SECTION 2
CHAPTER 11
ELECTRIC CONNECTOR SEALING COMPOUND

INTRODUCTION

1. Sealing compound is used to moisture-proof and reinforces the wiring connected to the backs of electric connectors against failure caused by vibration and lateral pressure which fatigues the wire at the solder cup. This process is commonly called potting. The sealing compound protects electric connectors from corrosion, contamination, and arcing by excluding moisture, and other contaminants.

2. This chapter describes the potting compounds used on aircraft electric connectors, and gives instructions for preparing and storing the compounds. Instructions for potting MS electric connectors are detailed in Section 2, Chapter 10.

REFERENCE SPECIFICATIONS

3. The following specifications are applicable to electric connector sealing:

- MIL-PRF-8516 Sealing Compound, Synthetic Rubber, Electric Connectors and Electric Systems, Chemically Cured
- MIL-PRF-23586 Sealing Compound (With Accelerator), Silicone Rubber, Electrical
- MIL-M-24041 Moulding and Potting Compound, Chemically Cured, Polyurethane
- SAE AMS-DTL-23053 Insulation Sleeving, Electrical, Heat Shrinkable

DESCRIPTION

4. Sealing compound in accordance with military specification MIL-PRF-8516 is a two-part polysulfide synthetic rubber compound, consisting of a base and an accelerator (curing agent), packaged together. This compound is used to seal connectors located in areas where the ambient temperature does not exceed 85°C. Sealing compound in accordance with military specification MIL-PRF-23586, silicone rubber compound, consists of a base and an accelerator (curing agent). This compound is used to seal connectors in areas where the ambient temperature exceeds 85°C, but does not exceed 230°C.
PREPARATION OF SEALING COMPOUND

Preparing Frozen Pre-Mixed Sealants

7. Remove the frozen, pre-mixed sealant from the deep freeze and bring its temperature to room temperature before use by warming with compressed air on the outside of the container. Never use heat to raise the sealant temperature. Utilise frozen, pre-mixed sealant as soon as possible after removal from the deep freeze because of a significant reduction in work life (approximately 50 percent).

Hand Mixing Procedure

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>The accelerator contains toxic compounds. Use in a well ventilated area. Avoid eye and skin contact. Use personal protective equipment, rubber or polyethylene gloves and approved eye protection. Clean hands thoroughly after use.</td>
</tr>
</tbody>
</table>

8. Paired containers of base compound and accelerator shall be mixed as follows:

a. Remove lid from accelerator container and stir contents slowly into a smooth creamy paste with a clean spatula, wooden tongue depressor, or putty knife.

b. Remove top from the base compound container and stir contents until material has a smooth texture. This is necessary to recombine material that may have settled in storage.

c. Combine accelerator and base material and thoroughly agitate or mix until no accelerator streaks or traces of unmixed material are visible. Mix slowly, do not beat or whip; fast mixing may cause excessive amounts of air to become trapped in the compound. Mixing normally requires five to eight minutes. Continued scraping of the sides and corners of the bottom of the container will ensure complete mixing.

d. For base compound and accelerator supplied in bulk, weigh out the desired amount of base compound and the related specified amount of accelerator in separate containers. Follow the manufacturer's instructions carefully. Combine the accelerator and the base material and thoroughly agitate or mix in such a manner as to minimise the entrapment of air until no accelerator streaks or traces of unmixed material are visible. This normally requires five to eight minutes. Continued scraping of the sides and corners of the bottom of the container will ensure complete mixing.

e. Determine if mixing is complete by spreading a drop of the mixture very thinly on a piece of white paper with a knife blade or similar instrument. Close examination should not reveal any specks or streaks. Do not mix the sealant beyond the point where tests show the accelerator to be thoroughly mixed into the base compound.

f. When the mixing procedure has been completed, the sealant is ready for use and may be poured directly into the connector (primed in accordance with the manufacturer's instructions) to be sealed. For details of connector sealing, see Section 2, Chapter 10.

9. Mechanical mixing should be done at 15°C or lower to prolong the working life of the sealant. The procedure is as follows:

a. Hand mix the accelerator as described in Para 8. A paint shaker vibrating machine may be used if available. Shake for five to seven minutes.

b. If the base material is packaged in a metal container, cut off the top of the container using a mechanical can opener. This should leave a smooth wall without any burr at the top of the can.

c. Clamp base material container securely to drill press geared to 50 RPM minimum to 90 RPM maximum. Insert a mixing paddle fashioned from a drill rod and wire.

d. Start drill press motor and slowly lower mixing paddle into the base compound to recombine any material that may have settled.

e. Scrape all accelerator from its container and place it in the base material. Start drill press motor again and mix slowly for approximately two minutes. Stop machine, raise paddle, and scrape container walls as clean as possible. Start the drill press and lower the mixing paddle again and continue mixing for an additional three minutes.

f. Make thin spread of sealant on white paper as described in Paragraph 8, step e. If necessary, continue mixing in two-minute cycles followed by paper test until no traces of unmixed material are visible. The sealant is then ready for use.

g. If the mixed compound is not to be used at once, store in accordance with instructions in Paragraph 11.
Storage of Unmixed Sealing Compound

10. Store base compound and accelerator in a cool place, preferably under refrigeration. Shelf life for MIL-PRF-8516 and MIL-PRF-23586 compounds is approximately six months when stored below 24°C and can be extended to one year when stored at 7°C or below.

CAUTION
Do not store sealing compound at temperatures above 27°C. Keep base compound and accelerator together in the carton as supplied. Note manufacturing date stamped on carton and use oldest material first.

NOTE
Do not use sealing compound which has exceeded normal shelf life unless it has been tested by an appropriate laboratory to evaluate its acceptability for further use.

Storage of Mixed Sealing Compound

11. Mixed MIL-PRF-8516 potting compound can be stored in cartridge tubes for periods of 30 to 60 days provided the filled tubes are quick-frozen immediately after mixing and are stored at -40°C. Quick-freezing and thawing of the filled tubes should be done in accordance with the manufacturer’s instructions. Freezing by slow cooling in air is not recommended since it reduces the mixed storage life. Mixed MIL-PRF-23586 potting compounds usually have shorter storage life than MIL-PRF-8516 compounds after quick-freezing; the storage life of quick-frozen MIL-PRF-23586 potting compounds is usually less than three weeks at -40°C. In general, extended storage of mixed, frozen potting compound shortens pot life and cure time after thawing. The method to determine whether the frozen compound is suitable for use is to thaw the material; if it is still pourable and has sufficient pot life remaining for application purposes, it can be considered satisfactory.

CAUTION
Mixed compound in tubes should not be stored in dry ice since the material will absorb carbon dioxide and cause sponging or porosity.

Dispensers for Sealing Compound

12. Potting compound once mixed should be immediately poured into dispenser tubes made of polyethylene, TFE, or aluminium. If necessary to store mixed compound in accordance with Paragraph 11, the compound should first be poured into the final dispenser tube.

PREPARATION OF FLUOROCARBON INSULATED WIRE FOR POTTING

13. The following types of insulated wire must be specially prepared prior to potting regardless of the type of sealant to be used: polytetrafluoroethylene (PTFE) or fluorinated polyethylene propylene (FEP). The preferred method is to etch the insulation with fluorocarbon compound. (See Paragraph 16)

14. An etching compound currently available is Tetra-Etch.

15. MIL-PRF-23586 silicone rubber sealant will require a primer application to all metal surfaces in addition to the etched fluorocarbon surfaces prior to potting. When using MIL-PRF-8516 sealant, prime and/or pre-coat when recommended in the manufacturer’s instructions.

Etching Method

WARNING
Personnel engaged in cleaning and etching operations should use appropriate personal protective equipment.

WARNING
Etching vapours are toxic. Ensure Adequate ventilation. If etchant solution contacts the skin, Neutralise with butyl alcohol and flush immediately with water. Avoid direct contact of the etchant solution with water, chlorinated hydrocarbons, and carbon dioxide. Any spillage of etchant solution should first be neutralised with butyl alcohol before washing with water. Etchant solution is highly flammable and should be kept away from open flames.
CAUTION
Sodium in the etchant solution reacts with oxygen, moisture, and carbon dioxide, and exposure to air affects the solution strength. Etchant that has deteriorated badly will appear as a yellow or white solution. The nominal colour of a fresh solution is dark bluish-black. Etching solution loses its normal dark colour as its potency reduces.

CAUTION
Chemical etches should be applied only to TFE and FEP insulations. Contact with other types of insulation should be avoided.

16. Etching wire to provide a bondable surface shall be completed prior to attachment to the connector, as follows:
   a. Clean the bonding surfaces by scrubbing with clean safety solvent and immediately wipe with a clean dry cloth.
   b. Dip the ends of the wire, at least 3mm above the anticipated potted level, in a fresh etchant solution for ten to thirty seconds. If the wire cannot be conveniently immersed, fresh solutions may be brushed on the bonding surfaces to obtain desired etching.
   c. After dipping, neutralise the solution on the wire with butyl alcohol and clean off residue by wiping with a clean cloth wet with acetone.
   d. A properly etched surface will have a brown to deep brown colour.

17. Carry out a quality control check as follows:
   a. Uniform colour of etched wires is desired.
   b. A colour comparison may be used with samples previously etched to within the acceptable colour range. The individual wires within the typical bundle may vary in colour within this range.
   c. Every precaution shall be taken to ensure that etchant or water does not come in contact with a connector assembly or pin.
   
   d. Before any etchant is brought into an aircraft, cover a sufficient section below the area to be treated with heavy grade polyethylene and, in turn, cover this with cloth. Any flowing of etchant (if spilled) across the polyethylene will be eliminated.
   e. If etchant is dripped or spilled on material other than the polyethylene cover, wipe it up immediately with a soft lint-free cloth.

Shrink Tube Method
18. An alternate to etching is to use heat shrink tubing as follows:
   a. Select tubing from Table 11–1 that has an unrestricted shrinkage that is at least 20% smaller than the outside diameter of the wire being used.
   b. Shrink a section of the tubing to the portion of individual wire insulation that is to be encased in potting compound. Tubing should extend approximately 9.5mm beyond the anticipated potting level.

PR-1547 (MIL-M-24041) MOULDING AND POTTING COMPOUND

| NOTE |
| PR-1547 must be prepared under controlled conditions as described below. |

Description
19. PR-1547 sealing compound is a two component polyether polyurethane system consisting of a prepolymer and a curing agent, before mixing. These compounds are flexible cold-flow and cold-resistant materials with excellent electrical properties and are intended for use in a sea-water environment. This compound will adhere to metal, rubber, or polyvinylchloride, and may be used for sealing and reinforcing electrical connectors, wiring, and other electrical apparatus. This compound is used to seal connectors located in areas where the temperature range is -62°C to 150°C.
### Table 11–1 Shrinkable Tubing

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<th>Military Part Number</th>
<th>As Supplied I.D. Min. (mm)</th>
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<td>19.3</td>
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#### Frozen Pre-Mixed Cartridges

**CAUTION**

Thawing time and temperature must be controlled closely to obtain the maximum application life. Application life will be reduced by an increase in either the thawing time or temperature. An incomplete thaw will result if thawing time or temperature is reduced.

#### Mixing Instructions

**NOTE**
The base compound absorbs moisture from the air. Do not open containers until ready to use.

21. For dense void-free compounds, it is recommended that the material be degassed prior to application. For small quantities, the material may be degassed in a standard laboratory dessicator connected to a vacuum pump. Larger quantities may be degassed in standard volume equipment. Instructions are as follows:

a. Prolonged storage of the base compound below 18°C will result in thickening. The base compound may be liquefied by warming to 82°C for approximately two to three hours and stirring thoroughly.

b. The accelerator thickens at ambient temperatures. Warm the accelerator to 94°C to 99°C. Stir occasionally until a homogeneous mix results.

**WARNING**
Avoid inhalation of vapours resulting from heating of accelerator. Conduct operation only in a well ventilated area.
c. Cool the base compound and the accelerator to 21°C to 27°C. Combine components and mix thoroughly. A wooden paddle must not be used due to the high moisture content of wood.

d. Place freshly mixed material in a container approximately two times the volume of the mixed material and degas under a vacuum of 3 millimetres of mercury or less for a period of 5 to 15 minutes or until foaming subsides. After this, the material is ready to use. If smaller quantities are desired, mix 100 parts base compound with 26 parts accelerator, using procedure outlined in the above paragraphs. It should be noted that when the base compound has been exposed to atmospheric moisture, it may chemically react and, further, foam and solidify. It is recommended that a blanket of inert gas be used on all base compound containers if small quantities are utilised.

CAUTION
After mixing the base compound and the accelerator, all subsequent operations should be expedited to minimise the reduction in application life.

Curing Time

22. PR-1547 may be cured at either room temperature or at elevated temperatures. PR-1547 cures to a firm condition in 24 hours at 25°C and in 1-1/2 to 2 hours at 82°C. PR-1547 reaches ultimate hardness after five days at 25°C or six hours at 82°C. When required, faster curing periods can be obtained by using cure temperatures of 94°C to 99°C.

Storage Life

23. When stored at temperatures below 27°C in original unopened containers, the storage life of PR-1547, supplied in two-component kit form, is six months. Pre-mixed frozen PR-1547 has a storage life of at least 7 days when stored at -29°C and a minimum storage life of 28 days when stored at -68°C.

Surface Preparation

24. Before applying PR-1547 potting compound, prepare the surface as follows:

a. Cleaning. To obtain good adhesion, PR-1547 should be applied only to clean, dry surfaces. Surfaces may be cleaned with an oil-free solvent using a small brush or a clean, oil-free cloth.

b. Application of Primer. Primers should be used for optimum adhesion and moisture resistance. The following surface preparations are recommended:

   1. Metal. PR-420-HTC is designed for metal surfaces. A thin film of primer is applied to the clean, dry surface.

   2. Neoprene. PR-1523M is designed for neoprene surfaces. For some neoprene formulations, buffing with an abrasive is sufficient. Otherwise, after thoroughly buffing, apply a coat of PR-1523M to the clean, dry surface.

   3. Polyvinyl Chloride. PR-1543 is designed for polyvinyl chloride surfaces. When a primer is required, apply a thin coat PR-1543 to the clean, dry surface.