

MIL-STD-2098(AS)

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MILITARY STANDARD
ORDNANCE PREPARATION AND APPLICATION
OF INTUMESCENT SHEET, TYPE III.



FSC 8010

MIL-STD-2098(AS)

**DEPARTMENT OF DEFENSE
WASHINGTON, DC 20381**

Ordnance Preparation and Application of Intumescent
Sheet, Type III.

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1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Engineering Specifications and Standards Department (ESSD) Code 93, Lakehurst, N.J. 08733 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FOREWORD

1. One of the most significant problems contributing to safety hazards to NAVAIR ordnance is the early detonation caused by intense heat from a fuel fire. The application of an intumescent sheet around an ordnance item will extend the firefighting time thereby providing a better safety factor to both personnel and equipment.

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1. SCOPE

1.1 General. This standard provides general instruction for the preparation and application of an intumescent sheet on ordnance items.

1.2 Classification. The intumescent sheet shall be of the Type III, as described in MIL-C-81945(AS).

2. REFERENCED 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 standard to the extent specified herein.

SPECIFICATION

FEDERAL

TT-L-50	Lacquer, Nitrocellulose, Acrylic and Acrylic-Butyrate, Aerosol (in Pressurized Dispensers)
PPP-T-680	Tape, Pressure-Sensitive Adhesive; Packaging and Packing of
TT-R-251	Remover; Paint (Organic Solvent Type)
TT-M-261	Methyl-Ethyl-Ketone, Technical

MILITARY

MIL-P-23377	Primer Coatings, Epoxy-Polyamide, Chemical and Solvent Resistant.
MIL-C-81945(AS)	Coating Compounds, Weapon Insulation. Intumescent

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

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3. DEFINITIONS (not applicable)

4. GENERAL REQUIREMENTS

4.1 Application. This document is applicable where Type III intumescent coating is applied for added protection of ordnance items in a fuel fire environment.

4.2 Quality assurance inspection. Inspections shall be performed by Quality Assurance Inspectors to determine that the requirements of this document are met in preparation of the ordnance item and material, conformance of materials, application, and workmanship of the completed item.

4.3 General information on application of intumescent sheet. Close adherence to this standard is vital to assure proper application and to provide a high quality end product. Satisfactory performance of an epoxy adhesive and intumescent sheet system is dependent upon properly prepared surfaces and the careful application of materials. The accomplishing activity shall insure that:

- a. Surfaces to be coated shall be free of dirt, oil, grease, silicone, salt deposits, moisture and other surface contaminants.
- b. The intumescent sheet is applied as soon as practical after cleaning to prevent contamination of the surface.

5. DETAILED REQUIREMENTS

5.1 Materials. The following list of materials are required to accomplish this procedure:

- a. Primer, strontium chromate, MIL-P-23377, Type I.
- b. DeVilbiss Model JGA spray equipment (or equal) or brush, paint, 3".
- c. Flexible epoxy adhesive, 3-M 2216 Clear Amber or equal.
- d. Intumescent sheet material, MIL-C-81945(AS) Type III.
- e. Putty knife, 3" blade.

- f. Wet film thickness gage, range .002 to .003 inch min.
- g. Dry film thickness gage, range .0006 to .001 inch min.
- h. Velostatic bag 10 inch dia. .003 to .006 inch thick material, or equal (Anti-static).
- i. Vacuum pump (capable of obtaining a minimum vacuum of 6-10 inches of mercury) and manifold assembly.
- j. Paint stripper, TT-R-251 Type III Class A.
- k. Abrasive blasting equipment.
- l. Solvent, TT-M-00261.
- m. Tape, adhesive, PPP-T-680, Type III, Class I.
- n. Paint, stencil marking, aerosol pack, TT-L-50, flat black.
- o. Paint, clear lacquer, aerosol pack, TT-L-50.
- p. Oven, thermostatically controlled (54 \pm 3 degrees centigrade).

5.2 Ordnance preparation. Remove all items (fuzes, detonation assemblies, armament cable assemblies, etc.) from the ordnance item in accordance with the applicable documents. Mask all openings that are not to be permanently coated.

5.2.1 Ordnance information and identification. Record all information printed on the ordnance item. This information shall accompany the ordnance item through the process for later copying to the outer surface of the newly coated item.

5.2.2 Type of paint. Determine the type of paint present on the ordnance item and the type of surface preparation required to remove it.

5.2.3 Paint stripping. Strip paint from all surfaces of the ordnance item by using chemical strippers, abrasive blasting or by mechanical scraping. After cleaning, wipe surfaces with methyl-ethyl-ketone to remove any residue.

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CAUTION: Personnel preparing surfaces shall wear impervious gloves and an approved organic vapor respirator. The solvents shall be contained in an approved safety container.

5.3 Application method. Pressurized spray equipment or brush shall be used to apply primer to the ordnance item. The first coat of primer shall be applied to all surfaces within one hour after the final solvent wipe.

5.3.1 Sprayer. A DeVilbiss Model JGA or equal with air pressure regulator valve attached to the gun shall be used.

5.3.2 Hoses. Air supply hoses shall be clean at the start of primer application. An in-line filter shall be placed on the air supply hose to the pressure pot.

5.3.3 Spray tests. Test spray equipment assembly by using normal shop procedures. Perform the following tests before starting work on the ordnance.

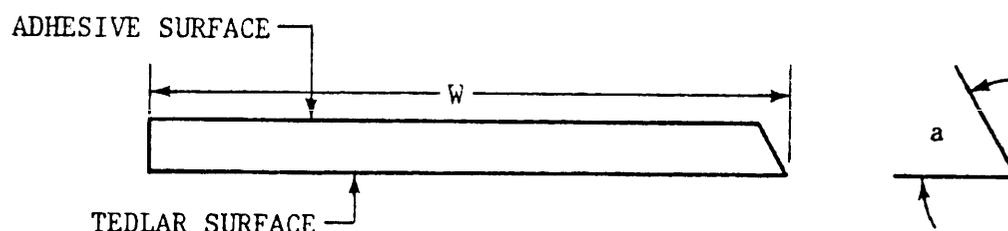
- a. Adjust spray pattern to ensure that the spray gun is properly atomizing the primer. The spray gun should be held 18 inches from a clean sheet of cardboard (12 inches by 24 inches). A short (1 second) application shall be made and the spray obtained shall be observed.
- b. The equipment shall be adjusted until a uniform pattern with no heavy spots is obtained. Do not use equipment that is not capable of producing a uniform spray pattern. The equipment must be free from leaks, splatters and other spray defects.

5.3.4 Primer application. Apply primer, MIL-P-23377 to obtain a final dry film thickness of .0006 inch to .0009 inch.

5.3.5 Curing. Allow primer to dry approximately 16 to 24 hours at 15 to 27 degrees centigrade before continuing coating operations.

5.4 Cutting of the intumescent sheet. Prepare the primed ordnance item for vacuum bagging by plugging, if necessary, both ends with wooden or foam type plugs to prevent damage to the vacuum bags and to protect the ends of the sheet material during curing time. Measure the item to be coated and determine the size of sheet required. Cut the

overall length of the sheet longer than the ordnance item to allow for the adjustment of the gap referenced in paragraph 5.4.3. Cut the sheet shorter than required in the circumferential dimension to provide a gap of $.015 \pm 0.005$. One edge of butt joint should be cut perpendicular to coating surface with opposite edge tapered as shown in Figure 1.



$W =$ circumference of sheet material $+0.000$
 -0.020

$a =$ Taper angle to be determined for each component diameter to result in true butt joint on the ordnance item.

FIGURE 1. Butt joint.

5.4.1 Applying adhesive. Mix adhesive following the manufacturer's directions. Using a putty knife, or suitable tool, apply a uniform layer of adhesive, .002 inch to .003 inch thick over the entire outer surface of the ordnance item. Apply a uniform layer of adhesive, .002 inch to .003 inch, over entire inner surface of the sheet material. Measure adhesive thickness using a wet film thickness gage.

5.4.2 Intumescent sheet preparation. Place the cut intumescent sheet (see 5.4) in an oven maintained at 54 ± 3 degrees centigrade to soften sheet and increase its flexibility (approximately 5 to 7 minutes).

5.4.3 Applying intumescent sheet. Wrap the warm sheet around the ordnance item while the sheet is still flexible enough to conform to the ordnance item surface without cracking. Position the mating edges of the longitudinal seam at the top vertical centerline. Slide one mating edge relative to the other so that the maximum gap along the top vertical centerline will be no greater than .020 inch at any point. Temporarily secure the edges with adhesive tape.

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5.5 Applying vacuum to ordnance item. Place the velostatic bag over the ordnance item and tightly seal it to the vacuum manifold base. Tape or clamp the top of the bag to obtain a vacuum tight seal.

5.5.1 Vacuum pressure. Apply a minimum vacuum of 6 to 10 inches of mercury and maintain this vacuum throughout curing of the adhesive.

5.5.2 Curing time. After 16 to 24 hours curing at 15 to 27 degrees centigrade, release the vacuum and remove the ordnance item from the vacuum bag. No voids shall exist along the top vertical centerline.

5.5.3 Trimming intumescent sheet. Trim excess intumescent sheet material from the ends of the ordnance item.

5.5.4 Ordnance identification. Transfer the ordnance identification information (see 5.2.1), using TT-L-50 black lacquer to the outer surface of the newly coated item. The identification information shall be applied as shown on applicable engineering drawings. Cover the identification information with TT-L-50 clear lacquer.

5.6 Pre-packaging cure time. Maintain the coated ordnance item at 15 degrees to 27 degrees centigrade for a minimum of 48 hours prior to packaging or re-assembly.

Preparing activity:

Navy - AS

(Project 8010-N180)

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