MIL-C-46157A(MR)
3 November 1983
SUPERSEDING
MIL-C-46157(MR)
14 February 1972

MILITARY SPECIFICATION

COATING COMPOUND, TEMPORARY PROTECTIVE FOR RETROGRADE MATERIALS

This specification is approved for use by the Army Materials and Mechanics Research Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers a temporary protective coating for use over aluminum or painted metal substrates. It is suitable for use under AIR POLLUTION REGULATIONS.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet
P-C-437 - Coating Compound, High Pressure (Steam) Cleaner.
TT-E-485 - Enamel, Semi-Gloss, Rust-Inhibiting.
PPP-P-1892 - Paint, Varnish, Lacquer and Related Materials; Packaging, Packing, and Marking of.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Director, US Army Materials and Mechanics Research Center, ATTN: DRXMR-SMS, Watertown, MA 02172 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

/ FSC 8030/

MILITARY

MIL-P-5425 - Plastic; Sheet, Acrylic, Heat Resistant.

STANDARDS

FEDERAL

Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing.

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

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings and publications form a part of this specification to the extent specified herein.

DEPARTMENT OF TRANSPORTATION

49 CFR (Code of Federal Regulations), Parts 100-199 - Department of Transportation Rules and Regulations for the Transportation of Hazardous Materials by Air, Motor, Rail and Water.

(Applications for copies of these regulations should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402)

3. REQUIREMENTS

3.1 Composition. The coating compound shall be a 100 percent water dispersed acrylic emulsion or a blend of acrylic polymers dispersed in alcohols and water combined with necessary additives to yield a product conforming to this specification. When tested as in section 4, the analysis shall conform to the requirements of Table 1 and 4.4.4.

3.2 Quantitative requirements. The coating shall conform to requirements in Table I when tested as in 4.4.

TABLE I. Quantitative requirements

Characteristics	Requirements	
	Minimum	Maximum
Total solids, percent by weight of coating	26	--
Pigment, percent by weight of coating	--	1.0
Vehicle solids, percent by weight of coating	25	--
Weight per gallon, pounds	8.3	--
Fineness of grind	7	--
Viscosity, No. 4 Ford Cup, seconds	20	200
Drying time, air dry		
Set to touch, minutes	--	30
Dry through, minutes	--	40
Dry hard, hours	--	24
Flash point, pensky-Martens Tester, °F.	93	--

3.3 Qualitative requirements.

3.3.1 Color. The color of the coating shall be transparent yellow or blue.

3.3.2 Condition in container. When tested as in 4.4.7, the coating shall show a minimum of foaming, shall be free of grit, seeds, skins, lumps, or livering and shall show no more pigment settling or caking than can be readily reincorporated to a smooth homogeneous state. In a freshly opened package, there shall be no rusting of the container and no offensive, disagreeable, or putrid odor.

3.3.3 Accelerated storage stability. When tested as in 4.4.8, the coating shall show no coagulation, flocculation, discoloration and shall not increase or decrease by more than 15 seconds, from the original viscosity.

3.3.4 Application properties.

3.3.4.1 Brushing properties. When tested as in 4.4.9.1, the coating shall brush satisfactorily and dry to a smooth uniform film free of grit, seeds, streaks and flooding.

3.3.4.2 Spraying properties. When tested as in 4.4.9.2, the coating shall spray satisfactorily in all respects and show no running, sagging, or streaking. The dried film shall show no seeding, dusting, floating, wrinkling, pinholing, cratering or discontinuity.

3.3.5 Freeze-thaw stability. When tested as in 4.4.10, the coating shall show no coagulation, flocculation or discoloration and shall not increase or decrease by more than 15 seconds, from the original viscosity.

3.3.6 Dry film removability. When tested as in 4.4.11, the coating shall be completely removed.

3.3.7 Flexibility. A film of the coating tested as in 4.4.12, shall withstand bending without cracking or flaking.

3.3.8 Salt spray resistance. When tested as in 4.4.13, the coating shall show no more than 5 scattered blisters none larger than 1 mm. in diameter. After removal of the coating the surface shall show no more than a trace of pitting or corrosion.

3.3.9 Accelerated weathering. When tested as in 4.4.14, the coating shall show no cracking, checking, peeling or flaking and shall be completely removed when tested as in 4.4.11.

3.3.10 Craze attack on plastic. When tested as in 4.4.15 the panels shall show no crazing beyond 1/8 inch from either edge of the specimen.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 Sampling, inspection and testing. Unless otherwise specified, sampling, inspection and testing shall be in accordance with method 1000 of Fed. Test Method Std. No. 141.

4.3 Classification of tests. Testing under this specification shall be for the purpose of acceptance of individual lots. The right is reserved to make any additional tests deemed necessary to determine that the coating meets the requirements of this specification.

TABLE II. - Index

Tests	Test Method: Applicable method in Fed. Test Method Std. No. 141	Test Method: Reference Paragraph	Requirement Paragraph
Composition	4022	4.4.4	Table I, 3.1
Total solids	4041	---	Table I
Pigment content	4022	---	Table I
Vehicle solids	4052	---	Table I
Weight per gallon	4184	---	Table I
Fineness of grind	4411	---	Table I
Viscosity	4282	4.4.5	Table I
Drying time	4061	4.4.6	Table I
Flash point	4293	---	Table I
Color	4250	---	3.3.1
Condition in container	3011	4.4.7	3.3.2
Accelerated storage stability	---	4.4.8	3.3.3
Application properties	---	4.4.9	3.3.4
Brushing properties	4321, 2141	4.4.9.1	3.3.4.1
Spraying properties	4331, 2131	4.4.9.2	3 3.4.2
Freeze-thaw stability	---	4.4.10	3.3.5
Dry film removability	---	4.4.11	3.3.6
Flexibility	6221	4.4.12	3.3.7
Salt spray resistance	6061	4.4.13	3.3.8
Accelerated weathering	6152	4.4.14	3.3.9
Craze attack on plastic	---	4.4.15	3.3.10
Test panels	---	4.4.3	---

4.4 Test methods.

4.4.1 Test conditions. The routine and referee test conditions shall be in accordance with section 7 of Fed. Test Method Std. No. 141 except as otherwise specified herein.

4.4.1.1 Safety. Liquids having a flash point under 100°F are considered flammable. Care should be used to measure properties under controlled laboratory conditions. Information concerning regulations is found in 49 CFR (Code of Federal Regulations, Parts 100-199.)

4.4.2 The following tests shall be conducted in accordance with applicable methods of Fed. Test Method Std. No. 141 or as herein after specified.

4.4.3 Test panels. Panels shall be solvent cleaned 20 gage aluminum-alloy 2024 conforming to specification QQ-A-250/4. When painted panels are specified, they shall be coated to a dry film thickness between 0.0009-0.0011 inch with enamel conforming to specification TT-E-485 and air dried 48 hours. Panels shall be either 3 by 6 or 4 by 12 inches, as specified.

4.4.4 Vehicle. Dry a 1 to 2 gram sample of the coating compound in an aluminum dish having a flat bottom, in an oven at 105°C. for one hour. Strip off the resin film, cut into small pieces and soak for about 18 hours in absolute methyl alcohol in a stoppered flask. Reflux for 30 minutes, cool and filter through paper. Evaporate the filtrate on the steam bath to a low volume and obtain a dried film on a salt plate for infrared examination. The infrared spectrum shall show the resin to be one of the acrylic types illustrated in Figure 2.

4.4.5 Viscosity. Determine the viscosity as in method 4282 of Fed. Test Method Std. No. 141. Stir by hand avoiding any air entrapment.

4.4.6 Drying time. Draw down a film of the coating using a 0.0015 inch (0.0030 inch gap clearance) film applicator and determine drying time as in method 4061 of Fed. Test Method Std. No. 141 under referee conditions. Check for compliance with Table I.

4.4.6.1 Full hardness. Determine full hardness by spraying the coating to a dry film thickness between 0.0009-0.0011 inch on a 3 by 6 inch aluminum panel prepared as in 4.4.3. The film shall be considered to have reached full hardness when it is difficult to remove with a knife blade.

4.4.7 Condition in container. Determine package condition for acceptance testing in accordance with method 3011 of Fed. Test Method Std. No. 141. Observe for compliance with 3.3.2.

4.4.8 Accelerated storage stability. Place 7 ounces of the coating in a 8 ounce glass jar, seal and place in an oven at 125° ± 2°F. for one week. Allow to return to room temperature, mix thoroughly by hand and examine for compliance with 3.3.3.

4.4.9 Application properties.

4.4.9.1 Brushing properties. Apply the coating to a 4 by 12 inch panel using a 1-1/2 inch brush. Observe for brushing properties in accordance with method 4321 of Fed. Test Mehod Std. No. 141. Apply at a rate of approximately 250 square feet per gallon. Observe for compliance with 3.3.4.1

4.4.9.2 Spraying properties. Spray the unreduced coating on an aluminum panel to a dry film thickness between 0.0009-0.0011 inch keeping the spray gun 6-8 inches from the panel. Observe for spraying properties in accordance with method 4331 of Fed. Test Method Std. No. 141 for compliance with 3.3.4.2. For referee test use automatic application per method 2131 of Fed. Test Method Std. No. 141.

4.4.10 Freeze-thaw stability. Place 7 ounces of the coating in a 8 ounce can, seal and subject the coating to the following cycle: 16 hours at 0°F., 8 hours at room temperature. At the conclusion of four cycles mix the coating thoroughly with stirring and examine for compliance with 3.3.5

4.4.11 Dry film removability. Spray a film of the coating as in 4.4.9.2 on a 3 by 6 inch solvent cleaned and painted panel as in 4.4.3 and air dry 72 hours. Immerse the panels in a one percent by weight solution of the standard comparison compound in Specification P-C-437 for 15 minutes and then flush thoroughly with warm water. Observe for compliance with 3.3.6.

4.4.12 Flexibility. Determine the flexibility in accordance with method 6221 of Fed. Test Method Std. No. 141. Prepare a 3 by 6 inch panel as in 4.4.6.1 and air dry 72 hours. Bend over a 1/4 inch mandrel and observe for compliance with 3.3.7.

4.4.13 Salt spray resistance. Spray a film of the coating as in 4.4.9.2 on three 4 by 12 inch panels. Air dry 72 hours and then expose to 5 percent salt spray for 144 hours as in method 6061 of Fed. Test Method Std. No. 141. Do not score. Upon removal wash the panels gently in running water not warmer than 100°F. until free from any visible salt deposits and examine for compliance with 3.3.8. Strip the coating compound from the panels as in 4.4.11 and inspect the panels for pitting or corrosion.

4.4.14 Accelerated weathering. Prepare two 3 by 6 inch panels as in 4.4.11 and expose for 168 hours to accelerated weathering as in method 6152 of Fed. Test Method Std. No. 141 using a twin arc apparatus. Examine for compliance with 3.3.9.

4.4.15 Craze attack on plastic. Prepare six acrylic panels machined to 1 by 7 by 0.250 inches from plastic sheet conforming to MIL-P-5425, Finish A. Carefully remove the protective masking paper and adhesive. Wash with castile soap and warm water, rinse, and wipe dry with a lint free cloth. The panels shall be set up as cantilever beams as shown in figure 1 and stressed to 2400 psi. The formula for calculating load shall be as in figure 1. Ten minutes after the beams have been loaded, examine for crazing while still under load. Three of the panels under stress shall then be coated on the top side as in 4.4.9.2 and allowed to air dry overnight. Heat at 120° ± 2°F. for 24 hours. At the end of the exposure, remove the stress and strip the coating as in 4.4.11. Return the panels to stress condition and examine for compliance with 3.3.10.

4.4.16 Toxicity. The manufacturer shall certify that the coating is nontoxic to personnel under normal use conditons.

4.4.17 Packaging, packing and marking. The coating shall be inspected for compliance with the packaging, packing and marking requirements of section 5.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking. The coating shall be packaged, packed and marked in accordance with PPP-P-1892. The level of packaging shall be A or C, and the level of packing shall be A, B or C as specified (see 6.2). The coating shall be furnished in 1 quart or 1 gallon multiple friction top containers, in 5 gallon lug cover steel pails or in 55 gallon steel drums, as specified (see 6.2).

6. NOTES

6.1 Intended use. The coating compound covered by this specification is intended for the temporary protection of retrograde material whose surfaces are painted, plated or chemically treated. It should not be used on bare items other than aluminum, unless it is known that such materials will not be exposed to either salt laden, or hot moist atmosphere for extended periods.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Size of container required (see section 5).
(c) Level of packaging and packing required (see section 5).

6.3 The coating covered by this specification should be purchased by volume, the unit being one U.S. liquid gallon (3.8 liters) at 20°C. (68°F.).

Custodian:

Army - MR

Preparing activity:

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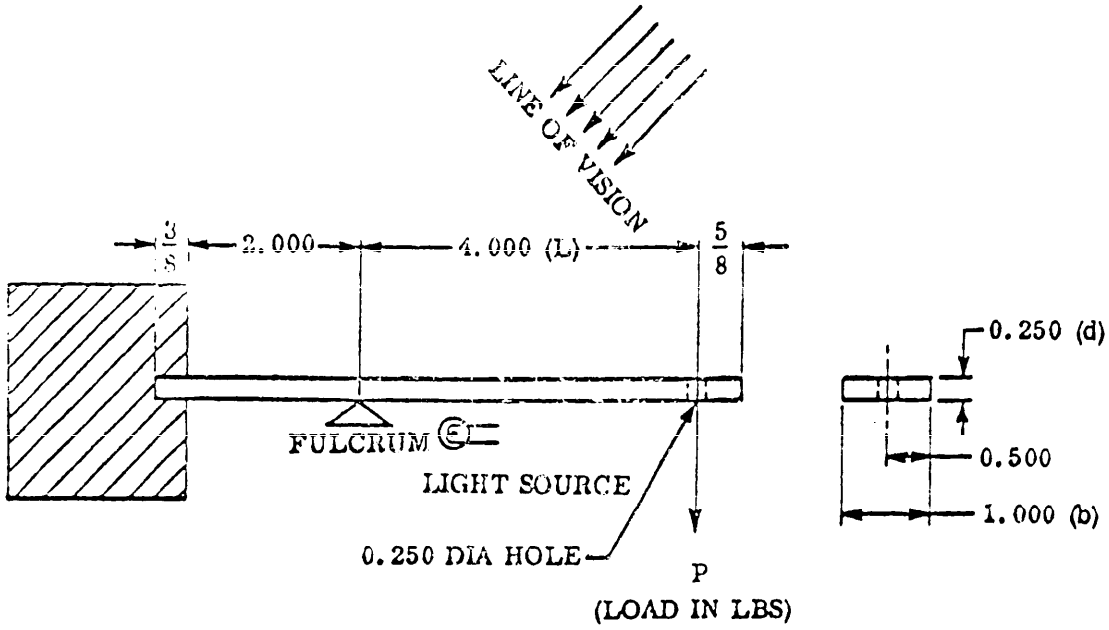

DIMENSIONS IN INCHES. TOLERANCES: DECIMALS, ±0.005, FRACTIONS, ±1/64

FORMULA FOR CALCULATING LOAD:

$P = \frac{Sbd^2}{6L}$ WHERE:

S = STRESS IN POUNDS PER SQUARE INCH
P = LOAD IN POUNDS
L = DISTANCE FROM FULCRUM TO LOAD IN INCHES = 4

b = WIDTH OF PANEL IN INCHES (MEASURED TO NEAREST $\frac{1}{1,000_1}$)
d = THICKNESS OF PANEL IN INCHES (MEASURED TO NEAREST $\frac{1}{1,000}$)

NOTE. TO PREVENT HEATING OF SPECIMENS, THE LIGHT SOURCE SHALL BE UTILIZED ONLY WHEN EXAMINING THE SPECIMEN FOR CRAZE.

FIGURE 1. TYPICAL STRESS CRAZING BEAM

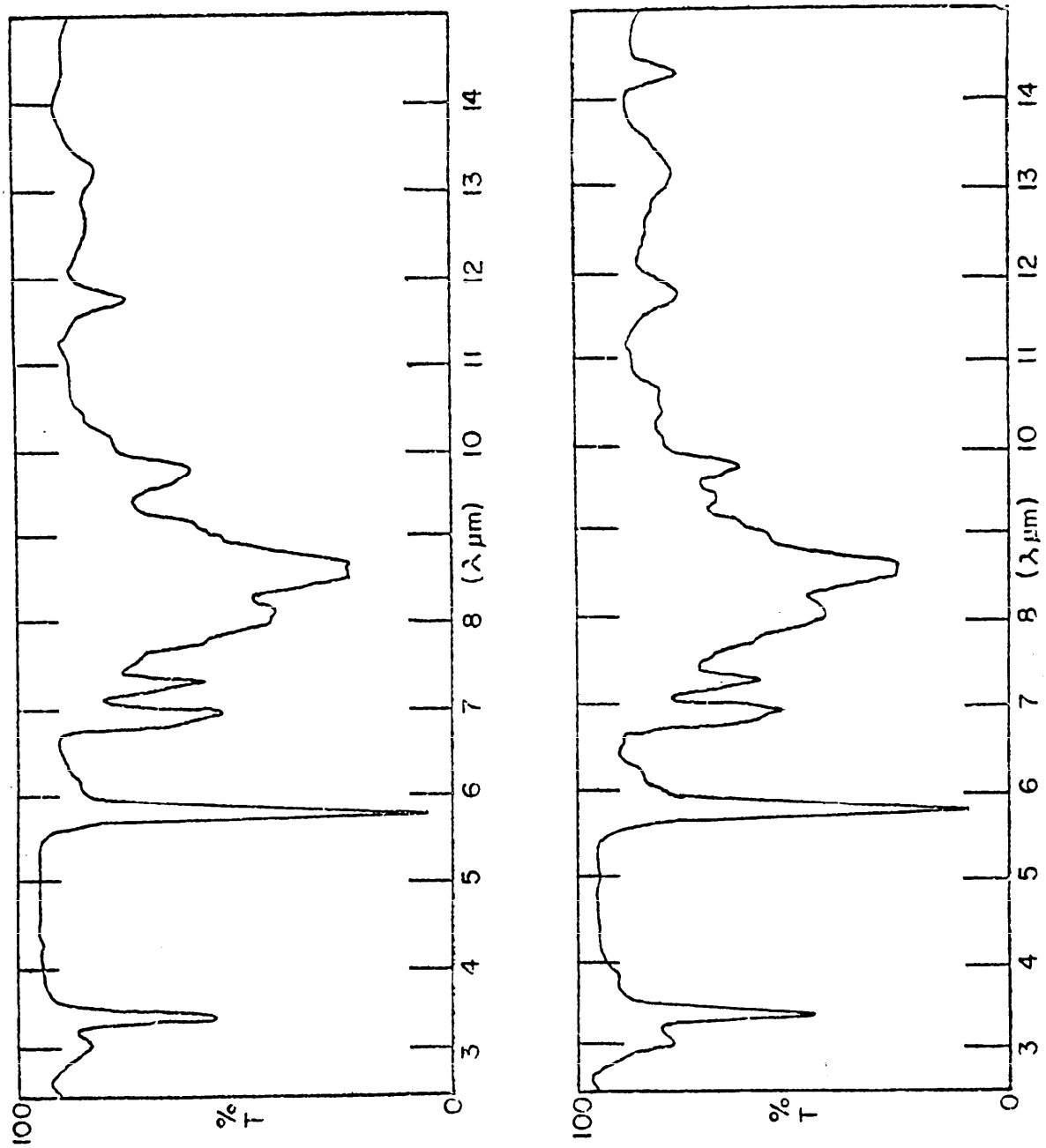

FIGURE 2

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5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

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