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SUPERSEDING
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MILITARY SPECIFICATION

FOAM, POLYURETHANE, PROCESS FOR APPLICATION OF

This specification is approved for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification defines the procedure to be used for applying polyurethane foam to printed circuit board assemblies.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

O-A-51	Acetone, Technical
TT-I-735	Isopropyl Alcohol
TT-M-261	Methyl-Ethyl-Ketone, Technical

Military

MIL-N-15178	Naphtha, Solvent
MIL-I-46058	Insulating Compound, Electrical, (For Coating Printed Circuit Assemblies)
MIL-F-47095	Foam, Polyurethane, for Imbedding Electronic Components and Boards

FSC 14GP

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

3. REQUIREMENTS

3.1 General. This specification covers the procedure for use and application of polyurethane foam of the type which conforms to MIL-F-47095.

3.2 Mold. The mold shall be designed to meet the final foam configuration specified on the Engineering Drawing and shall include a cover for the purpose of part removal.

3.2.1 Vent ports. Vent ports shall be incorporated into the mold design to act as overflow exists for the rising foam and to release pressure resulting from outgassing.

3.3 Mold material. The mold should be fabricated from steel, plastic or silicone rubber and the material shall be capable of being finished to a smooth surface.

3.4 Release agents. The release agents, when used, shall be homogenous and pure and shall be suitable for the complete release of the mold when foaming is complete.

3.5 Preliminary preparations. Prior to the foam application, the preliminary preparations shall be as follows:

3.5.1 Cleaning. Both the mold and the part shall be free from oil, grease and other contaminants.

3.5.1.1 Mold cleaning. The mold shall be cleaned using a suitable release agent taking care to avoid scoring of the mold inner surface. Cleaning is not necessary on silicone rubber molds.

3.5.1.2 Part cleaning. All parts and assemblies which are to be foamed shall be cleaned with Isopropyl Alcohol conforming to TT-I-735 or other cleaning agents which do not leave a residue or affect function or marking of parts and then dried with a stream of clean dry air.

3.5.2 Mold and part. Before the part is placed into the mold, the release agent shall be placed on the areas where foam adherance is not required.

3.5.2.1 Vent ports. The release agent should be applied to the surfaces of the vent ports. This action will speed the proper release of

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the cured foam.

3.5.3 Heating. Molds and parts may be heated before introducing the foam to the mold. When heating is used, both the mold and the part shall be placed in an oven and heated to a stabilized temperature of plus 50 degrees Celsius (C) (plus 122 degrees Fahrenheit (F)) plus or minus 5 degrees C (plus or minus 9 degrees F).

3.6 Foam application. The application of the foam shall be as follows:

3.6.1 Mixing. After the mold and the part have been temperature stabilized as specified in 3.5.3, the foam components shall be mixed in accordance with MIL-F-47095.

3.6.2 Pouring. When mixing has been completed, the mold shall be filled with the liquid foam mixture to approximately 50 percent of the volume. Accurate quantities can only be determined through experience and the size and configuration of the mold and part.

3.6.2.1 Technique. The liquid foam mixture should be poured evenly over the entire area of the mold. The pouring shall be done as quickly as possible due to the rapid rate of rise while taking precaution to exclude voids and maintaining a minimum overflow.

3.6.2.2 Part insertion. The part may be inserted, positioned and fastened into the mold prior to pouring the liquid foam. If the part is not inserted, positioned and fastened prior to pouring, part insertion shall be accomplished within 10 seconds after pouring.

3.6.3 Curing. Upon completion of the pouring as specified in 3.6.2, shall be placed on the mold and it shall then be cured in accordance with MIL-F-47095.

3.7 Mold release. When the foam has cured, the mold shall be removed from the part by cutting the cured foam which extends through the vent ports and gently separating the part from the mold.

3.8 Appearance. The cured foam shall be evenly distributed, surrounding all components or filling all small cavities without being tacky to the touch.

3.8.1 Surface hardness. The surface skin of the cured foam shall be firm to the touch without soft spots. Soft spots may be reworked in accordance with 3.10.

3.8.2 Surface blemishes. Surface blemishes shall not be greater than 0.190 inch in depth and 0.50 inch in diameter or shall not expose

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more than 33 percent of a component's surface area. Surface blemishes consist of inclusions, blowholes and extensive discolorations. Rework shall be permitted (see 3.10).

3.9 Trimming. The trimming of the cured foam shall be done with a suitable sharp instrument and shall be done to size in accordance with Engineering Drawing.

3.10 Rework. Rework (refoaming) shall be permitted when surface blemished exceed the size as specified in 3.8.2 or when soft spots (3.8.1) are found on the surface and shall be performed in accordance with the following.

3.10.1 Preparation. The area to be reworked shall be gently cut out with a suitable sharp instrument. The resulting void from the cut need not be smooth.

3.10.2 Application. Liquid foam mixture shall be applied into the cut-out areas to fill them approximately 50 percent. This foam may be cured at room temperature and then trimmed with a suitable sharp instrument.

3.10.3 Coating. Reworked (refoamed) areas which have no skin may be coated using material conforming to MIL-I-46058, Type PUR.

3.11 Clean-up. Any residue left from the foaming action may be cleaned up using Acetone conforming to O-A-51 or Methyl-Ethyl-Ketone conforming to TT-M-261.

3.11.1 Release agent removal. Residual release agent may be removed from the mold with Naphtha solvent conforming to MIL-N-15178B.

3.12 Workmanship. The cured foam, when trimmed, shall be neat in appearance and free from foreign matter.

4. *QUALITY ASSURANCE PROVISIONS*

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

4.2 Quality Conformance Inspection.

4.2.1 Verification. It shall be verified that the age control limits of the material have not exceeded that specified in MIL-F-47095.

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4.2.2 Uncured foam inspection. Once per week or every 25 parts, whichever occurs first, the process shall be surveyed to verify compliance with the requirements of 3.5, 3.6, and 3.7.

4.2.3 Cured foam inspection. Each foamed part shall be visually inspected for conformance to 3.8.

4.2.4 Rework. Where rework is required in accordance with 3.10, the part shall be re-inspected upon completion for conformance to 3.8.

5. PREPARATION FOR DELIVERY

This section not applicable to this specification.

6. NOTES

6.1 Intended use. The intended use of the procedure outlined in this specification is for the encapsulation of printed circuit board assemblies.

6.2 Ordering data. Procurement documents should specify the following:

Title, number and date of this specification.

6.3 Handling precautions. Polyurethane foams and ketones release toxic fumes which are harmful to the eyes and skin. Proper ventilation and handling during application will minimize the dangers in handling these products.

6.4 Supersession data. This specification includes the requirements of Missile Interim Specification MIS-13268, dated 7 June 1967 and Amendment 1, dated 29 November 1967.

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