

NOT MEASUREMENT
SENSITIVE

MIL-PRF-23377H
30 April 2002
SUPERSEDING
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PERFORMANCE SPECIFICATION

PRIMER COATINGS: EPOXY, HIGH-SOLIDS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for corrosion inhibiting, chemical and solvent resistant, solvent-borne, epoxy primer coatings that have a maximum volatile organic compound (VOC) content of 340 grams per liter (g/L)(2.8 pounds per gallon [lb/gal]).

1.2 Classification. The primer coatings will be of the following types and classes, as specified (see 6.2):

1.2.1 Types. The types of primer coatings are as follows:

- Type I - Standard pigments
- Type II - Low infrared reflective pigments

1.2.2 Classes. The classes of primer coatings are as follows:

- Class C - Strontium chromate based corrosion inhibitors
- Class N - Non-chromate based corrosion inhibitors

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8010

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

| | | |
|---------------|---|---|
| MIL-C-5541 | - | Chemical Conversion Coatings on Aluminum and Aluminum Alloys |
| MIL-C-8514 | - | Coating Compound, Metal Pretreatment, Resin-Acid |
| MIL-A-8625 | - | Anodic Coatings, for Aluminum and Aluminum Alloys |
| MIL-PRF-23699 | - | Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number 0-156 |
| MIL-T-81772 | - | Thinner, Aircraft Coating |
| MIL-PRF-83282 | - | Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537 |
| MIL-PRF-85285 | - | Coating: Polyurethane, High-Solids |

STANDARDS

FEDERAL

| | | |
|-------------|---|--|
| FED-STD-141 | - | Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing |
| FED-STD-595 | - | Colors Used in Government Procurement |

(Unless otherwise indicated, copies of the above specifications and standards are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM-B117 - Salt Spray (Fog) Apparatus, Operating. (DoD adopted)
- ASTM-D1200 - Cup, Viscosity by Ford Viscosity. (DoD adopted)
- ASTM-D1210 - Fineness Of Dispersion Of Pigment-Vehicle Systems By Hegman-Type Gage. (DoD adopted)
- ASTM-D1296 - Solvents and Diluents, Volatile, Odor of. (DoD adopted)
- ASTM-D1640 - Organic Coating, Drying, Curing, or Film Formation of at Room Temperature. (DoD adopted)
- ASTM-D1649 - Strontium Chromate Pigment
- ASTM-D1849 - Paint, Package Stability of. (DoD adopted)
- ASTM-D2803 - Metal, Organic Coatings on, Filiform Corrosion Resistance of. (DoD adopted)
- ASTM-D3335 - Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy, Test for Low Concentrations of. (DoD adopted)
- ASTM-D3718 - Paint, Chromium in, by Atomic Absorption Spectroscopy, Low Concentrations of. (DoD adopted)
- ASTM-D3742 - 1,1,1-Trichloroethane Content
- ASTM-D3924 - Paint, Varnish, Lacquer, and Related Materials, Conditioning and Testing, Standard Environment for. (DoD adopted)
- ASTM-D3960 - Paints and Related Coatings, Determining Volatile Organic Compound (VOC) Content of. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

- ASQC-Z1.4 - Procedures, Sampling and Tables for Inspection by Attributes. (DoD adopted)

(Application for copies should be addressed to the American Society for Quality Control, P.O. Box 3005, 611 East Wisconsin Avenue, Milwaukee, WI 53201-4606.)

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SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

| | |
|--------------------|--|
| SAE-AMS1640 | - Compound, Corrosion Removing for Aircraft Surfaces |
| SAE-AMS-QQ-A-250/4 | - Aluminum Alloy 2024, Plate and Sheet. (DoD adopted) |
| SAE-AMS-QQ-A-250/5 | - Aluminum Alloy Alclad 2024, Plate and Sheet. (DoD adopted) |

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The primer coating furnished under this specification shall be a product that is authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Material. Materials used in the manufacture of the primer coating supplied under this specification shall be of such a quality as to produce products conforming to the requirements of this specification.

3.3 Toxicity. The primer coating supplied under this specification shall have no adverse effect on the health of personnel (see 6.9), when used for its intended purpose and with the precautions listed in 3.11.

3.4 Composition. The primer coating shall consist of two components, as follows:

Component A - a base component composed of epoxy resin and solvents

Component B - a curing agent containing polyamide or amine resin and solvents

Component B shall act as the curing agent for component A. The components shall be packaged separately and furnished as a kit (see 6.7.1). When the components are mixed in the proportions specified by the manufacturer, a primer coating meeting the requirements of this specification shall result. Chlorinated solvents, except for para-chlorotrifluoromethylbenzene or equal, shall be prohibited in the formulation of this primer coating. Incidental cadmium and cadmium compounds shall be not greater than one part per million (ppm). The non-volatile portion shall contain not more than 0.06 percent by weight of lead metal or lead compounds.

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3.4.1 Pigment.

3.4.1.1 Class C. Coatings containing strontium chromate conforming to ASTM-D1649 as the corrosion inhibitor, along with extenders and other pigments, shall be identified as class C.

3.4.1.2 Class N. Coatings containing non-chromium corrosion inhibitors, along with extenders and other pigments, shall be identified as class N. Incidental chromium content of class N shall be not greater than 5 ppm (see 4.5).

3.4.2 Volatile organic compound (VOC) solvent content. The VOC content of admixed primer coatings shall be not greater than 340 g/L (2.8 lb/gal). The resistivity of the solvents shall permit application of the coating by electrostatic spray application (see 4.5).

3.4.2.1 Thinner compatibility. The admixed primer coatings shall be compatible with thinner conforming to MIL-T-81772, type II (see 6.11).

3.5 Physical properties – components before mixing.

3.5.1 Fineness of grind. The fineness of grind of the pigmented component shall be 5 or greater on the Hegman scale (see 4.5).

3.5.2 Condition in container. Components A and B shall be free of grit, seeds, lumps, abnormal thickening or livering, and shall not show pigment flotation nor excessive settling. They shall mix to a smooth, homogeneous, and pourable condition. In addition, the containers shall exhibit no deformation (see 4.5.1).

3.5.3 Storage stability. The primer coating components, as packaged by the manufacturer, shall meet all requirements of this specification after storage for not less than one year (see 4.5).

3.5.4 Accelerated storage stability. The primer coating, as packaged by the manufacturer, shall meet all requirements of this specification after storage for 14 days (see 4.5.2). The container shall not become deformed or the lid shall not become unsealed during the storage period.

3.6 Physical properties - admixed components.3.6.1 Color.

3.6.1.1 Type I. The color of the admixed type I primer coating shall be the natural color of the corrosion inhibiting pigments used, except that tinting to a darker shade is permitted.

3.6.1.2 Type II. The color of the admixed type II primer coating shall be dark green or gray.

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3.6.2 Odor. The odor of the admixed coating, wet or dry, shall be characteristic of the solvents used (see 4.5).

3.6.3 Viscosity. Immediately after mixing components A and B, the maximum viscosity of the unthinned, admixed primer coating shall be 40 seconds through a #4 Ford cup (see 4.5).

3.6.4 Pot life. After mixing and storage at room temperature in a closed container (see 4.5) for 4 hours, the maximum viscosity of the unthinned primer coating from 3.6.3 shall be 70 seconds through a #4 Ford cup (see 4.5).

3.7 Physical properties - film.

3.7.1 Surface appearance. The admixed primer coating, applied to a vertical surface, shall not sag, run, or streak. The dried film shall have a smooth, uniform surface free of grit, seeds, craters, blisters, and other irregularities (see 4.4.1). No orange peel (wavy appearance) shall be evident when viewed from at least six feet away.

3.7.2 Drying time. The admixed primer coating shall be tack free within 5 hours and shall dry hard within 8 hours (see table II).

3.7.3 Lifting. There shall be no evidence of lifting or any other film irregularity after topcoating the admixed primer coating that has air dried for 5 hours (see 4.5.3).

3.7.4 Adhesion. The primer coating shall not peel when tested in accordance with 4.5.4.

3.7.5 Flexibility. The primer coating shall exhibit an elongation of not less than 10 percent when tested in accordance with 4.5.5.

3.7.6 Infrared reflectance (type II primer coating only). The total reflectance (specular and diffuse) of the type II primer coating, relative to barium sulfate, shall be not greater than ten percent throughout the range of 700 to 2,600 nanometers (nm) (see 4.5.6).

3.8 Resistance properties.

3.8.1 Water resistance. The topcoated primer coating shall withstand immersion in distilled water maintained at 49 ± 3 °C (120 ± 5 °F) for four days without exhibiting any evidence of wrinkling, blistering, or any other coating deficiency (see 4.5.7).

3.8.2 Corrosion resistance.

3.8.2.1 Salt spray. The primer coating, with and without a topcoat, shall not exhibit

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blistering, lifting of either coating, nor substrate pitting after exposure to a 5 percent salt spray for 2,000 hours. Class C primer shall exhibit no corrosion in the scribe (see 4.5.8.1).

3.8.2.2 Filiform. The topcoated primer coating shall not exhibit filiform corrosion extending beyond 6.35 millimeters (mm) (0.25 inch) from the scribe, and the majority of the filaments shall be less than 3.175 mm (0.125 inch) in length (see 4.5.8.2).

3.8.3 Solvent resistance (cure). The primer coating shall withstand 50 passes (25 back and forth rubs) by a cloth rag soaked in methyl ethyl ketone (MEK). Rubbing through to bare substrate constitutes failure of the primer coating to properly cure (see 4.5.9).

3.8.4 Fluid resistance. The primer coating shall withstand immersion for 24 hours in each of synthetic lubricating oil conforming to MIL-PRF-23699 and synthetic hydraulic fluid conforming to MIL-PRF-83282. Four hours after removal from the respective fluid, the coating shall not exhibit any softening, blistering, loss of adhesion, nor any other coating deficiency. Discoloration of the coating is acceptable and shall not be cause for rejection (see 4.5.10).

3.9 Working properties.

3.9.1 Mixing and dilution. The components of the primer coating, including thinner if required (see 6.11), shall homogeneously blend when mixed by a mechanical mixer in the volume mixing ratio specified by the manufacturer. Within one hour of mixing, the admixed coating shall not separate into visually distinct layers (see 4.5.11.1).

3.9.2 Application. The admixed primer coating shall be capable of being applied by conventional, airless, high volume, low pressure (HVLP), or electrostatic spray equipment. Application shall yield a uniform film with no runs or sags at a dry-film thickness of 15 to 23 microns (μm) (0.6 to 0.9 mil) (see 4.5.11.2).

3.10 Identification of material. Individual containers greater than one pint and cases of containers less than one pint shall be identified with the following information:

MIL-PRF-23377H, "Primer Coatings: Epoxy, High Solids" type I or II, class C or N
Component identification (as applicable):

Component A - base component or Component B - curing agent
Manufacturer's name and product number
Date of manufacture (month/year)
Batch number/net contents
VOC content in grams/liter
Mixing and thinning instructions

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3.10.1 Component containers. Component A and component B containers shall have the following warning:

“WARNING! FLAMMABLE.”

3.11 Precaution sheet. A printed precaution sheet with the following information shall be included with each kit:

PRECAUTIONS

- a. The surface to be coated must be clean (free of oil, dust, etc.).
- b. Spray equipment must be adequately grounded. Clean equipment immediately after use with thinner conforming to MIL-T-81772, type II.
- c. Mix only the amount of primer coating to be used within 4 hours.
- d. Always add component B to component A – NEVER THE REVERSE.
- e. Never mix coating or individual component from one vendor with that of another vendor.
- f. Apply over pretreated metal. On fiberglass-reinforced plastic, a prior coating of wash primer in accordance with MIL-C-8514 will facilitate stripping without damage to the fiberglass.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification inspection shall consist of all the inspections listed in this specification. The qualification inspection performed by the qualification laboratory (see 6.3) shall consist of a review for approval of the submitted manufacturer’s test report and subjecting the qualification test sample to examination and testing to determine conformance to all requirements in section 3. The qualification test sample shall consist of not less than one quart of each component of the primer coating. The samples shall be legibly identified (see 6.3.1.1).

4.3 Conformance inspection.

4.3.1 Primer coating inspection. The conformance inspection shall consist of all the tests specified in 4.5, with the exception of storage stability (see 3.5.3), accelerated storage stability (see 3.5.4), and corrosion resistance (see 3.8.2.1 and 3.8.2.2). There shall be no failures (see 6.5). Samples for tests shall consist of one complete unopened kit selected at random from each batch. Containers shall only be opened when being tested.

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4.3.2 Visual inspection of filled containers. Samples shall be selected at random from each lot (see 6.6) in accordance with ASQC-Z1.4, inspection level S-2. The lot size for this inspection shall be the number of kits fully prepared for delivery. The selected samples shall be examined for container fill, proper location, and completion of item identification (see 3.10), warning statements (see 3.10.1), and the precaution sheet (see 3.11). There shall be no defects (see 6.5).

4.4 Test panels. Test panels shall be prepared under laboratory conditions (see 4.5). Test panels shall be constructed of aluminum alloy. Alloy composition and pretreatments of test panels shall be in accordance with table I. Unless otherwise specified in the test method, the primer coating shall be applied in accordance with 4.4.1 and the topcoat, when required, shall be applied in accordance with 4.4.2.

4.4.1 Application of primer coating. When required by the test method, the primer coating shall be prepared and applied as follows:

- a. Thoroughly mixing each component separately.
- b. Slowly pouring component B into component A while stirring the mixture to achieve the manufacturer's specified volume mixing ratio.
- c. Diluting the admixed primer coating, if necessary, with thinner conforming to MIL-T-81772, type II. If dilution of the primer coating is required, do not exceed 340 g/L (2.8 lb/gal) (see 6.11).
- d. Allowing admixed coating to stand undisturbed for 30 minutes prior to use, unless the manufacturer's directions state otherwise.
- e. Spraying the test panels with primer coating to a dry-film thickness of 15 to 23 μm (0.6 to 0.9 mil).

If a topcoat is not used, the primer coating shall be allowed to air dry for not less than 14 days, or air dry for not less than one hour followed by 24 hours at $65.5 \pm 3^\circ\text{C}$ ($150 \pm 5^\circ\text{F}$) prior to testing. If a topcoat is required, the primer coating shall be air-dried for 5 hours and then coated with a polyurethane coating conforming to MIL-PRF-85285 in accordance with 4.4.2.

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TABLE I. Aluminum test panels.

| Panel | Substrate | Pretreatment |
|-------|--------------------------------|---|
| A | SAE-AMS-QQ-A-250/4 (T3 temper) | MIL-C-5541, class 1A (conversion coating) |
| B | SAE-AMS-QQ-A-250/4 (0 temper) | MIL-A-8625, type I or IC (anodize) |
| C | SAE-AMS-QQ-A-250/5 (T3 temper) | Deoxidized <u>1/</u> |
| D | SAE-AMS-QQ-A-250/5 (T3 temper) | MIL-C-5541, class 1A (conversion coating) |

1/ Immerse test panel for 2 minutes in corrosion removing compound conforming to SAE-AMS1640, then remove test panel and rinse with distilled water. Apply the primer coating within one hour.

4.4.2 Application of topcoat. When a topcoat is required by the test method, mix polyurethane coating conforming to MIL-PRF-85285 (untinted gloss white conforming to FED-STD-595, color number 17925) adding thinner, if required, and allow it to stand 30 minutes prior to application. Apply the coating to a total dry-film thickness of 43 to 58 μm (1.7 to 2.3 mils). If applied in two coats, allow the first coat to air dry for 60 minutes prior to application of the second coat. After application of the topcoat to the required thickness and prior to testing, allow the coating to air dry for not less than 14 days or allow the coating to air dry for one hour followed by 24 hours at $65.5 \pm 3^\circ\text{C}$ ($150 \pm 5^\circ\text{F}$).

4.5 Test methods. The tests of this specification shall be conducted in accordance with table II and 4.5.1 through 4.5.11. Unless otherwise specified in the test method or paragraph, laboratory test conditions shall be in accordance with ASTM-D3924. Room temperature conditions are 18 to 29.5°C (65 to 85°F) and a relative humidity of 50 ± 10 percent.

4.5.1 Condition in container. Each component in its unopened container shall stand without agitation for not less than 14 days at room temperature (see 4.5). After this period, the containers shall be examined for bulging or other deformation due to internal pressure. Each component container shall be opened and examined, then mixed by hand vigorously stirring with a paddle for not more than 5 minutes, and examined for conformance to 3.5.2.

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TABLE II. Test methods.

| Test | Requirement Paragraph | Test Paragraph | FED-STD-141 Test Method | ASTM Test Method |
|---|-----------------------|----------------|-------------------------|------------------|
| Lead and cadmium content | 3.4 | --- | --- | ASTM-D3335 |
| Chlorinated solvent content | 3.4 | --- | --- | ASTM-D3742 |
| Chromium content (class N only) | 3.4.1.2 | --- | --- | ASTM-D3718 |
| VOC solvent content | 3.4.2 | | --- | ASTM-D3960 |
| Fineness of grind | 3.5.1 | --- | --- | ASTM-D1210 |
| Condition in container | 3.5.2 | 4.5.1 | | --- |
| Storage stability <u>1/</u> | 3.5.3 | --- | 3022 | --- |
| Accelerated storage stability <u>2/</u> | 3.5.4 | 4.5.2 | --- | ASTM-D1849 |
| Odor | 3.6.2 | --- | --- | ASTM-D1296 |
| Viscosity | 3.6.3 | --- | --- | ASTM-D1200 |
| Pot life | 3.6.4 | --- | --- | ASTM-D1200 |
| Surface appearance | 3.7.1 | 4.4.1 | | |
| Drying time <u>3/</u> | 3.7.2 | --- | --- | ASTM-D1640 |
| Lifting | 3.7.3 | 4.5.3 | --- | --- |
| Adhesion | 3.7.4 | 4.5.4 | --- | --- |
| Flexibility | 3.7.5 | 4.5.5 | --- | --- |
| Infrared reflectance (type II only) | 3.7.6 | 4.5.6 | --- | --- |
| Water resistance | 3.8.1 | 4.5.7 | --- | --- |
| Salt-spray corrosion resistance | 3.8.2.1 | 4.5.8.1 | --- | --- |
| Filiform corrosion resistance | 3.8.2.2 | 4.5.8.2 | --- | --- |
| Solvent resistance (cure) | 3.8.3 | 4.5.9 | --- | --- |
| Fluid resistance | 3.8.4 | 4.5.10 | --- | --- |
| Mixing and dilution | 3.9.1 | 4.5.11.1 | --- | --- |
| Application | 3.9.2 | 4.5.11.2 | --- | --- |

1/ The daily ambient air temperature at the storage location shall be within the range of 1.7 to 46 °C (35 to 115 °F).

2/ The primer coating shall be mixed with a mechanical shaker for 10 minutes instead of 300 stirs in 2 minutes.

3/ Use panels designated A in table I.

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4.5.2 Accelerated storage stability. Not less than one full, unopened, sealed container of each component shall be stored undisturbed for not less than 14 consecutive days in a location maintained at 60 ± 3 °C (140 ± 5 °F). At the end of 14 days, the container(s) shall be allowed to cool to room temperature (see 4.5). (During the storage period, it is advised that the unopened containers be placed in larger, vented containers to confine any splash that may occur if the lid of the unopened container is blown off by gassing.) If, upon removal, the unopened container is deformed, do not open. If the container is not deformed, open carefully and examine its contents for conformance to 3.5.4.

4.5.3 Lifting. The primer coating shall be applied to test panels designated A (see table I) in accordance with 4.4.1. Panels shall air dry for 5 hours and then be topcoated in accordance with 4.4.2. Examine for conformance to 3.7.3 during and after the drying of the topcoat.

4.5.4 Adhesion. The primer coating shall be applied to test panels designated C (see table I) in accordance with 4.4.1. The test panels shall be immersed in distilled water for not less than 24 hours at room temperature (see 4.5). After removal, the panels shall be dried with absorbent paper tissue and within 3 minutes after removal from the water, be tested in accordance with FED-STD-141, Method 6301, for conformance to 3.7.4.

4.5.5 Flexibility. The primer coating shall be applied to test panels designated B (see table I) in accordance with 4.4.1. The flexibility of the coating shall then be tested at the room temperature and relative humidity conditions as specified in 4.5, using a Gardco GE Universal Impact Tester, Model #172 (see 6.8), using a specialized impactor that weighs 3.6 lb and has formed four convex spherical segments on each end, each of different radii and extension. Place the coated panel, film side downward, on the rubber pad at the bottom of the impactor guide. Drop the impactor on the panel through the impactor guide, ensuring that the impression of the entire rim of the impactor is made in the panel. Reverse the impactor ends and drop it through the guide on the panel adjacent to the first area of impact. Using 10 power magnification, examine for conformance to 3.7.5; record the percent elongation corresponding to the largest spherical impression at which no cracking occurs.

4.5.6 Infrared reflectance (type II primer coating only). The type II primer coating shall be applied to test panels designated A (see table I) in accordance with 4.4.1. The total reflectance (specular and diffuse) of the primer coating relative to barium sulfate shall be measured using a near infrared spectrophotometer over a range of 700 to 2,600 nm. Examine for conformance to 3.7.7.

4.5.7 Water resistance. The primer coating shall be applied to test panels designated A (see table I) in accordance with 4.4.1 and topcoated in accordance with 4.4.2. The coated test panels shall then be completely immersed in distilled water maintained at 49 ± 3 °C (120 ± 5 °F) for four days. Two hours after removal from the water, the coating shall be examined for conformance to 3.8.1.

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4.5.8 Corrosion resistance.

4.5.8.1 Salt spray. Test panels designated A (see table I) shall be prepared with primer coating (see 4.4.1). One half of the primer coated panels shall be topcoated (see 4.4.2). Two intersecting lines shall be scribed diagonally across the coated surface of each panel, exposing the bare substrate. The test panels shall then be placed in a 5 percent salt-spray cabinet for 2,000 hours in accordance with ASTM-B117. After removal, the test panels shall be examined for conformance to 3.8.2.1.

4.5.8.2 Filiform. The primer coating shall be applied to test panels designated D (see table I) in accordance with 4.4.1 and topcoated in accordance with 4.4.2. Two intersecting lines shall be scribed diagonally across the coated surface of the test panels, exposing the bare substrate. The test panels shall then be placed vertically in a desiccator containing 12 Normal (N) HCl for 1 hour at room temperature (see 4.5). Within 5 minutes of removal from the desiccator, the test panels shall be placed in a humidity cabinet maintained at 40 ± 2 °C (104 ± 3 °F) and relative humidity of 80 ± 5 percent for 1,000 hours. The test panels shall then be examined for conformance to 3.8.2.2. Filiform corrosion appears as threadlike filaments initiating from the exposed substrate and spreading underneath the coating film. (A description of filiform growth is described in ASTM-D2803.)

4.5.9 Solvent resistance (cure). The primer coating shall be applied to test panels designated A (see table I) in accordance with 4.4.1. The primer coating shall then be examined for cure, as follows:

- a. Soak a cotton terry cloth rag in MEK solvent (see 6.10).
- b. Rub the coating with the soaked rag for 50 passes (25 back and forth rubs) with firm finger pressure.
- c. Examine coating for conformance to 3.8.3.

4.5.10 Fluid resistance. The primer coating shall be applied to test panels designated A (see table I) in accordance with 4.4.1. The test panels shall then be separately immersed to half their length for 24 hours in glass covered beakers containing the following liquids:

- a. Lubricating oil conforming to MIL-PRF-23699, maintained at 121 ± 3 °C (250 ± 5 °F);
- b. Hydraulic fluid conforming to MIL-PRF-83282, maintained at 65.5 ± 3 °C (150 ± 5 °F).

After removal from the test fluids, cool the test panels to room temperature (see 4.5) and examine for conformance to 3.8.4.

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4.5.11 Working properties.

4.5.11.1 Mixing and dilution. Thoroughly mix each component separately. Slowly pour component B into component A, while constantly stirring, until the manufacturer's specified volume mixing ratio is achieved. If necessary, dilute the admixed primer coating with thinner conforming to MIL-T-81772, type II (see 6.11). Stir well and allow coating to dwell for 30 minutes. Examine for conformance to 3.9.1.

4.5.11.2 Application. Using conventional, airless, high volume, low pressure (HVLP), or electrostatic spray equipment, apply the primer coating to test panels to a dry film thickness of 15 to 23 μm (0.6 to 0.9 mil) in accordance with 4.4.1. Examine for conformance to 3.7.1 and 3.9.2.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The materials covered by this specification are low VOC, corrosion-inhibitive, chemical resistant, and strippable primer coatings. These primer coatings are formulated for the unique performance requirements of military aircraft. These requirements include adhesion to a wide variety of metals and composites, flexibility to withstand tactical maneuvers at low temperatures, corrosion resistance in a marine environment, resistance to leaking aircraft fluids, and low-infrared reflectance for stealth in combat. Type I is for general use. Type II is for use where low infrared reflectance is required. Unless a specific type or class is referenced in a contract or purchase order, type I, class C is the default reference. The non-chromated (class N) primer coatings are for use where federal, state, or local regulations restrict the use of chromate based materials. Class N primer coatings may only be used when authorization for their use is given by the engineering authority for the system or item to which the primer coatings are to be applied. For users of MIL-PRF-23377F, class 2, high-solids coating, use class C of this document.

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6.1.1 Compatibility. For some applications, and only when authorized by the procuring activity, MIL-PRF-85582, Primer Coatings: Epoxy, Waterborne, may be substituted for MIL-PRF-23377. Both MIL-PRF-23377 and MIL-PRF-85582 are compatible with the following coatings: TT-P-2756, Polyurethane Coating: Self-Priming Topcoat, Low Volatile Organic Compounds (VOC); MIL-PRF-22750, Coating, Epoxy, High-Solids; MIL-C-46168, Coating, Aliphatic Polyurethane, Chemical Agent Resistant; and, MIL-C-53039, Coating, Aliphatic Polyurethane, Single Component; MIL-PRF-85285 Coating: Polyurethane, High Solids.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Type and class required (see 1.2)
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2 and 2.3).
- d. Packaging requirements (see 5.1)
- e. Quantity and kit size identification (see 6.7.1)

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL-23377, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Commander, Naval Air Warfare Center Aircraft Division, Code 4.3.4.1, Building 2188, Patuxent River, MD 20670-1908.

6.3.1 Inspection report and other information. When authorizing the forwarding of qualification samples, the qualifying activity will request the manufacturer to submit the qualification inspection sample, the Material Safety Data Sheet (MSDS) (see 6.9), and a test report (see 4.2) showing that the material conforms to the requirements of this specification.

6.3.1.1 Qualification inspection sample identification. Qualification inspection samples are to be forwarded to the laboratory designated in the letter of authorization (see 6.3) and identified as follows:

Qualification test samples.

Specification MIL-PRF-23377H, type I or II, class C or N (as applicable)

Primer Coatings: Epoxy, High-Solids

Manufacturer's name and product number

Submitted by (name and date) for qualification testing in accordance with authorization (reference authorizing letter)

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6.4 Retention of qualification. To retain qualification approval of products listed on the Qualified Products List (QPL), the manufacturer will be required to verify by certification to the qualifying activity that its product(s) comply with the requirements of this specification. Unless otherwise specified by the qualifying activity, the time of periodic verification by certification will be in two-year intervals from the date of original qualification. The certification action will be initiated by the qualifying activity.

6.5 Conformance rejection and retest. Failure in any conformance inspection will result in the rejection of the batch from which it was obtained and constitutes justification for removal from the qualified products list. Rejected material cannot be resubmitted for acceptance without written approval from the qualification activity (see 6.3). The application for resubmission will contain all details concerning previous rejections and measures taken to correct these deficiencies.

6.6 Lot and batch formation. A lot shall consist of all of the primer coatings manufactured at one time from one batch, forming part of one contract or purchase order and submitted for acceptance. A batch shall consist of all primer coatings manufactured during one continuous operation.

6.7 Part or Identifying Number (PIN). The PIN to be used for primer coatings acquired to this specification is created as follows:

| | | | | | | |
|-----------------------------|---|--|---|------------------------------|---|------------------------------------|
| M23377 | - | X | - | X | - | XXXX |
| Specification identifier | | Type designator 1 = Type I 2 = Type II | | Class designator (C or N) | | Kit size designator (see 6.7.1) |

6.7.1 Kit size. The primer coatings covered by this specification should be purchased by volume, the unit being a kit containing two components. The kit component sizes need not be of the same size. When this part numbering system is used, the kit size is to be identified as:

| Kit Size <u>1/</u> | Kit Size Designator |
|------------------------|---------------------|
| Less than one pint | <u>2/</u> |
| 4-pint (0.47-liter) | 004P |
| 4-quart (0.95-liter) | 004Q |
| 4-gallon (3.79-liter) | 004G |
| 20-gallon (75.7-liter) | 020G |

1/ The kit size and its designator may be modified for ease of procurement and is not limited.

2/ Designators for less than pint size kits (small touch-up kits) shall be expressed in cubic centimeters (cc) and shall be designated by "C." Example: A type I, class C, 50 cc kit shall be designated M23377-1-C-050C.

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6.8 Impact tester source. An instrument for conducting the flexibility (see 4.5.5) is the Gardco GE Universal Impact Tester, Model #172, available from the Paul N. Gardner Company, 316 NE First Street, PO Box 10688, Pompano Beach, FL 33061-6688. There may be other instruments equivalent to this unit.

6.9 Material Safety Data Sheet (MSDS). An MSDS must be prepared and submitted in accordance with FED-STD-313. The MSDS must also meet the requirements of 29 CFR 1910.1200. The 29 CFR 1910.1200 requires that the MSDS for each hazardous chemical used in an operation must be readily available to personnel using the material. Questions pertinent to the effect(s) of these coatings on the health of personnel using them shall be referred by the procuring activity to the appropriate medical service, who will act as its adviser. Contracting officers will identify the activities requiring copies of the MSDS.

6.10 Safely handling MEK solvent. To minimize exposure to MEK solvent, it is recommended that personnel conducting the solvent resistance (cure) test (see 4.5.9) wear, as a minimum, either butyl rubber or Teflon gloves and a National Institute of Occupational Safety and Health (NIOSH) approved half-face respirator equipped with organic vapor cartridges and goggles or a full-face respirator equipped with organic vapor cartridges.

6.11 Thinning. If it is necessary to add thinner to this coating, use only thinner conforming to MIL-T-81772, type II. In areas where air quality regulations restrict volatile emissions, do not add thinner to the primer coating if that addition will raise the VOC content to greater than 340 g/L (2.8 lb/gal).

6.12 Subject term (key word) listing.

- Chemical resistance
- Corrosion inhibitive
- Flammable
- Hydrochloric acid (HCl)
- Low infrared reflectance
- Methyl ethyl ketone (MEK)
- Strontium chromate

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6.13 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:

Army - MR

Navy - AS

Air Force - 99

Preparing activity:

Navy - AS

(Project 8010-0175)

Review activities:

Army - AR, AV, EA, MI

Navy - CG, MC, OS, SH

Air Force - 11, 84

Other - DS, GSA/FSS (9FTE-10)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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|---|--|--|--|
| I RECOMMEND A CHANGE: | | 1. DOCUMENT NUMBER MIL-PRF-23377H | 2. DOCUMENT DATE (YYYYMMDD) 20020430 |
| 3. DOCUMENT TITLE PRIMER COATINGS: EPOXY, HIGH-SOLIDS | | | |
| 4. NATURE OF CHANGE (<i>Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.</i>) | | | |
| 5. REASON FOR RECOMMENDATION | | | |
| 6. SUBMITTER | | | |
| a. NAME (<i>Last, First, Middle Initial</i>) | | b. ORGANIZATION | |
| c. ADDRESS (<i>Include ZIP Code</i>) | | d. TELEPHONE (<i>Include Area Code</i>) (1) Commercial (2) DSN (<i>If applicable</i>) | 7. DATE SUBMITTED (YYYYMMDD) |
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| a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION | | b. TELEPHONE (<i>Include Area Code</i>) (1) Commercial (732) 323-2947 (2) DSN 624-2947 | |
| c. ADDRESS (<i>Include ZIP Code</i>) CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100 | | IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888 | |