

MIL-A-38267A
~~22 July 1971~~
 SUPERSEDING
 MIL-A-38267(USAF)
 3 August 1964

MILITARY SPECIFICATION

APPLICATION OF POLYURETHANE FUEL TANK COATINGS

This specification has been approved by the Department of the Air Force and by the Naval Air Systems Command.

1. SCOPE

1.1 This specification covers methods for applying polyurethane coatings to aircraft integral fuel tanks. The application of these coatings are suitable for use under local area Air Pollution Control Regulations.

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

TT-E-751	Ethyl Acetate, Technical, Organic Coatings Use
TT-I-735	Isopropyl Alcohol
TT-M-261	Methyl-ethyl-ketone (For Use in Organic Coatings)
TT-N-97	Naphtha, Aromatic

Military

MIL-S-4383	Sealing Compound, Topcoat, Fuel Tank, Buna-N Type
MIL-C-5541	Chemical Films and Chemical Film Materials for Aluminum and Aluminu Alloys
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-S-8802	Sealing Compound, Temperature-Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High-adhesion
MIL-C-18187	Coating, Protective, Application to Fabric Surfaces of Aircraft

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MIL-C-25769 Cleaning Compound, Aircraft Surface, Alkaline
Waterbase

MIL-C-27725 Coating, Corrosion Preventive, for Aircraft
Integral Fuel Tanks

(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. APPLICATION OF COATING

3.1 Methods of application. The fuel tank coating may be applied by brush or spray. The spray method is the preferred application. Brushing may result in an uneven coating thickness, but is adequate for areas that are inaccessible with spray equipment or where the use and subsequent cleaning of spray equipment is impractical.

3.2 Application equipment.

3.2.1 Standard spray gun. A standard spray gun, such as a DeVilbiss P-MBC-510, or equal, may be used. This gun can be used with a 704FX nozzle combination, using an approximate feed tank pressure of 5 to 12 pounds per square inch gage (psig) and an atomizing air pressure of approximately 100 psig, or a 45-G nozzle combination, using an approximate feed tank pressure of 5 to 12 psig and an atomizing air pressure of approximately 35 psig. (The feed tank pressures are approximate and will vary, depending on the length and diameter of the hose.) Pressure feed tanks shall be equipped with mechanical agitators to provide proper pigment suspension. Feed lines should be as short as practical to minimize stagnant fluid in the lines. Immediately after use, all equipment and lines shall be cleaned with a solvent such as methyl-ethyl-ketone.

3.2.1.1 It is extremely important that air supplied to the spray gun be free of any oil or water. Filtering for air or oil shall be done as close to the spray gun as practicable.

3.2.2 Brush. A fine camel-hair or hog-bristle brush shall be used for applying the coating by the brush method.

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3.3 Toxicity. Polyurethane coatings contain solvents and other components that are toxic if breathed or absorbed through the skin in excessive quantities. One component of the polyurethane coating, toluene diisocyanate (TDI), is also a sensitizing material. These materials can be used without causing hazards to personnel provided the general precautions specified hereinafter are observed. A bio-environmental engineer should be consulted to assure that the operations are being adequately controlled.

3.3.1 Protective clothing. Supplied air, full facepiece respirators with head cover shall be worn by personnel applying solvents, strippers, or coatings in confined areas (inside tanks, wings, etc.). Impermeable clothing, including gloves and boots, shall be worn whenever the job involves operations that may wet the clothing with a chemical. Where applications will not result in wetting the clothing, cotton clothing, head covers, and bot covers may be substituted for impermeable clothing.

3.3.2 Ventilation. Good, general ventilation shall be provided in all work areas to prevent the buildup of solvent vapor and TDI vapor. The use of dilution ventilation to control hazardous exposure is not considered practical. A minimum of 300,000 cubic feet of air shall be supplied to dilute to safe levels the volatile fractions in each gallon of polyurethane coating applied. (A minimum of 5,000 cubic feet of air per minute (cfm) shall be provided for each gallon of coating applied per hour; i.e., if a spray gun delivers 6 gallons per hour, dilution air shall be provided at a minimum rate of 30,000 cfm, for a total of 1,800,000 cubic feet of air per hour.) To control the exposure of personnel to toxic concentrations of coating solvent and TDI, local exhaust ventilation should be used. Mixing of the two components shall be done in an exhaust ventilated booth having a minimum face velocity of 200 feet per minute (fpm). When possible, wings, wing tanks, or other parts and components shall be coated in exhaust ventilated spray paint booths having a minimum face velocity of 125 fpm. In the absence of specific recommendations to the contrary by bio-environmental engineers, supplied air respirators and cotton coveralls, gloves, and head cover should be worn by persons applying coatings in exhaust ventilated booths. Where coating must be applied in wing tanks, local exhaust ventilation shall be supplied to the wing tank; and the person applying the coating shall wear the supplied air mask and protective clothing prescribed in 3.3.1. To prevent the buildup of toxic quantities of solvent and TDI, the first 24 hours of curing shall be accomplished in a well ventilated space.

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3.3.3 Safety procedures. Personnel should be checked by a medical officer prior to using this toxic material. The preplacement physical examination should focus special emphasis on the detection of chronic respiratory diseases and allergy.

3.3.3.1 The aircraft or fuel tank (when detached from aircraft) shall be electrically grounded during the coating operation in accordance with MIL-C-18187.

3.4 Cleaning and coating procedures. All cleaning and coating operations shall be conducted as follows in as clean and well-lighted environment as possible. Thoroughly wash the metal surface to be coated with alkaline water-base cleaner conforming to MIL-C-25769. Rinse thoroughly at least twice with warm water. Either (1) apply an anodic coating in accordance with MIL-A-8625, or (2) apply a chemical film conforming to class II of MIL-C-5541 by spray or brush to all parts. Allow the latter conversion coating to be in contact with the metal 3 to 4 minutes, then rinse with water and air dry. (A definite iridescent yellow color indicates a clean, well-prepared surface when the chromic acid type coating is used.) In either case scrub and rinse the surface to be coated with the solvent formulation of table I, cleaning small areas at a time. Wipe dry with a clean, lint-free cloth; do not allow solvent to air dry. Mix the two components of the coating (MIL-C-27725) using the ratio specified by the manufacturer, stir thoroughly, and apply the coating over the anodic or chemical conversion coating surface. Do not prepare more material than will be used in a 5-hour period, to allow for local temperature and humidity variations, even though the material has an 8-hour application life at 75°F and 50 percent relative humidity. Apply a coating of 0.8 to 1.0 mil by spraying with a light, double pass to barely cover the surface, or by brushing. For best application of the coating the temperature range shall be 70° to 90°F and the maximum relative humidity shall be 90 percent. Do not apply the coating under environmental conditions that can result in condensation of water on parts or structure being coated.

Table I. Solvent formulation

Ingredient	Specification	Percent by volume.
Aromatic naphtha	TT-N-97, Type I, Grade B	50
Ethyl acetate	TT-E-751	20
Methyl-ethyl ketone	TT-M-261	20
Isopropyl alcohol	TT-I-735	

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3.5 Ultimate cure. The coating will be tack-free in 4 hours under an approximate condition of 75°F and 50 percent relative humidity. Complete cure requires 14 days at 75°F and a relative humidity of at least 30 percent. Cure may be accelerated after a minimum of 48 hours at 75°F by heating at 120°F for 24 hours or at 140°F for 8 hours. Do not cure the coating at temperatures below 65°F as crystal formation may occur in the coating. The state-of-cure can be checked by rubbing a test spot with a gauze pad wet with methyl-ethyl ketone. Bare metal will not be exposed in 50 double strokes of the pad at moderate pressure when cure is complete.

3.5.1 Cure for JP-4 and aviation gasoline resistance. The coating will be cured sufficiently to allow contact with fuel by initially curing the coating 4 hours at a temperature of 70° to 90°F and a relative humidity between 30 and 90 percent and then subjecting the coating to one of the cure conditions shown in table II.

Table II. Cure time (in hours) chart for JP-4 and aviation gasoline resistance

Humidity (percent)	Temperature (°F)											
	65	70	75	80	85	90	95	100	105	110	115	120
20	392	228	98	73	58	47	42	37	34	31	29	27
45	376	212	90	65	47	35	27	21	17	13	10	8
65	344	184	84	56	39	28	21	16	12	9-1/2	7-1/2	6
90	240	124	55	32	20	14	10	7	5-1/2	4-1/2	4-1/4	4

3.6 Repair. Repair may be necessary because of damage by scratching, gouging, or abrasion. Such repair shall be made by lightly abrading the damaged and surrounding areas, being careful not to damage the anodic coating or chemical film, and cleaning with the solvent as specified in 3.4. Apply a new coating, overlapping the existing coating.

3.7 Use with sealing compound. If the coating is used in conjunction with the sealing compound conforming to MIL-S-8802, the coating may be applied to the bare metal either prior to or after application of the sealant. In either case the coating on the sealant shall be applied to a clean anodic or chemical conversion coating surface. If the coating is applied first, areas that are scratched or abraded during application of the sealing compound should be retouched with a coating, or a second final coating

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applied. Option may be exercised as to whether the coating in any case need be applied over the sealant itself. The maximum thickness of two coatings should be 2 mils and the maximum thickness of one coating should be 1 mil. If the coating is applied over the sealant, the sealant shall be cured to a tack-free condition prior to application of the coating. If the sealant has been cured for a considerable length of time prior to coating, the surface should be cleaned with solvent in accordance with 3.4. If the coating is applied first, it shall be cured for approximately 10 days and washed with a cleaner recommended by the coating manufacturer before applying the sealant. (See 4.2.)

3.8 Storage life. The storage life of the coating material is approximately 6 months when stored in the original unopened container at temperatures below 80°F. The material may become cloudy if subjected to temperatures below 65°F. To clear, heat the material to the temperature range of 120°F to 150°F. If cloudiness remains after heating, the storage life has been exceeded and the material should not be used.

4. NOTES

4.1 Intended use. This specification is intended primarily for use in the application of coating material conforming to MIL-C-27725 on surfaces of aircraft integral fuel tanks. Other applications are not excluded.

4.2 General properties of the coating. The coating conforming to MIL-C-27725 are two-part polyurethane materials that have been evaluated and found to withstand very stringent environments, typical but more severe than those likely to be encountered in service. This evaluation included aging in jet reference fluid, water, salt water, engine oil, hydraulic fluid, ferric chloride solution, and simulated microbial byproducts. Application properties such as viscosity, application life, drying time, and cure time are determined and controlled. Compatibility with other materials such as sealing compounds conforming to MIL-S-8802 and coatings conforming to MIL-S-4383 is assured. These precautions provide a coating that will produce as much protection against corrosion of metal surfaces as possible. Unless the coating is applied properly, failures could occur. The elimination of these application failures is the purpose of this specification.

4.3 Marginal indicia. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

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SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22-R255
<p>INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.</p>		
SPECIFICATION		
ORGANIZATION		
CITY AND STATE		CONTRACT NUMBER
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO (If "yes", in what way?)		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity - Optional)		DATE

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REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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