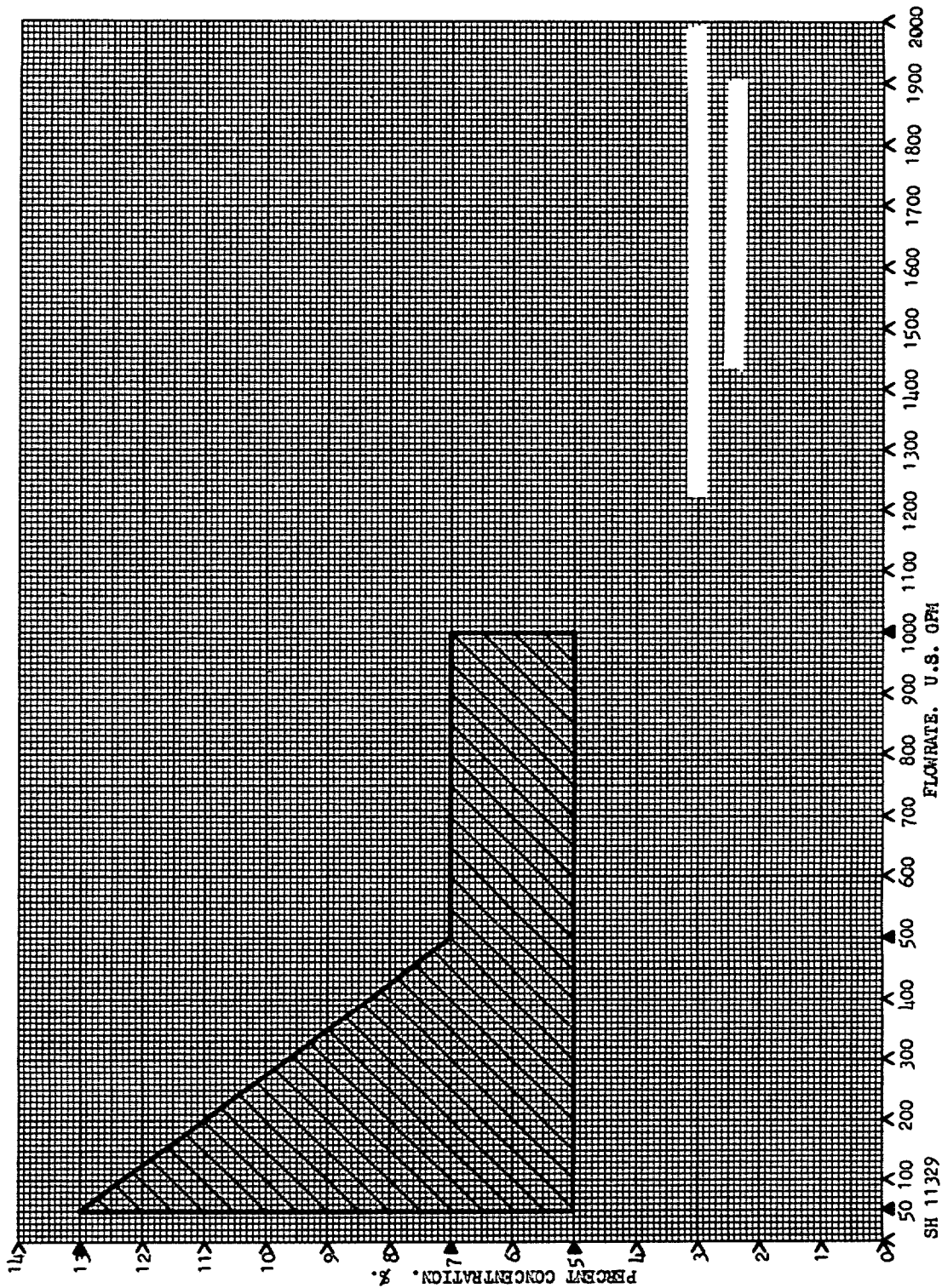


FIGURE 4. Type III proportioner characteristic.

SH 11329

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

NOTE: This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

DOCUMENT IDENTIFIER (Number) AND TITLE

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

VENDOR USER MANUFACTURER

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY (Printed or typed name and address — Optional)

TELEPHONE NO.

DATE

DD FORM 1426
1 OCT 76

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.