INCH-POUND

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SUPERSEDING
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(See 6.9)

MILITARY SPECIFICATION

PROPORTIONER SYSTEMS, BALANCED PRESSURE, AQUEOUS FILM-FORMING FOAM (AFFF) LIQUID CONCENTRATE

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 establishes requirements for balanced pressure proportioning systems for use with AFFF liquid concentrate for fire fighting services.

1.2 Classification.

1.2.1 Proportioners. Proportioners shall be identified by a code for the following types as specified (see 6.2 and 6.7):

Type II - Usable flow range of 90 to 500 gallons per minute (gal/min).
Type III - Usable flow range of 90 to 1000 gal/min.

1.2.2 Components and assemblies. Proportioner systems shall consist of the following components and assemblies as specified (see 6.2 and 6.7). Components and assemblies shall be identified by a code corresponding to the component or assembly number shown below.

Component number:

1 - Proportioning assembly (ratio controller) including internal AFFF orifice assembly (see 3.3.2).
2 - Back pressure regulating valve (see 3.3.3).

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 55Z3, 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

3 - AFFF concentrate discharge control valve with check feature (see 3.3.4).
4 - AFFF concentrate cutout valve (see 3.3.5).
5 - Pressure gauge (see 3.3.6).
6 - Gauge isolation valve (see 3.3.7).
7 - Pressure gauge root valve (see 3.3.8).
8 - AFFF concentrate pump (see 3.3.9).
9 - Electric motor (see 3.3.10).
10 - Motor controller (see 3.3.11).

12 - AFFF pump motor and pump assembly (see 3.3.12).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications and standards 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

FF-B-171	-	Bearings, Ball, Annular (General Purpose).
QQ-C-390	-	Copper Alloy Castings (Including Cast Bar).
TT-P-645	-	Primer, Paint, Zinc-Chromate, Alkyd Type.

MILITARY

MIL-S-901	-	Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for.
MIL-F-1183	-	Fittings, Pipe, Cast Bronze, Silver-Brazing, General Specification for.
MIL-G-1149	-	Gasket Materials, Synthetic Rubber, 50 and 65 Durometer Hardness
MIL-C-2212	-	Controllers, Electric Motor A.C. or D.C. and Associated Switching Devices.
MIL-P-15024	-	Plates, Tags and Bands for Identification of Equipment.

MIL-P-15024/5 - Plates, Identification.
MIL-E-15090 - Enamel, Equipment, Light-Gray (Formula No. 111).
MIL-T-16420 - Tube, Copper-Nickel Alloy, Seamless and Welded (Copper Alloy Numbers 715 and 706).
MIL-B-16541 - Bronze, Valve: Castings.
MIL-P-16789 - Pumps (Including Prime Movers and Support Items); Packaging of.
MIL-M-17060 - Motors, 60-Hertz, Alternating Current, Integral - Horsepower, Shipboard Use.
MIL-V-17501 - Valves, Magazine and Hangar Deck Sprinkler.
MIL-V-18030 - Valves, Control, Air-Diaphragm-Operated (Complete with Instrumentation).
MIL-G-18997 - Gauge, Pressure, Dial Indicating.
MIL-P-19131 - Pumps, Rotary, Power Driven, Miscellaneous.
MIL-F-20042 - Flanges, Pipe and Bulkhead, Bronze (Silver Brazing).
MIL-F-24385 - Fire Extinguishing Agent, Aqueous Film-Forming Foam (AFFF) Liquid Concentrate, for Fresh and Sea Water.
DOD-G-24508 - Grease, High Performance Multi-Purpose (Metric).
MIL-V-24578 - Valves, Globe, Pressure Instrument, Stem Test Connection, Union End.
MIL-T-31000 - Technical Data Packages, General Specification for.
MIL-R-83248 - Rubber, Fluorocarbon Elastomer, High Temperature, Fluid and Compression Set Resistant.

STANDARDS

MILITARY

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 - Welding and Casting Standard.

MS18229 - Plug for "0" Ring Gasket.

(Unless otherwise indicated, copies of federal and military specifications and standards are available from the Standardization Documents Order Desk, Buliding 4D, 700 Robbins Avenue, Philadelphia, PA 19120-5099.).

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

DRAWINGS

NAVAL SEA SYSTEMS COMMAND (NAVSEA)
803-1385714 - Valves, Bronze 1/4-2, Union End Gate.
803-5959218 - Valve, Pilot, Solenoid Operated.
803-5959273 - AFFF Balanced Pressure Proportioning System.

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

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 SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 182 -	Pipe, Forged or Rolled Alloy Steel, Flanges, Forged Fittings and Valves, and Parts for High Temperature Service (DoD adopted)
A 564 -	Hot-Rolled and Cold-Finished Age-Hardening Stainless and Heat-Resisting Steel Bars, Wire, and Shapes (DoD adopted)
A 744 -	Alloy Castings Corrosion Resistant Iron Chromium Nickel and Nickel Base Alloy Castings for General Application (DoD adopted)
B 62 -	Standard Specification for Composition Bronze or Ounce Metal Castings (DoD adopted)
B 148 -	Aluminum Bronze Sand Castings (DoD adopted)
B 164 -	Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire (DoD adopted)
B 166 -	Rod and Bar, Nickel Chromium Iron Alloy (UNS N06600) (DoD adopted)

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

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, 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 First article. A sample shall be subjected to first article inspection (see 6.4) in accordance with 4.4.

3.2 Materials. Proportioner components and assemblies covered by this specification shall be made from materials specified herein. Material not definitely specified shall be of the best commercial grade and suitable for the purpose intended. Material shall be selected so as to reduce erosion and corrosion and prevent galling, seizing, or excessive wear of operating parts. Materials, gaskets, and seals in contact with AFFF shall be compatible with the fluid. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.2.1 Recovered materials. 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.

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

3.2.3 Castings. Castings shall not be plugged, brazed, or impregnated nor otherwise repaired without prior approval of NAVSEA. Routine industry standard metallic sealing operations are acceptable prior to testing.

3.2.4 Painting. External unmachined surfaces of ungalvanized ferrous metal, except corrosion-resisting steel (CRES), shall be thoroughly cleaned and coated with one coat, formula 84 as specified in TT-P-645 and two finish coats of light gray enamel, as specified in MIL-E-15090, formula 111, class 2. External surfaces composed of nonferrous material such as metal castings, piping, or other parts shall not be painted. The remaining components shall be painted to the requirements of applicable specifications.

3.3 General requirements.

3.3.1 Construction. Proportioner components and assemblies described herein shall be installed as part of a balanced pressure proportioning system in accordance with Drawing 803-5959273 and figure 1. The balanced pressure proportioning system shall automatically proportion the correct amount of type 6 AFFF concentrate, specified in MIL-F-24385, with seawater over a wide range of flows and firemain pressures. Components and assemblies shall be compact, consistent with the requirements of reliability, and accessibility to repair. The requirement of reliability and accessibility to repair is paramount and no compromise of reliability and accessibility to repair shall be made with the other basic requirements. System valves shall be mounted in horizontal runs of pipe and upright with the bonnet on top. Valve position indicators shall be visible from the operating area. Position shall be such so that any valve may be dismantled, leaving the main body in place, or removed from the interconnecting piping without loosening, dismantling, or removing any other component. Interconnecting pipe shall be in accordance with MIL-T-16420, composition 90-10 copper-nickel, type I or II, 200 pound class, and fittings shall be in accordance with type A of MIL-F-1183.

3.3.2 (ratio controller) (component number 1). The proportioning assembly shall include an AFFF orifice assembly (see 3.3.2.2). The proportioning assembly used to mix type 6 AFFF concentrate of MIL-F-24385 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. Proportioning assembly body materials shall be bronze conforming to MIL-B-16541 alloy 9220 or alloy C83600 of ASTM B 62. The proportioner nozzle shall be nickel-copper alloy conforming to alloy C95800 of ASTM B 148. Type II and III proportioning assembly seawater connections shall be integral 250 pound class, 4-inch and 5-inch flanges respectively, in accordance with MIL-F-20042, with bolt holes straddling the vertical line. The face-to-face dimension shall not exceed 18 ± 1/32 inches. When specified (see 6.2), type III seawater connections shall be 6-inch flanges. Proportioning assembly AFFF concentrate inlet connections shall be integral 250 pound class, MIL-F-20042, 1-1/2 inch flanges, positioned with the concentrate flow line at right angles to the direction of seawater flow. A 3/8 inch nominal pipe size (nps) union connection conforming to MIL-F-1183 on a silver brazed short nipple for attaching the firemain pressure sensing line to the back pressure regulating valve of 3.3.3 shall be provided at the seawater inlet to the proportioning assembly. Proportioning assemblies shall contain no moving parts.. The proportioning assembly shall be configured to be supported by inlet and outlet piping.

3.3.2.1 Production unit sensing connection. Contractors may elect to furnish a regular production design proportioning assembly that does not provide an integral connection for attaching the firemain pressure sensing line from the back pressure regulating valve. The installing activity shall provide a connection in the seawater supply line to the proportioning assembly. The connection shall be located within 5-feet upstream of the seawater inlet flange.

3.3.2.2 AFFF orifice assembly. The orifice plate shall be removable and mounted between the proportioning assembly AFFF inlet flange and the AFFF supply piping. The orifice shall consist of a 1/8-inch nominal thickness, square-edged, single orifice plate, with circular orifice and outlet edges deburred but not beveled. The orifice diameter shall be suitable to provide proportioner characteristics specified in 3.4.2 at AFFF concentrate pressures maintained as specified in 3.3.3. The orifice diameter shall be concentric with the outside diameter to not more than 0.125-inch . Orifice diameter tolerance shall not exceed plus or minus 0.003 inch. When provided the tab width and length shall be 1 ± 1/16 inch and 2 ± 1/16 inches, respectively. oth sides of the tab approximately 5/8-inch from the end. Orifice plates without tabs shall have the orifice diameter etched or engraved in 1/8 to 1/4-inch high numerals on both sides of the orifice plate. Orifice plates shall conform to alloy C95800 of ASTM B148. Gasket material shall be nitrile (Buna N) rubber conforming to type I or II class 5 of MIL-G-1149. Flange bolting shall be monel nickel-copper conforming to ASTM A564 alloy number S17400.

3.3.3 Back pressure regulating valve (component number 2). The back pressure regulating valve shall be double spool type, constructed in accordance with MIL-V-18030, composition E, modified as follows: Valve pressure rating shall be 250 pounds per square inch (lb/in^2) at 150 degrees Fahrenheit (°F). Diaphragm springs shall not be used and the valve shall not be air/pilot controlled. The valve shall operate by applying AFFF concentrate pressure directly to the lower side of the diaphragm through a sensing line from the discharge of the AFFF pump (component number 8) and seawater pressure applied directly to the upper side of the diaphragm through a sensing line from the firemain at the proportioning assembly (component number 1) inlet. The valve mechanism 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 nps integrally-cast silver brazing union type conforming to MIL-F-1183, complete with nuts, tailpieces, and retainers. End connections shall be 1-1/2 inch integrally-cast 250 pound flanges in accordance with MIL-F-20042. Unless otherwise specified flange face-to-face dimension shall be 6-5/8 inches. Stem assembly (including diaphragm supports) and bolting shall be nickel-copper conforming to ASTM A564 alloy number S17400. Non-metallic valve trim diaphragms, and gaskets shall be nitrile (Buna N) rubber conforming to type I or II class 5 of MIL-G-1149. Diaphragm material burst pressure shall not be less than 600 lb/in^2 over a 1-inch diameter opening. Regulator operation shall be stable without the use of orifices or other restrictive devices in control piping or valves. The valve shall regulate AFFF concentrate flows from zero to 65 ± 5 gal/min maintaining AFFF concentrate pressure equal to the seawater pressure at the sensing line from the proportioning assembly (component number 1). During operation,

the seawater pressure in the sensing line shall vary from 100 to 200 lb/in² . The AFFF concentrate pressure shall be maintained within plus or minus 0.8 lb/in² of the seawater pressure at the proportioning assembly with a deviation not greater than plus or minus 1 lb/in² under any operating pressure and flow condition. Pressure fluctuations resulting from a change in seawater pressure shall stabilize in 30 seconds or less to within specified pressure requirements. The valve shall operate satisfactorily with sensor piping up to an equivalent pipe length not greater than 35 feet.

3.3.4 AFFF concentrate discharge control valve with check feature (component number 3). The AFFF concentrate discharge control valve shall be in accordance with MIL-V-17501, type I, class 1, 1-1/2-inch nps. The valve shall be suitable for controlling AFFF concentrate of MIL-F-24385 and shall be equipped with a stop check feature. A test attachment is not required. There shall be no lower spring applying pressure on the valve disc. Gaskets, seals, and packing in contact with AFFF concentrate fluid shall be nitrile (Buna N) rubber conforming to type I or II class 5 of MIL-G-1149. Diaphragm material burst pressure shall not be less than 600 lb/in^2 over a 1-inch diameter opening.

3.3.5 AFFF concentrate cutout valve (component number 4). Cutout valves shall be 1-1/2 inch nps, union ends, gate type, bronze and nickel-copper alloy, in accordance with Drawing 803-1385714 for 0 to 140 ° F, 400 lb/in² service. Silverbraze tailpiece assemblies including union nuts, O-rings, and retainer rings shall conform to MIL-F-1183. O-rings shall be fluorocarbon rubber in accordance with MIL-R-83248.

3.3.6 Pressure gauge (component number 5). The pressure gauge shall be a duplex type in accordance with MIL-G-18997, classification DG4ID3hp WRONAG. The gauge shall be provided with an integral assembly to prevent incursion of AFFF or seawater into the bourdon tube.

3.3.7 Gauge isolation valve (component number 6). The gauge isolation valve shall be in accordance with MIL-V-24578, 1/4-inch OD with union ends, and of nickel-copper alloy.

3.3.8 Pressure gauge root valve (component number 7). The root valve shall be 1/4-inch nps, union end, gate type, bronze and nickel-copper alloy, in accordance with Drawing 803-1385714 for 0 to 140 ° F 400 lb/in² service. Silverbraze tailpiece assemblies including union nuts, O-rings, and retainer rings shall conform to MIL-F-1183. O-rings shall be fluorocarbon rubber in accordance with MIL-R-83248.

3.3.9 AFFF concentrate pump (component number 8). The AFFF concentrate pump shall be horizontal mounted and driven by electric motor (see 3.3.10) through a belt drive (see 3.3.12). The AFFF concentrate pump shall be of the sliding vane, positive displacement type, in accordance with type X of MIL-P-19131, fitted with a mechanical seal and an integral relief valve. Relief valves shall not be of the sleeve-type. The adhesive quality of dried AFFF concentrate shall be considered in the relief valve design to prevent malfunctions due to sticking. Vanes shall have wear plates. Pump capacities when

pumping AFFF concentrate of MIL-F-24385, with pump suction at atmospheric pressure and flooded, shall be as shown in table I. The relief valve shall be fully open at pressure shown on table I at full flow with a fluid viscosity in the range of 2 to 10 centistokes . Pump inlet and outlet connections shall be flanged in accordance with MIL-F-20042 and shall be 1-1/4 inch for type II and 2 inch for type III. Inlet and outlet connection shall be horizontal opposed and perpendicular to the pump centerline. Pump heads shall have drain connections fitted with plugs in accordance with MS18229 and shall be sealed with O-rings. The pump shall be tested in accordance with 4.5.3. Pump materials shall be as shown in table II.

TABLE I. AFFF concentrate pump capacities.

Type	Capacity gal/min	Discharge pressure lb/in^2	Relief valve setting lb/in^2
			Fully open maximum
II	35± 5	200	220-230
III	65± 5	200	220-230

TABLE II. Pump materials.

Name of part	Materials
Pump body, Heads, Rotor, Liner	Bronze, alloy number C93400 of QQ-C-390 or C93700 of ASTM B584.
Mechanical seals: Springs Primary ring (Rotating sealing face) Mating ring (Stationary sealing face) Internal Parts (Metal components)	Nickel-chromium-iron alloy wire, number N06600 of ASTM B168 / B166 or N06625 of ASTM B443. Carbon grade CTI-6 (Carbon Technology, Inc.), or grade 658 RC (Pure Carbon Co), or grade 39 (U.S. Graphite, Inc.), or CNFJ (National Electrical Carbon Co) or equal. Nickel bound tungsten carbide, or silicon carbide. ASTM A 182 type 304 or 316; nickel-copper alloy number N04400 of ASTM B 164 or B 127; ASTM A 744 grade CN-7M or CN-7MS; or nickel-iron chromium alloy number N08020 of ASTM B 472 or B 473.
Shaft, Discs	Corrosion resistant steel (17-4PH) conforming to ASTM A 564 alloy number S17400.

Name of part	Materials
Bearings	Annular ball, FF-B-171 single seal.
Relief valve: Spring Valve body, valve, valve cap Adjusting screw, spring guide	 Nickel-chromium-iron alloy wire, number N06600 of ASTM B168 / B166 or N06625 of ASTM B443. Bronze, alloy number C93400 of QQ-C-390 or C93700 of ASTM B584. Brass conforming to ASTM B16 alloy number C36000.
Vanes Vane wear plates	Kevlar-melamine plastic composition. ASTM A240 alloy number S31600.
O-rings	Fluorocarbon MIL-R-83248.
Lubricant	Grease, DOD-G-24508.
Studs (for head plates) Stud nuts	Stainless Steel ASTM A193 Grade 316 Class 2 Monel QQ-N-281 CLASS A or B

3.3.10 Electric motor (component number 9). 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 degrees Celsius (°C).
(d) Voltage: 440 volts, three phase, 60 Hertz (Hz).
(e) Duty: Continuous.
(f) Enclosure: Totally enclosed, fan cooled with non-rubbing labyrinth seal at both ends.
(g) Horsepower:
7-1/2 - Type II proportioning system.
15 - Type III proportioning system.
(h) Revolutions per minute (r/min): 1750.

(i) Type: Squirrel cage.
(j) Design: B.
(k) Mounting: Horizontal.
(1) Bearings: all.
(m) Insulation: Sealed insulation system.
(n) Mechanical balance: Standard.
(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.

The motor shall drive the pump by means of a belt (see 3.3.12).

3.3.11 Motor controller (component number 10). 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 volts, three-phase, 60 Hz.
(c) Current rating:

45 amperes

(d) Operation and protective features:

Type: accross the line.
Protection: low voltage release (LVR); ambient-compensated overload relays.
Function: motor starting.

(e) Motor horsepower:

7-1/2 - Type II proportioning system, 9.2 Amps Full Load.
15 - Type III proportioning system, 18.3 Amps Full Load.

(f) Control voltage: 440 volts.
(g) Motor field isolation: Not applicable.
(h) Fuses: One set 20A and one set 10A. Blown fuse indicator type fuse holders (in cover)
(i) Emergency-run feature: Required.
(j) Two selector switches required:
  (1) One single pole two position selector switch marked NORMAL-RUN, with the pole open in the NORMAL position and closed in the RUN position, maintain contact.
  (2) One seven pole two position selector switch marked NORMAL-OFF, with the seven poles open in the NORMAL

position and closed in the OFF position, spring return to normal.

(k) Indicating lights: Required. (White - Pwr avail, Green - motor running).

(l) Enclosure: Drip proof.

(m) Motor start: The motor specified in 3.3.10 shall be energized by means of a motor controller and the controller is remotely operated by a limit switch in the master solenoid operated pilot valve in accordance with Drawing 803-5959218.

The controller circuitry shall include indicating lights, connections to switching devices, and other remote devices and features in accordance with Drawing 803-5959273 as specified (see 6.2).

3.3.12 AFFF pump motor and pump assembly (assembly number 12). AFFF pump motor and pump assemblies shall be installed on a common bedplate. The bedplate shall be sufficiently rigid to permit handling, shipment, and installation of the units on board ship without disturbing the alignment of the assembled units; and such that the normal distortion, weaving, and vibration of the supporting structure on board ship will not cause misalignment between AFFF pumps and motors or exert undue strain on valves and interconnecting piping. Shock (resilient) mounts shall not be used. Type II configuration shall be with motor and pump horizontal and approximately coplaner. The overall dimensions of the unit (including bedplate) shall not exceed 18 inches wide by 30 inches long by 18 inches high not including lifting eyebolts. Type III configuration shall be with motor and pump horizontal and the pump located below the motor. The overall dimensions shall not exceed 30 inches long by 24 inches wide by 42 inches high not including lifting eyebolts. The type II and III pumps shall be driven by a synchronous (timing) belt operating on sprocket-type pulleys. The belt shall be manufactured using fiberglass cords, with curvilinear tooth profile and fabric tooth facing. Belt covering material shall be resistant to AFFF and suitable for use in marine environment. Belt service factor shall be a minimum of two. The belt shall be tensioned and aligned by adjusting the motor on its base. The pump shall be pinned to the bedplate. Sprockets shall be fitted with taperlock bushings keyed to the shaft. The driving sprocket shall be flanged and the pump sprocket shall not be flanged. Belt guards shall be of the hinged quick-opening type to facilitate belt change. The AFFF pump and motor assembly shall be given an operating test (see 4.5.6).

3.4 Performance.

3.4.1 Pressure rating. The maximum allowable working pressure for components subject to seawater pressure shall be 250 lb/in^2 .

3.4.2 Proportioning characteristics. The rated capacity and overload capacity of the balanced pressure proportioning system shall be as listed in table III. The proportioner shall operate with seawater pressures of 100 to 200 lb/in^2 measured at the seawater inlet to the ratio assembly (component number 1). The volumetric ratio of AFFF concentrate pumped, to the volume of the water flowing through the proportioning assembly plus the volume of AFFF concentrate pumped, shall fall within the shaded area of figures 2 or 3, as applicable, when tested at rated capacity and overload capacity in accordance with 4.5.4, 4.5.4.1, and 4.5.4.2.

3.4.3 Proportioning capacity and pressure drop. The pressure drop across the water flow line of the proportioning assembly (component number 1) shall not exceed 30 lb/in² at any point within the range of flow rates of 500 gal/min for type II proportioners and 1000 gal/min for type III proportioners (see 4.5.5).

TABLE III. Proportioning System Capacities. 1/

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

1/ Minimum usable flow for type II and type III is 90 gal/min.

3.4.4 Shock. The proportioner system components shall withstand the shock test requirements of MIL-S-901, grade A, hull mounted, class I, type C (see 4.5.8).

3.4.5 Vibration. The proportioner system components shall withstand the type I vibration requirements of MIL-STD-167-1 (see 4.5.9).

3.4.6 Hydrostatic pressure. Component numbers 1 through 4 and 6 through 8 shall be tested as specified in 4.5.2.

3.4.7 Cycle life. The proportioner system shall withstand cyclic operation without adjustment, excessive noise, leakage or erratic operation, or failure of any part. Following the cyclic operation at rated capacity, the components and assemblies shall operate at the overload capacity without failure of any part (see 4.5.10).

3.5 Marking. Component body identification plates shall be in accordance with the requirements of applicable specifications and drawings.

3.5.1 Identification plates. Component number 1, 2, 3 and assembly number 12 identification plates shall be fixed in a readily accessible location and shall be brass or corrosion resisting steel, type A or B of MIL-P-15024. The plates shall be in accordance with the normal service requirements of MIL-P-15024/5. Identification plates shall be permanently attached to equipment with corrosion resistant screws and shall contain the following information as applicable:

(a) Manufacturer's name.
(b) 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 :

        Min._____, Max_____
    (3) Hydrostatic test pressure lb/in² :
    (4) Motor r/min: 1750
    (5) Pump r/min:_____

(f) Contract number.
(g) Nine-digit CID number.
(h) National stock number.
(i) Section for inspector's stamp.
(j) Year of manufacture_____
(k) AFFF orifice diameter, inches: _____

3.6 Interchangeability. In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance, and strength.

3.7 Special tools. No special tools shall be required for maintenance. 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 Services Management Area (DCASMA)).

3.8 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 fins and roughness shall be removed. Piping and cabling shall be supported by clamps or hangers. Cabling or wire insulation shall not be nicked, gouged, cut, or otherwise damaged. Safety guards, covers, shields, and warning plates shall be appropriately installed and 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 inspections 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.

4.1.2 Test equipment and inspection facilities. The contractor shall establish and maintain inspection facilities of sufficient accuracy, quality, and quantity to permit performance of required inspections.

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

(a) Quality conformance inspection (see 4.3).
(b) First article inspection (see 4.4).
(c) Inspection of packaging (see 5).

4.2.1 Inspection conditions. Inspections shall be performed in accordance with the test conditions specified herein.

4.2.1.1 Test temperature. Inspection and all tests shall be accomplished at ambient room temperature (70-90°F).

4.2.1.2 Test fluid. Tests requiring operation of components and assemblies shall be conducted using fresh water and AFFF concentrate in accordance with MIL-F-24385, type 6. The contractor is responsible for complying with all environmental requirements when testing with AFFF.

4.2.1.3 Test installation approval. The test arrangement and components shall be approved by NAVSEA prior to conducting tests.

4.3 Quality conformance inspection. Quality conformance inspection shall consist of the tests specified in table IV.

TABLE IV Quality Conformance Tests.

Inspection	Requirements	Test
Visual and dimensional examination	3.3.2 to 3.3.12, 3.5, 3.8	4.5.1
Hydrostatic test	3.4.6	4.5.2
Pump test	3.3.9	4.5.3
AFFF pump and motor assembly operating test	3.3.12	4.5.6
Material Inspection	3.2, 3.2.1	4.6

4.3.1 Inspection lot. Proportioner components and assemblies of the same type which are manufactured under essentially the same conditions and offered for delivery at the same time shall be considered a lot for purpose of sampling.

4.3.1.1 Sampling for quality conformance tests. For the tests specified in table IV a random sample of components/assemblies shall be selected from each lot in accordance with the requirements specified in table V. If any sample fails any quality conformance inspection, the entire lot shall be rejected. If approved by the Government, 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.

TABLE V. Sampling for quality conformance.

Lot Size	Sample Size	Accept	Reject
1 - 20	All	0	1
21 - 280	20	0	1
281 - 500	47	0	1

4.3.1.2 Quality conformance report. When specified in the contract or order, a test report shall be prepared (see 6.3).

4.4 First article inspection. First article samples shall be subjected to the first article inspection as specified (see table VI and appendix A). Samples shall consist of one unit of each of the components and assemblies listed in 1.2.1 which have been submitted at the same time for inspection. First article components and assemblies may be standard production items from the contractor's current inventory, provided the items meet the requirements of this specification and are representative of the design, construction, materials, and manufacturing techniques applicable to the remaining items to be furnished under the contract.

TABLE VI First article inspection and test.

Inspection	Requirements	Test
Visual and dimensional examination	3.3.2 to 3.3.12, 3.5, 3.8	4.5.1
Hydrostatic test	3.4.6	4.5.2
Pump test	3.3.9	4.5.3
Proportioning test	3.4.2	4.5.4
Pressure drop test	3.4.3	4.5.5
AFFF pump and motor assembly operating test	3.3.12	4.5.6
Back pressure regulating valve test	3.3.3	4.5.7
Shock test	3.4.4	4.5.8
Vibration test	3.4.5	4.5.9
Cycle life test	3.4.7	4.5.10
Material Inspection	3.2, 3.2.1	4.6

4.4.1 First article identification. First article samples (each component)shall be permanently marked (i.e. steel stamped) with a government logo, along with the date that the first article testing was completed.

4.5 Methods of inspection.

4.5.1 Visual and dimensional examination. Each sample item selected in accordance with 4.3.1.1 shall be visually and dimensionally examined to determine conformance with this specification. Major and minor defects shall be classified as shown in table VII. Any sample failing to conform to the visual and dimensional examination shall be rejected. Where applicable, visual and dimensional examination shall be in accordance with the requirements of applicable specifications.

TABLE VII. Classification of Defects.

Major	
101	Type not as specified.
102	Dimensions not as specified.
103	Material not as specified.
104	Components not as specified.
105	Workmanship not as specified.
Minor	
201	Components missing or damaged.
202	Improper assembly.
203	Identification markings missing, incorrect, or illegible.
204	Painting defective.

4.5.2 Hydrostatic pressure test. Components (see 3.4.6)shall be hydrostatically tested at 500 lbs/in^2 for a period of 10 minutes. Performing routine industry standard sealing operations on castings prior to testing is acceptable. Fresh water shall be used. Leakage sweating, rupture, or permanent deformation of any part, or failures described in applicable specifications shall constitute failure of the hydrostatic pressure test.

4.5.3 Pump test. AFFF concentrate pumps (component number 8) shall be tested in accordance with requirements specified in MIL-P-19131, and shall comply with the acceptance criteria stated therein. Pumps shall also be tested to determine compliance with requirements specified in 3.3.9. The pump capacities shall be tested using calibrated 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 gauge. Pumping capacities and discharge pressures not as specified or rough and noisy operation shall be causes for rejection. The quality conformance inspection test may be conducted using fresh water.

4.5.4 Proportioning characteristics test. The proportioning system shall be operated to determine that proportioning characteristics are in compliance with requirements specified in 3.4.2. The test installation and piping shall approximate drawing 803-5959273 and include all components and assemblies listed in 1.2.2, and additional valves, gauges, fittings, electrical components, switches, flowmeters and instrumentation necessary to operate the proportioner system to conduct tests and record data. If this specification is used to purchase a single component, Navy approved components shall be installed to complete the system. AFFF concentration determination shall be performed by measuring the discharge capacities of AFFF and fresh water. AFFF concentration is calculated as follows:

% Foam Concentration (AFFF) = [Q_{conc} / (Q_{water} + Q_{conc})] X 100

where Q_{conc} = quantity of AFFF discharged and Q_{water} = quantity of water discharged.

4.5.4.1 Test at rated capacity. The characteristic curves specified in 3.4.2 shall be prepared with a water inlet pressure rating at the ratio controller (component no.1) of 100, 150, 175, and 200 lb/in² , at the following flow rates for the applicable type:

Type II: 90, 325, and 500 gal/min.
Type III: 90, 300, 500, 750, and 1000 gal/min.

4.5.4.2 Test at overload capacity. The characteristic curves specified in 3.4.2 shall be prepared with a water inlet pressure at the ratio controller (component no.1) of 200 lb/in² at the following flow rates for the applicable type:

Type II: 600 and 750 gal/min.
Type III: 1300 and 1500 gal/min.

4.5.5 Pressure drop test. The proportioning assembly shall be operated to determine compliance with 3.4.3. A pressure drop exceeding the specified value shall be cause for rejection.

4.5.6 AFFF pump and motor assembly operating test. The AFFF pump motor and pump assembly (assembly number 12) shall be operated to determine compliance with 3.3.12 and the requirements specified in 3.3.9. The assembly shall operate for not less than 15 minutes at AFFF concentrate pressure of 175 lb/in² . Motor and pump speed, motor current, and rate of AFFF flow shall be recorded. Unusual noises, belt slippage, leakage, failure to maintain the volumetric capacity for the applicable type, or exceeding rated motor current (see 3.3.11) shall be cause for rejection. The quality conformance inspection tests may be conducted using fresh water.

4.5.7 Back pressure regulating valve test. The valve shall be inspected and tested in accordance with MIL-V-18030 and tested to determine compliance with the requirements specified in 3.3.3. The test piping installation shall approximate Drawing 803-5959273. The test shall be conducted with AFFF concentrate supplied at the type II specified gal/min rate and repeated with AFFF concentrate supplied at the type III rate. The seawater sensing inlet pressure shall be varied over a 100 to 200 lb/in² pressure range in 25 lb/in² increments. AFFF and seawater gauge readings and flow meter readings shall be recorded for each increment. Time to stabilize the AFFF pressure shall be noted. At completion of the above portion of the test, flow downstream of the ratio controller shall be secured and all the AFFF flow shall be directed through the regulator valve to a storage tank at atmospheric pressure with seawater sensing line pressure varied from 100 to 200 lb/in² in 25 lb/in² increments. A minimum of 6 gal/min shall flow through the valve at any pressure. AFFF and seawater gauge readings and meter readings shall be recorded for each increment. Pressure deviation between AFFF pressure and seawater pressure in excess of the specified amount shall be cause for

rejection (see 3.3.3). Excessive time to stabilize pressure fluctuations shall be cause for rejection (see 3.3.3).

4.5.8 Shock test. The proportioner components shall be shock tested to determine compliance with 3.4.4. Components are not required to be operated during the test. Permanent deformation, misalignment, functional impairments, breakage of any parts including mounting bolts, or failure to operate after testing shall be cause for rejection. After shock test, the proportioner system shall be given an operating test in accordance with 4.5.4, 4.5.5, and 4.5.6. Failure of these tests shall be cause for rejection.

4.5.9 Vibration test. The proportioner components shall be vibration tested to determine compliance with 3.4.5. Components are not required to be operated during the test. Permanent deformation, misalignment, functional impairments, breakage of any parts including mounting bolts, or failure to operate after testing shall be cause for rejection. After vibration test, the proportioner system shall be given an operating test in accordance with 4.5.4, 4.5.5, and 4.5.6. Failure of these tests shall be cause for rejection.

4.5.10 Cycle life test. Proportioner systems shall be cycle life tested to determine compliance with 3.4.7. Operating data shall be taken during test. The proportioner system shall be cycled for 1000 operations of 1 minute "on" and 1 minute "off" operating at rated capacity with 175 lb/in^2 seawater pressure and or AFFF concentrate pressure or both, and shall complete the cycle life test without adjustment, excessive noise, leakage, erratic operation, excessive wear or breakage of parts, or failure of the component or assembly to maintain output specified. Following the test at rated capacity, components and assemblies shall be operated at an overload capacity (see 4.5.4.2) for 1 hour without failure of any part.

4.6 Material Inspection. Material inspection shall consist of certification supported by verification that the materials used in the fabrication of the components and assemblies (see 1.2.2) are in accordance with the requirements of this specification.

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

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.8.)

5.1 Preservation. As specified (see 6.2), the equipment and accessories shall be preserved level A or C, in accordance with MIL-P-16789. The equipment shall be packaged in a single container concept

5.2 Packing. Packing shall be as specified (see 6.2). The equipment and accessories shall be packed level A, B, or C in accordance with MIL-P-16789.

5.3 Marking. Marking shall be in accordance with MIL-STD-129.

6. NOTES

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

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) into seawater from firemains to supply AFFF and seawater mixture for firefighting services.

6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number, and date of this specification.
(b) Type, quantity, and component number required (see 1.2 and 6.9).
(c) Type, quantity, and assembly number required (see 1.2.and 6.9).
(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) Whether 6-inch flanges are required for component number 1, type III (see 3.3.2).

(f) Controller features required including number and type of stations operated (see 3.3.11).
(g) Special component marking requirements (see 3.5).
(h) Types to be first article inspection (see 4.3.1).

(i) Levels of preservation and packing required (see 5.1 and 5.2).

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.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
3.3.1	DI-DRPR-81000	Product Drawings and Associated Lists	MIL-T-31000
4.1.1	UDI-R-21375A	Plan, Inspection and Test	- - -
4.2.2.3, 4.3 and appendix A	DI-NDTI-80809	Test/Inspection Reports	- - -
4.5.8	DI-ENVR-80708	Shock Test Report	- - -
4.5.9	UDI-23762	Report, Vibration Testing	- - -
4.1.1, 4.6 and appendix B	DI-MISC 80678	Certification/ Data Report	- - -
			- - -

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.

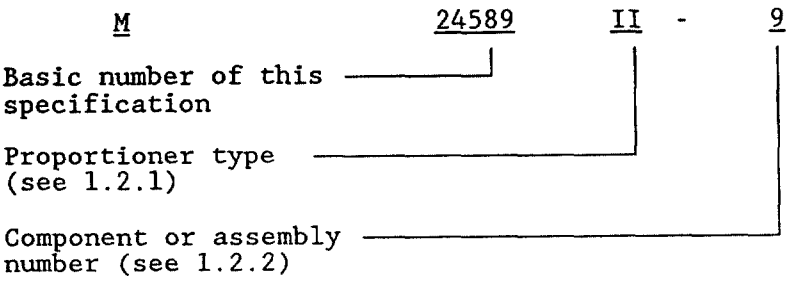
6.4 First article. First article inspection is required and the item should be a first article sample (see 3.1). The first article should consist of one unit (see 4.4). The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, 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. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.5 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract. Spare parts and repair parts are required for those components of new design and construction that have not previously been furnished and for which National Stock Number (NSN) and Allowance Parts List (APL) have not been established.

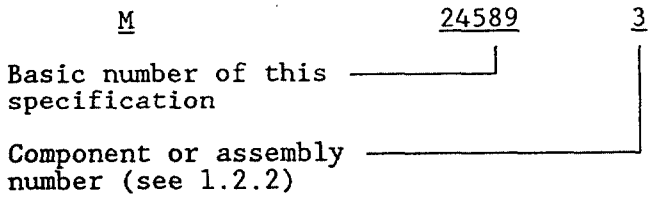
6.6 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.7 Part or identifying number (PIN).

6.7.1 Proportioner components and assemblies. Proportioner components and assemblies numbers 1, 8, 9, 10, and 12 (see 1.2.2), should be identified by a PIN consisting of a general prefix followed by a specific design designator. The prefix shall consist of the letter "M" and the basic number of this specification. The design designator shall consist of a combination of digits and letters specifying the proportioner type and the component/assembly number as follows:



6.7.2 Proportioner components. Proportioner components numbers 2, 3, 4, 5, 6, and 7 (see 1.2.2) should be identified by a PIN consisting of a general prefix followed by a specific design designator. The prefix shall consist of the letter "M" and the basic number of this specification. The design designator shall consist of the component/assembly number as follows:



6.8 Subject term (key word) listing.

Back pressure regulating valve
Firefighting
Foam extinguishing systems
Ratio controller

6.9 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:
Navy - SH
(Project 4210-N409)

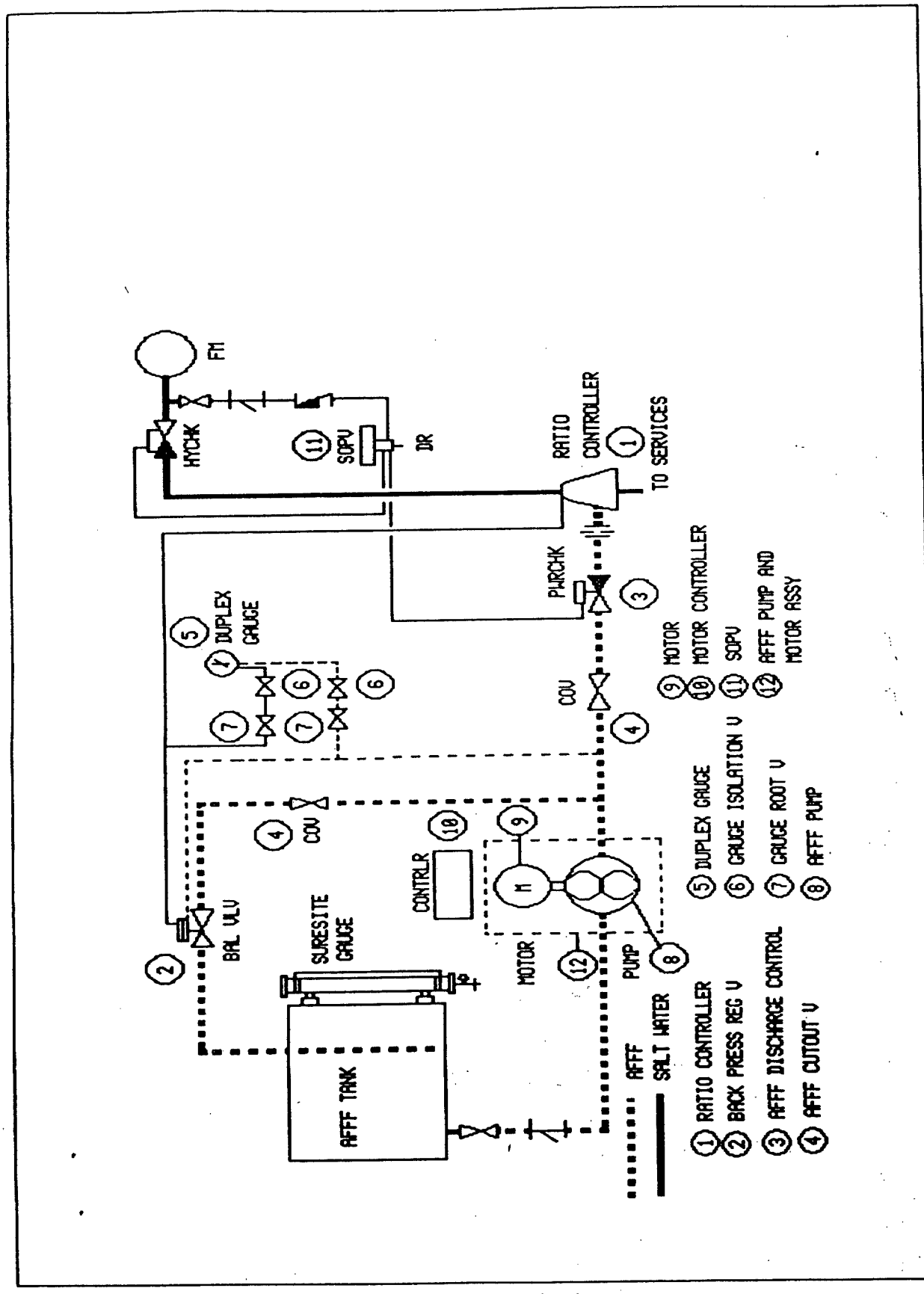


FIGURE 1. Balanced Pressure Proportioning System

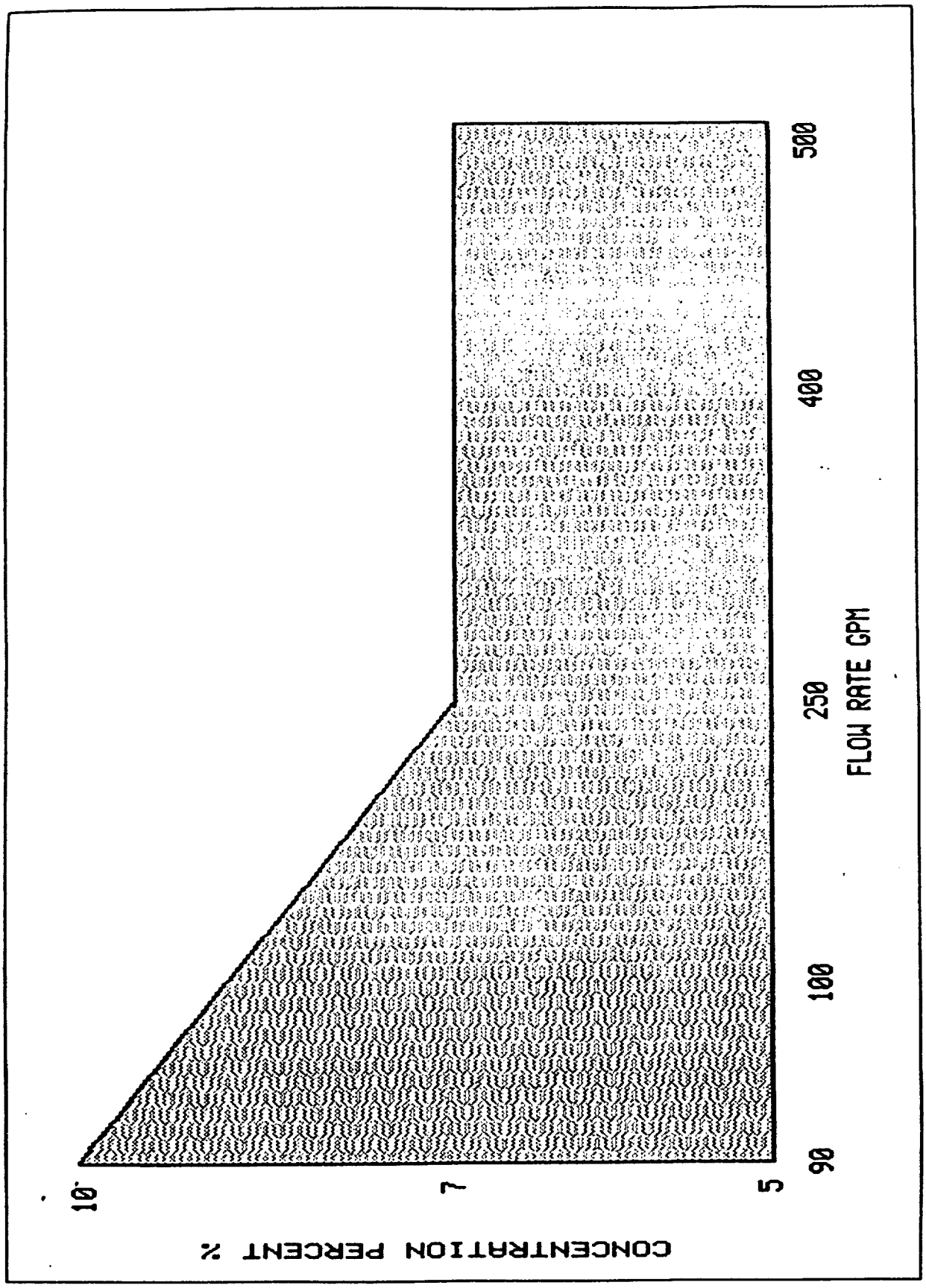


FIGURE 2. Balanced Pressure Proportioner Type II

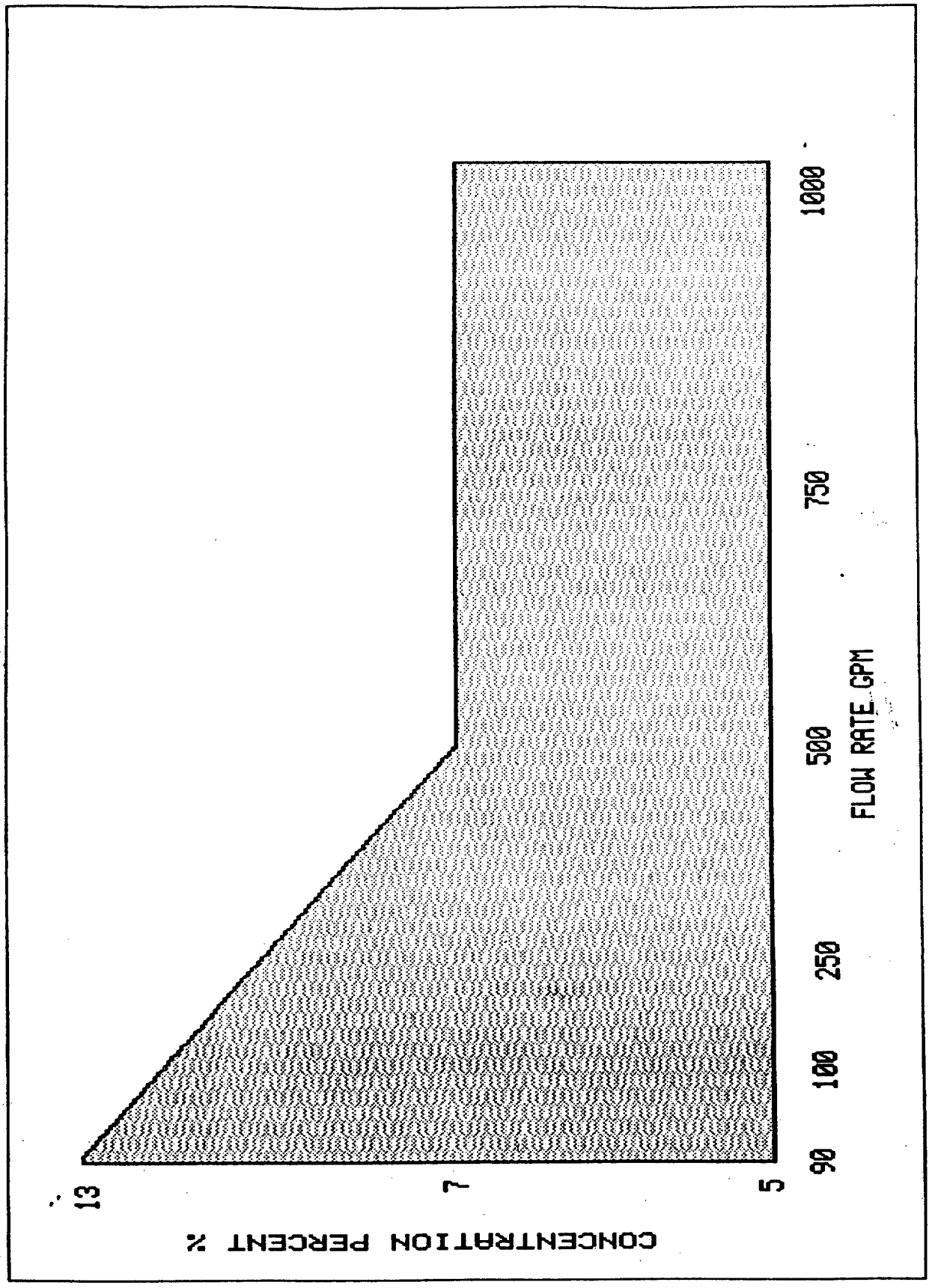


FIGURE 3. Balanced Pressure Proportioner Type III

APPENDIX A

TEST REPORTS TECHNICAL CONTENT REQUIREMENTS

10. SCOPE

10.1 Scope. This appendix covers the technical content requirements that shall be included in test reports. This appendix is mandatory only when data item description DI-NDTI-80809 is cited on the DD Form 1423.

20. APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

30. TEST REPORTS

30.1 First article inspection report. When required by the contract or order, the first article inspection report shall contain the following information as a minimum:

(a) Type of proportioner, component, or assembly.
(b) Name of manufacturer.
(c) Date of first article inspection and test.
(d) Date and file number of Navy letter of approval of test arrangement and components.
(e) List of equipment (with calibration dates) used for the first article inspection and test.
(f) Sketch or photograph of the first arrangements identifying and locating instrumentation.
(g) Detailed test results, including characteristic curves showing the relationship between the total flow through the proportioner assembly and the following:

(1) Proportioner assembly seawater inlet and outlet pressures.
(2) Percent AFFF concentration downstream of the proportioner assembly.
(3) AFFF concentrate supply pressure to the proportioner assembly.
(4) Seawater flow rate.
(5) Time to stabalize the system
(6) Report of failures, repairs and parts replacement during test.
(7) Adjustments made.
(8) Report on deficiencies uncovered and corrective measures taken.

30.2 Quality conformance inspection report. The quality conformance inspection report as a minimum shall contain the characteristic curves of component and assembly operation at rated and overload capacity.

APPENDIX B
CERTIFICATION DATA/REPORT TECHNICAL CONTENT REQUIREMENTS

10. SCOPE

10.1 Scope. This appendix covers the technical requirements that shall be included in certification data/reports. This appendix is mandatory only when data item description DI-MISC-80678 is cited on DD Form 1423.

20. APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

30. CERTIFICATION/DATA REPORTS

30.1 Material inspection. Certification showing conformance with applicable material specifications. The supplier shall furnish test verifying data in the form of test reports showing actual results of chemical tests, mechanical tests and specific heat treatment as required by the material specifications.

30.2. Certificate of compliance. Certification shall be provided that materials, construction, and tests and inspections of proportioner systems components conform with applicable component specification requirements and requirements of this specification.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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

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

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-P-24589A(SH)	2. DOCUMENT DATE (YYMMDD) 20 MAY 1992

3. DOCUMENT TITLE
PROPORTIONER SYSTEMS, BALANCED PRESSURE, AQUEOUS FILM-FORMING FOAM (AFFF) LIQUID

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

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME COMMANDER NAVAL SEA SYSTEMS COMMAND (SEA 5523)	b. TELEPHONE (Include Area Code) (1) Commercial: (703) 602-6020 (2) AUTOVON: (AV) 332-6020
c. ADDRESS (Include Zip Code) WASHINGTON, DC 20362-5101	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340