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MILITARY SPECIFICATION
FOAM-IN-PLACE PACKAGING SYSTEMS,
GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification describes the general requirements for foam-in-place (FIP) dispensing systems capable of pouring a chemical two component mixture to give an end product of a flexible, semi-rigid or rigid, flame retardant, polyurethane foam for packaging applications.

1.2 Classification. Foam dispensing equipment shall be furnished in the following types and classes of equipment as specified by the procuring activity.

- Type I - Portable System
- Type II - Semi-Portable System
- Type III - Fixed System
- Class 1 - Mechanical Pump System
- Class 2 - Pneumatic Piston Pump System
- Class 3 - Compressed Gas Displacement System
- Kind A - Fixed Proportioning
- Kind B - Variable Proportioning

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Fitting Out and Supply Support Assistance Center, Naval Base, Norfolk, VA 23512 by using the self-addressed Standardation Document Improvement Proposal (DD form 1426) appearing at the end of this document or by letter.

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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

L-P-378

-Plastic Sheet and Strip, Thin Gauge, polyolefin

NN-P-71

-Pallet, Material Handling, wood, Stringer construction, 2-way and 4-way (partial)

QQ-S-781

-Strapping, Steel and Seals

PPP-B-601

-Boxes, Wood Cleated Plywood

PPP-B-621

-Boxes, Wood, Nailed and Locked Corner

PPP-B-636

-Box, Shipping, Fiberboard

PPP-B-640

-Box, Fiberboard, Corrugated, Triplewall

MILITARY

MIL-F-45216

-Foam-In-Place Packaging, Procedures For

MIL-F-83671

Foam-In-Place Packaging Materials, General Specification for

MIL-P-116

-Preservation, Methods of

MIL-P-15011

-Pallet, Material Handling, Wood, Post Construction, 4-way entry

STANDARDS

FEDERAL

FED-STD-H28

-Screw Thread Standards For The Federal Services

MILITARY

MIL-STD-129

-Marking for Shipment and Storage

MIL-STD-147

-Palletized and Containerized Unit Loads

MIL-STD-1399

-Interface Standard for Shipboard Systems Electric Power Alternating

(Section 103)

Current

(Copies of specifications and standards, required by contractors in connection with specific procurement functions should be obtained from the procuring agency 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 of the date of invitation for bids or request for proposal shall apply.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
(ACGIH)

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ACGIH - Documentation of Threshold Limit Values
 (Application for copies should be addressed to the
 American Conference of Government Industrial Hygienists,
 P. O. Box 1937, Cincinnati, Ohio 45201).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM G 31	-Laboratory Immersion Corrosion Testing of Metals
ASTM B 117	-Salt Spray (Fog) Testing
ASTM D 3951	-Practice for Commercial Packaging

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

3. REQUIREMENTS

3.1 General. The foam generating systems described herein shall each be capable of continually pouring machine-mix flame retardant flexible, rigid or semi-rigid, foams from 0.4 pounds per cubic foot to 4 pounds per cubic foot (PCF) density at ambient temperatures from 60 to 120 F. The physical characteristics of the liquid chemical components and the generated foam after curing shall comply with the requirements of MIL-F-83671. Procedures used for foam-in-place applications of equipment described herein shall comply with MIL-F-45216.

3.2 First Article Inspection. This specification makes provisions for first article inspection (see 4.3).

3.3. Materials of Construction

3.3.1 Compatibility. Each foam generating system shall be compatible with all available polyurethane foam-in-place chemical formulations and solvents which comply with the requirements of MIL-F-83671. There shall be no metal which will react with, or be adversely affected by, any constituent of any of the available commercial polyurethane chemicals. When tested as specified in 4.4.1 herein the corrosion rate of metals shall not exceed 3 mils (0.003 inch) per year.

3.3.2 Salt Atmosphere. When specified for shipboard use equipment shall also be protected from salt water atmosphere (see 6.2). Metal parts which are suspect shall be tested in a salt spray chamber as specified in 4.4.1.2 and shall show no evidence of corrosion or other adverse effects. Incompatibility with salt atmosphere shall be defined as a corrosion rate exceeding 3 mils (0.003 inch) per year.

3.4 Equipment Design Criteria. The systems shall include the subsystems detailed herein and any other required for the safe, efficient functioning of the foaming systems (see 4.4.1). Types I, II and III foam generating systems shall, as a minimum, consist of:

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- a. Chemical component containers when supplied as part of the equipment. They shall comply with the packaging requirements of MIL-F-83671 (see 6.2).
- b. Interface fittings or manifolds to connect the foam generating system to the chemical containers.
- c. A means of elevating and controlling the temperatures of the two liquid components to achieve the correct properties for mixing and foaming unless otherwise specified (see 6.2).
- d. Protected, properly designed hoses to transport the chemical components from the chemical containers to the foam dispenser.
- e. A foam dispenser to properly mix the components A and B in correct proportions (see 3.5.3) and deliver the specified rate of foam per minute (see 6.2).
- f. An electrical system that provides maximum reliability and simplicity to power and control the system unless otherwise specified.
- g. A control panel to contain the switches, lights, controls, gauges, meters and other accessories to control functions and monitor all system conditions unless otherwise specified.
- h. A chemical movement system for supplying the energy required to propel the components A and B from the containers, through the system and out the dispenser consistent with the production of high quality foam.
- i. Readily accessible filters or other devices shall be incorporated to ensure that both components A and B chemicals delivered to the dispensing unit are clean and free from foreign and extraneous matter.
- j. When the system uses solvent purge there shall be at least four hours of capacity in the solvent reservoir. Mechanical purging and air purging systems shall be complete and so equipped that frequent disassembly of the dispenser is not required for continuous, effective operation.
- k. Purge controls shall be single electric switch, valve, or other equally simple, effective device for maintaining the dispenser in a ready-to-foam condition. Solvent or other type purge actuating controls shall be located on the dispensing head.
 - l. A kit of recommended spare parts.
- m. Operating and maintenance manuals as specified herein (see 3.8).
- n. The equipment shall be designed for ease of maintenance through the use of hinged panels, quick fasteners and "off-the-shelf" replacement of parts from the equipment manufacturer. The need for special tools shall be held to a minimum.

3.4.1 Connectors. Connectors shall be designed so that it will be difficult to make erroneous connections. All connections shall be capable of being made without the use of specially designed tools (see 4.4.1).

3.4.2 Chemical Hoses. Unless specified otherwise (see 3.5.1.1 and 6.2), fifteen feet of chemical resistant fluid hose for each component for use from the machine to the dispensing unit shall be provided. Also included shall be enough chemical resistant hose, to a maximum of 25 feet, for each component to connect the machine to the chemical sources. Source lines shall be provided with connections and adapters for use with the specified chemical cannisters, drums or containers. Hoses and connectors shall be color coded to agree with the colors specified in MIL-F-83671 (see 4.4.1). A 1" wide (minimum), permanent, color coded band at each hose fitting will comply with this requirement.

3.4.2.1 Heating Provision. When internally heated, protected and insulated hoses are not provided for the heating of chemical components, other heating provisions shall be provided when required (see 6.2). When heater wires or in-line type heaters are used with each chemical dispensing hose, the warmup time from an ambient temperature of 60°F to operating temperature shall not exceed 30 minutes (10 minutes for type 1). Operating temperature shall thereafter be maintainable to $\pm 5^\circ\text{F}$. Exterior temperatures of the hose or in-line heaters shall not exceed 120°F. All required temperature sensing components and electrical controls for maintaining proper heating shall be included as part of the total heating provision.

3.4.3 Foam Dispenser. The foam dispenser shall be self-cleaning utilizing a purging solvent, air purge or mechanical method that will prevent clogging of the orifices or ports in the mixing chamber or head. The dispenser housing and mixing chamber shall be provided with porting features or equivalent devices to eliminate chemical crossover.

3.4.4 Control Panel. The electrical controls must be located and arranged so that equipment can be quickly and safely shut off in the event of failure or malfunction of equipment. A ground fault sensing device shall interrupt the electric power in the event of an electrical short to ground of 6 milliamperes maximum. The control panel shall be easily accessible and well arranged. It shall at least be provided with the following (when necessary for operation):

- a. Manual on-off switch or button
- b. Power on light
- c. Heat on light
- d. Temperature control
- e. Compressor or pump on-off switch
- f. Pressure gauge or indicating light

- g. Main circuit breaker
- h. Motor circuit breaker or fuses
- i. Hose heater circuit breaker or fuses
- j. Ammeter
- k. Voltmeter
- l. Pressure warning light
- m. Proportioner indicating light
- n. Solvent level indicator
- o. Pump speed indicator

If a compressor is used for Type I systems the compressor on-off switch and the pressure indicating light may be located on the main panel or on a separate switch box conveniently located adjacent to the compressor.

3.5 Detailed Equipment Requirements. In addition to the design criteria noted previously the following detailed requirements shall apply to each equipment type, class and kind.

3.5.1 Equipment Types. The foam generating systems shall be divided into three types depending upon degree of system portability (see 6.2).

3.5.1.1 Type I, Portable System.

a. The portable foam generating system shall be self-contained, (except for the chemical canisters) and deliver 5 ± 1 pounds of foam per minute.

b. The total weight of the portable system (not including canisters A and B) shall not exceed 150 pounds when the unit is packed and secured for movement.

c. The equipment shall be capable of operating on an air (or compressed gas) supply not exceeding 5 cubic feet per minute (CFM) at 100 psi maximum and shall be equipped with a pressure gauge and filter of 5 micron maximum pore size.

d. Hoses from canisters to dispenser shall be 20 feet long and 10 feet long from the air supply to the canisters.

e. The carrying case shall contain the operating and maintenance manuals, control panel, compressor (when required), dispenser, all hoses and lines, spare parts, and miscellaneous items required for operation (with the exception of the chemical component canisters). The case shall be constructed of high impact resistant, corrosion resistant metallic or non-metallic material. It

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shall be provided with reinforced locking latches and a double carrying handle (one on each end). The dimensions shall be of sufficient size to contain all the components of the foam-in-place system with the exception of the chemical canisters, but no greater than 39 inches long by 27 inches wide by 17 inches high.

3.5.1.2 Type II, Semi-Portable System.

a. The semi-portable foam generating system shall be self-contained including the A and B chemical containers (unless a 55 gallon drum is used). All required components shall be in one cabinet equipped with rubber tired swivel caster wheels of 3" minimum diameter equipped with anti-friction bearings for movement within an extensive area. Drums for liquid components may be secured to wheeled dollies (or similar) for ease of movement when required by the government (see 6.2).

b. When required by the procuring agency additional features may be specified including (but not limited to) the following (see 6.2):

(1) Timed dispense - An adjustable timer which can be set to dispense a predetermined amount of A and B chemical mixture each time the dispenser is actuated. This shall not inhibit any other features (i.e., dispenser purging).

(2) Dispensing head support - When specified, the contractor shall supply a boom type mechanical support to position and hold the dispenser in the desired location and angle of discharge. The boom shall be self supporting with counterbalancing springs, adjustable, and capable of being locked in the set position.

3.5.1.3 Type III, Fixed System.

a. The fixed foam generating system shall be immobile with some parts of the system attached to building walls, structure or work stations.

b. When specified, the system shall include chemical containers having a minimum capacity of 10 gallons (unless otherwise specified) and one or more foaming stations (see 6.2).

c. When more than one station is required each station shall have a control panel and a minimum of one dispenser. Normally, no more than five (5) stations shall be connected to one system.

d. When required by the procuring agency additional features may be specified including (but not limited to) the following:

(1) Timed dispense - An adjustable timer which can be set to dispense a predetermined amount of A and B chemical mixture each time the dispenser is actuated. This will not inhibit any other feature (i.e., purging).

(2) Higher output capability - Output in excess of 5±1 pounds per minute (per dispenser) when specified by the procuring agency (see 6.2).

(3) Dispensing head support - When specified, the contractor shall supply a boom type mechanical support to position and hold the dispenser in the desired location and angle of discharge. The boom shall be self supporting with counter-balancing springs, adjustable, and capable of being locked in the set position.

3.5.2 Equipment Classes. The foam generating systems shall be categorized into 3 classes depending upon the method by which the chemicals are pumped through the system (see 6.2).

3.5.2.1 Class 1 - Mechanical Pump System.

a. Class 1 systems shall move the liquid components by means of a motor driven mechanical pump.

b. The pump can be either gear, piston, vane, centrifugal or propeller pumps. However, Class 1 pumps are characterized by being driven by a rotary electric or air motor.

c. These pumps may have either axial or radial patterns and may come in numerous variations of design of those mentioned in subparagraph "b" above.

d. The flows of these pumps may be either fixed or variable (see 3.5.3) by varying either pump displacement or motor speed.

3.5.2.2 Class 2 - Pneumatically Actuated Piston Pump System.

a. Class 2 systems shall move the liquid components by means of a piston type pump which is powered by compressed air.

b. The configuration may be either fixed or adjustable volume as specified in 3.5.3.

c. The compressed air supply shall be filtered through a 20 micron (max.) filter and passed through a water trap to remove entrained droplets to yield clean, regulated, compressed air.

3.5.2.3 Class 3 - Compressed Gas Displacement System.

a. Class 3 systems shall move the chemical components by means of displacing the liquid with a compressed, dry gas which bears directly or indirectly upon the surface of the liquid.

b. When nitrogen is specified it shall meet or exceed the type and minimum purity levels established by the equipment and chemical manufacturers. (see 6.2).

c. When specified, the compressed gas source shall be 125 psi regulated air which has been filtered through a 5 micron filter and dried in a desiccant type dryer to yield compressed air of 2% maximum relative humidity (-40 F wet bulb temperature).

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d. When it is required, the compressed gas displacement system shall have a rated output and pressure capability sufficient to produce the maximum amount of foam of all densities and temperature conditions specified herein. The system shall be equipped with an automatic shut-off, safety valve, and a filter and dryer as applicable. The safety valve shall release at 110 psi when tested in accordance with 4.4.3 and shall be easily adjustable over the range of pressures encountered during operation.

3.5.3 Equipment Kinds. The foam generating systems shall be of two kinds depending upon its ability to vary the ratio of the A and B chemical components.

3.5.3.1 Kind A - Fixed Proportioning.

a. Equipment of Kind A shall accommodate foam formulations of a fixed ratio of components A and B. Unless specified otherwise the ratio shall be 1 to 1. + 0.1 by volume (see 6.2).

b. In this equipment the fixed ratio may be changeable to another fixed ratio by system modification.

3.5.3.2 Kind B - Variable Proportioning.

a. Equipment of Kind B shall be adjustable by the operator to give a range of chemical component ratios of from 2:1 to 1:2 unless specified otherwise (see 6.2).

b. The ratio change shall be easily and quickly accomplished by a movement of levers, cranks, valves or other simple means without excessive trial and error.

c. The ratio adjustment, once set and locked, shall not drift or require frequent readjustment.

d. The ability to change component ratio shall be a design criteria of the equipment and shall not consist of a modification of fixed ratio equipment.

3.6 Electrical.

a. The electrical system shall provide the necessary operating voltages as required for the optimum safe performance of the foam generating system.

b. The electrical installation shall comply with MIL-STD-1399, section 103. All electrical circuits shall be insulated from the equipment housing, frame or casing so that the said housing, frame or casing can be grounded without grounding the electrical system.

c. When necessary a transformer shall be provided by the contractor to interface with the available power.

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d. The high voltage power subsystem shall supply power for operating motors, compressors, heaters and other items of high power consumption.

e. The equipment shall be wired for operation on 115 VAC, single phase, 60 Hz electrical service, unless specified otherwise (see 6.2). Electrical wiring and components shall conform to applicable Federal Standards. Solid State electronics and printed circuitry shall be used where applicable. All equipment shall be able to accommodate voltage fluctuations of $\pm 10\%$ and still operate at peak efficiency.

f. The power and control systems shall be designed for reliable operation and ease of troubleshooting and maintenance.

3.7 Equipment Installation. Each dispensing unit shall be delivered ready for installation and provided with a complete tool kit and all recommended spare parts. The contractor shall provide, at each location where his equipment is to be used, a representative skilled in assembly and operation of the equipment. The representative will direct any assembly and operation of the equipment necessary in rendering the equipment operable. The cost to furnish a representative will be included in the equipment cost so that there will be no additional cost to the government. The representative will also provide training and guidance to potential operators for a training period not less than eight hours including instruction and "hands on" operation of the equipment for each operator.

3.8 Operation and Maintenance Manuals. Five operation and maintenance manuals for each system shall be provided (see 6.3). They shall list in correct sequence:

a. All actions required to operate and control the furnished equipment.

b. A troubleshooting guide listing malfunctions most likely to occur.

c. Procedure for locating and correcting the malfunctions.

d. All drawings and schematic wiring diagrams required for troubleshooting and maintenance.

e. All notes of caution shall be included at the proper place giving information on the potential danger and actions to be taken to avoid accident or injury. Caution notes shall be printed in red or placed in a block.

f. A table of spare parts keyed to location drawings and giving the original manufacturers name, part number and description.

g. The description and ordering data for each filter, water trap, compressed gas source, and other expendable or frequently replaced component when required in the system.

3.8.1 Submittal. The operation and maintenance manuals shall be submitted, in their entirety, for government approval at least 30 days prior to first article

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inspection and test (see 3.13). In addition to the manual a waterproof/greaseproof instruction card shall provide step-by-step operating procedures, troubleshooting guide and safety precautions. One copy of each manual and instruction card shall be submitted with each item. The other four manuals shall be sent by mail.

3.9 Identification Plate. An identification plate made of corrosion resistant metal shall be securely and permanently affixed to the exterior of each unit. It shall state, "US GOVERNMENT PROPERTY" (in bold capital letters), the manufacturer's name, address, model number, serial number, voltage characteristics, contract number and date of manufacture embossed or stamped into the metal. This data shall be highly visible, readable and permanent.

3.10 Workmanship. Workmanship shall be consistent with best commercial practice. All parts subject to wear, breakage or distortion shall be accessible for fast adjustment and repair. Holes shall be accurately punched, drilled or reamed and shall be free of burrs, pins or slivers. Surfaces to be painted shall be free of rust, scale, oil or other inhibiting matter. Prime and finish coats shall be smooth and free from runs, tackiness and imbedded foreign particles. Mating parts shall fit properly with no excessive play or roughness of assembly and operation. All bolts, nuts, screws, and studs shall be tight with lock washers used where necessary. Threads shall conform to FED-STD-H28. Wiring shall be properly joined and shall not be cut, abraded or loose at terminal ends.

3.11 Safety Requirements.

3.11.1 System Safety. The foam-in-place system, including all hoses, fittings and connections shall be capable of withstanding 180 psi when tested in accordance with 4.4.2. All necessary safety devices shall be provided to preclude operator injury. In addition to ground fault sensing, (see 3.4.4) safety devices shall include covering for all parts that represent safety hazards. The equipment shall be provided with appropriate control devices for the operator to quickly shut down the system if uncontrolled foaming, overpressurization or loss of supply of either chemical should occur.

3.11.2 Health Hazard Requirements. When correctly used for its intended purpose, the foam-in-place equipment shall not result in production of atmospheric concentrations of free isocyanates, organic vapors or other chemicals in the workers breathing zone which exceed the Threshold Limit Values (TLV) for the respective materials as delineated in the current listing of TLVs published by the American Conference of Government Industrial Hygienists (ACGIH). Testing shall be in accordance with MIL-F-83671.

3.12 Warranty. When specified the contractor shall guarantee the foam-in-place system to perform as specified herein for a period of one year. This warranty shall cover labor and material from the time of first operation by the user under normal conditions afloat or ashore. Malfunctions or failures shall be corrected by the contractor at no cost to the government. (routine preventive maintenance excluded).

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3.13 First Article Inspection. After the complete system is delivered or installed and the contractor declares the system ready for operation, the system shall be subjected to performance tests under normal working conditions. During the testing period, the machine must demonstrate satisfactorily that the dispensing machine controls, meters, gauges and any accessories operate in accordance with the terms of these specifications. At least one 24 hour (three 8 hour shifts) operating performance run shall be conducted under trouble free conditions (with no failure preventing satisfactory performance) for the equipment to be acceptable. This test shall be made by the contractor under the direction of the designated government packaging supervisor.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility For Inspection. Unless otherwise specified (see 6.2), the supplier is responsible for the performance of all inspection requirements specified. He may use his own or any other suitable facilities for the performance of the inspections subject to approval 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 assure supplies and services conform to prescribed requirements.

4.2 Classification Of Inspection. The inspection requirements specified herein are classified as follows:

- a. First Article Inspection (see 4.3)
- b. Quality Conformance Inspection (see 4.4)
- c. Inspection of Preparation for Delivery (see 4.5)

4.3 First Article Inspection. The contractor shall provide a sample production FIP system for first article inspection, test and approval (see 3.2, 3.13 and 6.2). The equipment shall be examined in accordance with 4.4.1 and tested in accordance with 4.4.2 through 4.4.4. The presence of any defects, dimensional deviations, or failure to pass any tests shall be cause for rejection of the first article. When the first article fails this inspection the Government may require a design review including analysis of each discrepancy with proposed corrective actions and plans for retest. When requested corrective action on all malfunctions shall be successfully retested, approved by the Government and implemented into design and manufacturing prior to further production of FIP equipment. The contractor shall issue a complete report of this inspection and test (or retest) within 10 days after test performance. The report shall indicate conformance or non-conformance with these requirements with reference to paragraph number of this specification and the contract (where applicable).

4.4 Quality Conformance Inspection. Inspection shall be performed on 100% of the FIP systems.

4.4.1 Visual Examination. Each machine shall be examined for the defects listed in Table I. Any defect shall be cause for rejection.

TABLE I. CLASSIFICATION OF DEFECTS

EXAMINE	DEFECT	CLASSIFICATION		REFERENCE PARAGRAPH
		MAJOR	MINOR	
1. Portability	System is not correct type	X		3.5.1
2. Pump	Pump is not correct class	X		3.5.2
3. Proportion	System is not correct kind	X		3.5.3
4. System Operation	Foam ratios & quality not as specified	X		3.1
5. Materials	System not compatible with all chemical components	X		3.3
6. Containers	Chemical containers not as specified		X	3.4
7. Hoses & Dispenser	Not as specified	X		3.4.2
8. Control panel	Controls not as specified	X		3.4.4
9. Electrical	Circuit grounded	X		3.6
10. Electrical	Will not operate under voltage extremes as required	X		3.6
11. Spare parts & tool kit	Missing or inadequate		X	3.7
12. Manuals	Missing or inadequate		X	3.8
13. Workmanship	Not as specified		X	3.10
14. Marking & Ident.	Missing, illegible or not as specified		X	3.9
15. Ground fault Sensing	System does not shut down at 6 ma or less	X		3.4.4
16. Connectors	Not as specified		X	3.4.1
17. Fitting or Manifold	Missing		X	
18. Flushing means system	missing or not as specified	X		3.4
19. Filter, Hinges Fastners	Not as specified		X	3.4
20. Materials	System not compatible with salt atmosphere (when specified)	X		3.3.2

4.4.1.1 Compatibility Test. Materials which are wetted by the two chemical components and may be subject to corrosive attack shall be tested as specified in ASTM G 31 procedures. The liquid temperature shall be held to the maximum ($\pm 5\%$) recommended by the chemical manufacturer. Each test specimen shall be immersed in the chemicals for at least 30 days. The corrosion rate shall not exceed that specified in paragraph 3.3.1.

4.4.1.2 Salt Atmosphere. When specified in the contract, equipment subject to salt atmosphere shall be tested as specified in ASTM B 117. Unless otherwise specified 5 specimens of each material shall be tested until incompatibility is apparent but no longer than 30 days (see 3.3.2).

4.4.1.3 Functional and Dimensional Examination. The machine and its applicable controls shall be examined and tested at a site designated by the procuring activity to ascertain compliance with the requirements of this specification. The machine shall show no signs of either electrical or mechanical failure, or any other defect or deficiency that would affect performance or use. The equipment must function without any deviations from the performance requirements of this specification. Any dimension not within specification tolerances shall be a defect.

4.4.2 Pressure Test. Each system shall be pressure tested with the pressure relief valve blocked to a maximum of 1.5 times the working pressure at ambient temperatures and held for 10 minutes. At the end of this time no part of the system shall show permanent deformation or leakage. Failure to pass this test shall be cause for rejection of the unit.

4.4.3 Pressure Relief Valve Test. (Type 1 Only) The pressure relief valve shall be pressure tested and shall vent at a maximum pressure 1.15 times maximum operating pressure at ambient temperature. Test of pressure relief valves shall be conducted on each unit. Failure to pass this test shall be cause for rejection of the unit.

4.4.4 Operating Test. An operating test of 24-hours shall be conducted with the system operating normally using foam density as specified in the contract. This test shall span a three day period and shall consist of intermittent use of the equipment. The equipment shall demonstrate its start-up capability after an over-night "unplugged" condition. A minimum of 100 cubic feet of foam shall be dispensed during the test. The equipment shall operate as required without clogging, service repairs or uncontrolled foaming and shall demonstrate a capability of being easily and quickly shut off when either component container A or B is empty. The equipment shall demonstrate its capability of producing foam complying with MIL-F-83671. Classes 1, 2 and 3.

4.5 Inspection of Preparation For Delivery. Examination will be made to determine that packing and marking as required in section 5 herein is complied with. Defects will be scored as specified in Table II.

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TABLE II. CLASSIFICATION OF PACKING AND MARKING DEFECTS

Examine	Defects	Classification	
		Major	Minor
Preservation	Failure to properly clean, flush & preserve system (See 5.1)	X	
Packing	Level of packing not as specified (See 5.2)	X	
Container	Boxes not as specified. Weight limit of shipping container exceeded. (See 5.2)		X
Workmanship	Boxes improperly closed; strapping omitted. Cushioning, blocking and bracing, mis-applied or missing (See 5.2)	X	
Marking	Marking on interior and exterior containers omitted, incorrect or illegible. (See 5.4)	X	

5. PACKAGING

5.1 Preservation. Preservation shall be level A, B or Commercial as specified (see 6.2) and shall comply with MIL-STD-1188. All systems shall be cleaned and purged with solvent and preserved with a plasticiser in accordance with commercial practice.

5.1.1 Level A.

5.1.1.1 Type I Portable System. All components shall be secured inside the carrying case. The carrying case lid shall be closed with the locking latches not secured. The keys shall be attached to the power cord. The case shall be placed in a close-fitting box conforming to PPP-B-636, class weather resistant, grade W5c. Closure shall be in accordance with the appendix of the box specification.

5.1.1.2 Type II Semi-Portable System. All components shall be secured within or attached to the portable cabinet. The system shall be unit packed in conformance with MIL-P-116, method IA.

5.1.1.3 Type III Fixed System. The foam generating system shall be unit packed in accordance with MIL-P-116, Method IA.

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5.1.1.4 Plastic Film. Each roll of plastic film shall be unit packed in accordance with Level A requirements of L-P-378.

5.1.1.5 Cleaning Solvent. Solvent containers shall be unit packed in the quantities specified (see 6.2) in a fiberboard container conforming to PPP-B-636, class weather resistant, grade W5c. Closure shall be in accordance with the appendix of the box specification.

5.1.2 Level B. Unit packing shall be as specified in 5.1.1, except that Method III shall be substituted for IA and the barrier bag shall be omitted. The solvent container shall conform to PPP-B-636, class domestic.

5.1.3 Commercial. Each foam generating system complete with components shall be unit packed in accordance with ASTM D 3951.

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

5.2.1 Level A. Each complete foam generating system unit packed as specified in 5.1 shall be packed within a close-fitting box conforming to PPP-B-601, overseas type, or PPP-B-621, style 4, class 2. Skids, 3 x 4 inch, laid flat, shall be applied in accordance with the requirement of the box specifications. Closure and strapping shall be in accordance with the applicable container specifications or appendix thereto, except that metal strapping shall conform to QQ-S-781, type I or IV, finish A. Liquid components shall be packed in accordance with MIL-P-83671.

5.2.2 Level B. Each complete foam generating system as unit packed in 5.1 shall be packed within a close-fitting container conforming to PPP-B-601, domestic type or PPP-B-640, class 2, style optional. Closure and reinforcement shall be in accordance with the applicable container specifications or appendix thereto, except strapping shall conform to QQ-S-781, type I or III, finish A. Liquid components shall be packed in accordance with MIL-P-83671.

5.2.3 Commercial. Each foam generating system complete with components shall be packed in accordance with ASTM D 3951.

5.3 Unitization. Palletization shall be required when quantities to a single destination exceed either a total of 100 pounds weight or 10 cubic feet volume. The pallet shall conform to MIL-P-15011 or NN-P-71, type IV, group I or II woods. The load shall be "bonded" to the pallet by strapping conforming to QQ-S-781, type I or IV, finish A; shrink film conforming to L-P-378, type IV; or stretch film or bonding means P of MIL-STD-147.

5.4 Marking.

5.4.1 Military. In addition to any special marking required by the contract or order, interior packs, exterior shipping containers and unitized loads shall be marked in accordance with MIL-STD-129.

5.4.2 Commercial. Marking shall be in accordance with MIL-STD-1188.

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6. NOTES

6.1 Intended Use. The foam-in-place equipment described herein is for use by DOD activities for the purpose of packaging items of supply for shipment and storage using chemicals conforming to MIL-F-83671 and procedures described in MIL-F-45216.

6.2 Ordering Data. The following data shall be specified in the contract or order:

- a. Which equipment type, (I, II or III) is required (see 3.5.1).
- b. Which equipment class (1, 2, or 3) is required (see 3.5.2).
- c. Which equipment kind (A or B) is required (see 3.5.3).
- d. For Type III systems, number of foaming stations required (see 5.1.3).
- e. Foam chemicals provided for type I in other than equal quantities of components A and B and other than 5 gallon containers (see 3.5.1.1).
- f. Which size and type of cannister or drum is required (see 3.4).
- g. When special marking is required (see 5.4.1).
- h. When supplier not held responsible for the performance of all inspection requirements (see 4.1).
- i. When a first article is not required for inspection and approval (see 3.13 and 4.3).
- j. When chemical ratio is other than 1.1 (see 3.5.3).
- k. Foam density to be used for operating test (see 4.4.4).
- l. When power service of other than 110, VAC, single phase, 60 Hz is required (see 3.6).
- m. Which level of preservation and packing A, B, or Commercial is required (see 5.1).
- n. Protection from salt water atmosphere is required (see 3.3.2).
- o. Temperature controls not required (see 3.4).
- p. Amount of foam chemical delivery, pounds per minute (see 3.4).
- q. Dispensing head support boom required (see 3.5.1.2).

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- r. When dispensing hoses are to be special lengths (see 3.4.2.1).
- s. When special provisions for heating are required (see 3.4.2.1).
- t. When type II system requires a wheeled dolly for the chemical drums (see 3.5.1.2).
- u. When a one year warranty is not required (see 3.12).
- v. When dispensing timer is required (see 3.5.1.2).
- w. When immersion tests are required (see 3.3.2).
- x. Type III chemical container size (see 3.5.1.3).
- y. When an output in excess of 5 lbs/min is required (see 3.5.1.3).
- z. When class 3 system is to use compressed nitrogen (see 3.5.2.3).
- aa. When class 3 system is to use compressed air (see 3.5.2.3).

6.3 Data Requirements. The data specified below will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraphs:

<u>Reference Paragraph</u>	<u>Data Requirements</u>	<u>Submittal Date</u>
3.8	Operations & Maint. Manuals (5 for each system)	30 days prior to first inspection & test.
3.13	First Article Test Report	10 days after first article inspection and report.

Custodians:

Army - SM
 Navy - SA
 Air Force - 69
 DLA - DH, DM

Preparing Activity
 Navy - SA

(Project No. 3540-0130)

Review Activities:

Army - AL, AT, CR, EA, MD, ME, MI
 Navy - AS, EC, SH
 Air Force - 11, 43, 80, 82
 DLA - CS, ES

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User Activities:

Army - AV, ER, MR, MT

Navy - MC, YD

Air Force - 84

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER <i>MIL-F-87075B</i>		2. DOCUMENT TITLE	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	