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NOT MEASUREMENT SENSITIVE

MIL-PRF-23377J
DRAFT
SUPERSEDING
MIL-PRF-23377H
30 April 2002

# 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 corrosion inhibiting, chemical and solvent resistant, solvent-borne, high-solids 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 are 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 C1 - Barium chromate based corrosion inhibitors
Class C2 - Strontium chromate based corrosion inhibitors
Class N - Non-chromate based corrosion inhibitors

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100 or emailed to thomas.omara@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil.

AMSC N/A

FSC 8010

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

| M23377 | - | X | - | XX | - | XXXX |
|---|---|---|---|---|---|---|
| Specification identifier | | Type designator<br>1 = Type I<br>2 = Type II | | Class designator<br>(C1, C2 or N) | | Kit size designator<br>(see 1.3.1) |

1.3.1 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 1/ | Kit Size Designator |
|---|---|
| Less than one pint | 2/ |
| 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 C2, 50 cc kit shall be designated M23377-1-C2-050C.

## 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 of 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 cited in the solicitation or contract.

FEDERAL STANDARDS

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

| | | |
|---|---|---|
| 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. |

(Copies of these documents are available on line at http://assist.daps.dla.mil/quicksearch/ or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

| | | |
|---|---|---|
| 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)

(Copies of these documents are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

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

(Copies of this document are available from www.asq.org or American Society for Quality, 600 Plankinton Avenue, Milwaukee, WI 53203)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) INTERNATIONAL

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)

(Copies of these documents are available from www.sae.org or SAE World Headquarters, 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 coatings furnished under this specification shall be products that are 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 coatings supplied under this specification shall be products conforming to the requirements of this specification.

3.3 Toxicity. The primer coatings shall have no adverse effect on the health of personnel (see 6.8), when used for its intended purpose and with the precautions listed in 3.11.

3.4 Composition. The primer coatings 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 1.3.1). 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 primer coatings. 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.

3.4.1 Pigment.

3.4.1.1 Class C1. Coatings containing barium chromate based corrosion inhibitors, along with extenders and other pigments, shall be identified as class C1.

3.4.1.2 Class C2. Coatings containing strontium chromate conforming to ASTM-D1649 as the corrosion inhibitor, along with extenders and other pigments, shall be identified as class C2.

3.4.1.3 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 coatings 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 6.10).

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 for metal containers and six months for plastic containers (see 4.5).

3.5.4 Accelerated storage stability. The primer coatings, 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 coatings 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 coatings shall be dark green or gray.

3.6.2 Odor. The odor of the admixed coatings, 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 coatings 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 coatings (see 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 coatings, 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 coatings 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 coatings that have air dried for 5 hours (see 4.5.3).

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

3.7.5 Flexibility. The primer coatings 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 coatings only). The total reflectance (specular and diffuse) of the type II primer coatings, 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 coatings shall withstand immersion in distilled water maintained at 49 ± 3 °C (120 ± 5 °F) for 4 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 coatings, with and without a topcoat, shall not exhibit blistering, lifting of either coating, nor substrate pitting after exposure to a 5 percent salt spray for 2,000 hours. Class C1 and C2 primers shall exhibit no corrosion in the scribe (see 4.5.8.1).

3.8.2.2 Filiform. The topcoated primer coatings 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 coatings 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 coatings to properly cure (see 4.5.9).

3.8.4 Fluid resistance. The primer coatings shall withstand immersion for 24 hours in 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 coatings shall not exhibit any softening, blistering, loss of adhesion, nor any other coating deficiency. Discoloration of the coatings 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 coatings, including thinner if required (see 6.10), 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 coatings shall not separate into visually distinct layers (see 4.5.11.1).

3.9.2 Application. The admixed primer coatings 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-23377J, "Primer Coatings: Epoxy, High-Solids" type I or II, class C1, C2, 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

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 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. 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).

4.3.1 Primer coating test samples. Samples for tests shall consist of one complete unopened kit selected at random from each batch (see 6.6). Containers shall only be opened when being tested.

4.3.2 Visual inspection of filled containers. Samples shall be selected at random from each lot (see 6.6) in accordance with ASQ-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 coatings shall be applied in accordance with 4.4.1 and the topcoat, when required, shall be applied in accordance with 4.4.2.

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 1/ |
| 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.

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

a. Thoroughly mix each component separately.
b. Slowly pour component B into component A while stirring the mixture to achieve the manufacturer's specified volume mixing ratio.
c. Dilute 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 6.10).
d. Allow admixed coating to stand undisturbed for 30 minutes prior to use, unless the manufacturer's directions state otherwise.
e. Spray 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 coatings 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 ± 3 °C (150 ± 5 °F) prior to testing. If a topcoat is required, the primer coatings 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.

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 ± 3 °C (150 ± 5 °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.

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) | 3.4.1.3 | --- | --- | 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 1/ | 3.5.3 | --- | 3022 | --- |
| Accelerated storage stability 2/ | 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 3/ | 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 coatings 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.

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 coatings 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 coatings 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 coatings shall be applied to test panels designated B (see table I) in accordance with 4.4.1. The flexibility of the coatings 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 or equivalent as approved by the qualifying activity (see 6.7), using a specialized impacter 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 impacter guide. Drop the impacter on the panel through the impacter guide, ensuring that the impression of the entire rim of the impacter is made in the panel. Reverse the impacter 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; observe the percent elongation corresponding to the largest spherical impression at which no cracking occurs.

4.5.6 Infrared reflectance (type II primer coatings only). The type II primer coatings 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 coatings 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 3.7.6.

4.5.7 Water resistance. The primer coatings 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 coatings shall be examined for conformance to 3.8.1.

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

a. Soak a cotton terry cloth rag in MEK solvent (see 6.9).
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 coatings 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.

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 6.10). 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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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 C2 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 C2 of this document.

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 should specify the following:

a. Title, number, and date of the specification.
b. Type and class required (see 1.2)
c. Quantity and kit size identification (see 1.3.1)
d. Packaging requirements (see 5.1)

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 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 6.8), 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-23377J, type I or II, class C1, C2, 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)

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 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.

6.8 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.

6.9 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.

6.10 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).

6.11 Subject term (key word) listing.

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

6.12 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 8010-0217)

Review activities:
Army - AR, AV, EA, MI
Navy - CG, MC, OS, SH
Air Force - 11, 84
Other - DS, GSA/FSS (9FTE-10)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at www.dodssp.daps.mil.