

NOT MEASUREMENT SENSITIVE

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SUPERSEDING
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MILITARY SPECIFICATION

PRIMER COATINGS: EPOXY, WATERBORNE

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 two types (see 1.2.1) and two classes (see 1.2.2) of waterborne, epoxy primer coatings that are corrosion inhibiting, and chemical and solvent resistant. These primer coatings are formulated primarily for spray application and are compatible with polyurethane and epoxy topcoats (see 6.9). The maximum volatile organic compound (VOC) content of the admixed primer coatings is 340 grams per liter (g/l) (2.8 pounds per gallon (lbs/gal)).

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

1.2.1 Type. The primer coatings consist of the following types:

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

1.2.2 Class. The primer coatings consist of the following classes:

- Class 1A - Barium chromate based corrosion inhibitors
- Class 1B - Strontium chromate based corrosion inhibitors
- Class 2 - Non-chromate based corrosion inhibitors

The classes listed above are different from the previous revision of this document. See 6.10 for the cross-reference.

<p>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 SR3, Highway 547, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.</p>

AMSC N/A

FSC 8010

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1.2.3 Components. The pigment of the primer coating may be contained in Component A or B. The primer coatings are supplied as a two component kit, as specified (see 3.4):

- Component A - Resin solution.
- Component B - Curing agent solution.

1.3 Part numbers. Part numbers for cataloging under this specification may be coded in accordance with 6.7.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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

FEDERAL

- QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet
- QQ-A-250/5 - Aluminum Alloy Alclad 2024, Plate and Sheet
- QQ-A-250/12 - Aluminum Alloy 7075, Plate and Sheet
- PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials, Packaging, Packing and Marking of

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- MIL-M-3171 - Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on
- 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-L-23699 - Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-156
- MIL-A-24641 - Acid, Hydrofluoric; Technical
- MIL-R-81294 - Remover, Paint, Epoxy, Polysulfide and Polyurethane Systems
- MIL-H-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, Metric, NATO Code Number H-537
- MIL-C-83286 - Coating, Urethane, Aliphatic Isocyanate, for Aerospace Applications
- MIL-C-85285 - Coating: Polyurethane, High-Solids

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STANDARDS

FEDERAL

- FED-STD-141 - Paint, Varnish, Lacquer and Related Materials: Method of Inspection, Sampling and Testing
- FED-STD-313 - Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from DoDSSP - Customer Service, Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issue shall be those in effect on the date of the solicitation.

CODE OF FEDERAL REGULATIONS

DEPARTMENT OF LABOR

- 29 CFR 1910.1200 - Occupational Safety and Health Standards - Hazard Communications

DEPARTMENT OF TRANSPORTATION

- 49 CFR 171-178 - Hazardous Materials Regulations

(Application for copies of the Code of Federal Regulations (CFR) should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402).

2.2 Non-Government documents. The following document forms 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).

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AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI Z129.1 - Precautionary Labeling of Hazardous Industrial Chemicals

(Application for copies should be addressed to the American National Standards Institute, 11 West 42nd Street, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM B117 - Standard Test Method of Salt Spray (Fog) Testing
- ASTM D523 - Standard Test Method for Specular Gloss
- ASTM D1193 - Standard Specification for Reagent Water
- ASTM D1200 - Standard Test Method for Viscosity by Ford Viscosity Cup
- ASTM D1210 - Standard Test Method of Fineness of Dispersion of Pigment-Vehicle Systems
- ASTM D1296 - Standard Test Method for Odor of Volatile Solvents and Diluents
- ASTM D1475 - Standard Test Method for Density of Paint, Varnish, Lacquer and Related Products
- ASTM D1640 - Standard Test Method for Drying, Curing or Film Formation of Organic Coatings at Room Temperature
- ASTM D1849 - Standard Test Method for Package Stability of Paint
- ASTM D2243 - Standard Test Method for Freeze-Thaw Resistance of Water Borne Paints
- ASTM D2369 - Standard Test Method for Volatile Content of Coatings
- ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
- ASTM D2803 - Standard Test Method for Filiform Corrosion Resistance of Organic Coatings on Metal
- ASTM D3335 - Standard Test Method for Low Concentrations of Lead, Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy
- ASTM D3718 - Standard Test Method for Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy
- ASTM D3792 - Standard Test Method for Water Content of Water-Reducible Paints by Direct Injection Into a Gas Chromatograph
- ASTM D3924 - Standard Specification for Standard Environment for Conditioning and Testing of Paint, Varnish, Lacquer, and Related Materials
- ASTM E275 - Standard Practice for Describing and Measuring Performance of Ultraviolet, Visible, and Near-Infrared Spectrophotometers

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

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SOCIETY OF AUTOMOTIVE ENGINEERS

AMS 4375 - Magnesium Alloy Sheet and Plate 3.0Al 1.0Zn 0.20Mn,
Annealed and Recrystallized

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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

3. REQUIREMENTS

3.1 Qualification. Primer coatings furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.4). Any change in the formulation of a qualified product will necessitate its requalification. The material supplied under contract shall be identical, within manufacturing tolerances to the product receiving qualification.

3.2 Material. Materials used in the manufacture of products 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 manufacturer shall certify (see 6.3) that the coatings supplied under this specification have no adverse effect on the health of personnel when used for its intended purpose and with the precautions listed in 5.2.1. A Material Safety Data Sheet (MSDS) shall be prepared and submitted in accordance with FED-STD-313. The MSDS shall also meet the requirements of 29 CFR 1910.1200 (see 6.6). 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.

3.4 Composition. The pigment of the primer coating may be contained in Component A or B. The primer coatings shall be supplied as a kit, consisting of two components, as follows:

Component A shall contain the epoxy resin solution
Component B shall be the curing agent.

When the components are mixed in the proportions specified by the manufacturer and reduced with water, if required, a product meeting the applicable

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requirements of this specification shall result. Chlorinated solvents are prohibited from the formulation of this primer coating. When tested in accordance with ASTM D3335 (see 4.6 and Table I), no component of the primer coating shall contain cadmium, cadmium compounds, or more than 0.06 percent by weight of lead metal or lead compounds.

3.4.1 Volatile organic compound (VOC) content. The VOC content of the admixed primer coating shall be a maximum of 340 g/l of coating, excluding water, when tested in accordance with 4.6.1.

3.4.2 Pigment.

3.4.2.1 Class 1A. The pigment portion of the Class 1A primer coating shall contain barium chromate as the corrosion inhibitor, siliceous extenders, and other pigments, as required.

3.4.2.2 Class 1B. The pigment portion of the Class 1B primer coating shall contain strontium chromate as the corrosion inhibitor, siliceous extenders, and other pigments, as required.

3.4.2.3 Class 2. The pigment portion of the Class 2 primer coating shall contain non-chromate corrosion inhibitors, siliceous extenders, and other pigments, as required. When tested in accordance with ASTM D3718 (see 4.6 and Table I), the Class 2 primer coating shall not contain chromium.

3.4.3 Water (thinner). When thinned to application viscosity with water conforming to ASTM D1193, Type IV, the admixed primer coating shall meet the applicable requirements of this specification.

3.5 Physical properties - liquid.

3.5.1 Color.

3.5.1.1 Type I. The color of the admixed Type I primer coating shall be the natural color of the corrosion inhibiting pigments used, with the exception that tinting to a darker shade is permitted to improve hiding power.

3.5.1.2 Type II. The color of the admixed Type II primer coating shall be dark green.

3.5.2 Odor. The odor of the primer coatings, as packaged components or as a film after application, shall be characteristic of the thinners used and shall not be obnoxious, when tested in accordance with ASTM D1296 (4.6 and Table I).

3.5.3 Fineness of grind. The fineness of grind of the admixed primer coating at application viscosity shall be not less than 5, on the Hegman scale, when tested in accordance with ASTM D1210 (4.6 and Table I).

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3.5.4 Pot life. The viscosity of the admixed primer coatings, when thinned in accordance with the manufacturers instructions and stirred constantly at 140 ± 30 rpm in an open or closed container, shall not increase more than 8 seconds through a number 4 Ford cup after 4 hours at $23^\circ \pm 2^\circ\text{C}$ ($73^\circ \pm 5^\circ\text{F}$), when tested in accordance with ASTM D1200 (see 4.6 and Table I). At the end of the 4 hour period, the applied primer coating shall meet all of the requirements of 3.6 through 3.7.4.

3.5.5 Condition in container. Components A and B shall be capable of being mixed to a smooth, homogeneous, pourable condition. They shall be free from grit, seeds, lumps, abnormal thickening, or livering, nor shall it show pigment flotation or excessive settling when tested in accordance with FED-STD-141, Method 3011 (see 4.6 and Table I).

3.5.6 Storage stability. The primer coating components, as packaged by the manufacturer, shall meet all requirements specified herein for a period of one year, when tested in accordance with FED-STD-141, Method 3022, at a daily ambient air temperature of 1.7° to 46°C (35° to 115°F) (see 4.6 and Table I).

3.5.7 Accelerated storage stability. The primer coating components, as packaged by the manufacturer, shall meet all the requirements specified herein when tested in accordance with ASTM D1849 (see 4.6 and Table I), with the exception that the coating shall be mixed on a mechanical shaker for 10 minutes instead of 300 stirs in 2 minutes.

3.5.8 Room temperature stability. The primer coating components, as packaged by the manufacturer, shall meet all the requirements specified herein when tested in accordance with ASTM D1849 (see 4.6 and Table I), with the exception that the coating shall be mixed on a mechanical shaker for 10 minutes instead of 300 stirs in 2 minutes.

3.6 Physical properties - film.

3.6.1 Surface appearance. The admixed primer coating, applied to a vertical surface in accordance with 4.5.1, shall exhibit no sagging, running or streaking. The dried film shall be free from grit, seeds, craters, blisters or any other surface irregularities.

3.6.2 Drying time. The applied primer coating shall be tack free in not more than 60 minutes and shall be dry-hard in not more than 6 hours, when tested in accordance with ASTM D1640 (see 4.6 and Table I).

3.6.3 Gloss.

3.6.3.1 Primer coating only. The primer coating, 24 hours after application to test panels in accordance with 4.5 through 4.5.2, shall have a 60° specular gloss of less than 10, when tested in accordance with ASTM D523 (see 4.6 and Table I).

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3.6.3.2 Primer coating with topcoat. At a 60° geometry, the specular gloss of coating conforming MIL-C-83286 or MIL-C-85285, applied to the primer coating in accordance with 4.5 through 4.5.2, and tested in accordance with ASTM D523 (see 4.6 and Table I), shall be a minimum of 90.

3.6.4 Lifting. When tested in accordance with 4.6.2, there shall be no evidence of lifting or any other film irregularity upon the application of gloss polyurethane coating, conforming to MIL-C-83286 or MIL-C-85285, to primer coating that has air dried for 2, 4, and 18 hours, respectively.

3.6.5 Adhesion - wet tape. When tested in accordance with 4.6.3, the primer coating shall not peel from the substrate, nor shall the topcoat delaminate from the primer coating after immersion for 24 hours in distilled water at room temperature (18° to 29.5°C (65° to 85°F)).

3.6.6 Flexibility. The primer coating shall exhibit a minimum impact elongation of 10 percent when tested in accordance with 4.6.4 at room temperature (18° to 29.5°C (65° to 85°F)).

3.6.7 Strippability. When tested in accordance with 4.6.5, the applied and cured primer coating, with and without a topcoat, shall have at least 90 percent of the primer coating stripped within 15 minutes with the use of remover conforming to MIL-R-81294, Type I, at room temperature (18° to 29.5°C (65° to 85°F)).

3.6.8 Infrared reflectance (Type II primer coating only). The maximum total reflectance (specular and diffuse) of the Type II primer coating, relative to barium sulfate, shall be less than 10 percent throughout the range of 450 to 2700 nanometers (nm) when tested in accordance with 4.6.6.

3.7 Resistance properties.

3.7.1 Water resistance. The primer coating and primer coating topcoated with coating conforming to MIL-C-83286 or MIL-C-85285 shall withstand immersion in distilled water at $49^{\circ} \pm 3^{\circ}\text{C}$ ($120^{\circ} \pm 5^{\circ}\text{F}$) for four days without exhibiting any evidence of softening, wrinkling, blistering, or any other coating deficiency, when tested in accordance with 4.6.7.

3.7.2 Corrosion resistance.

3.7.2.1 Salt spray.

3.7.2.1.1 Aluminum test panel. The primer coating and the primer coating topcoated with gloss coating conforming to MIL-C-83286 or MIL-C-85285 shall exhibit no blistering, lifting of either coating, nor substrate corrosion after exposure to a 5 percent salt spray for 2000 hours, in accordance with 4.6.8.1.1.

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3.7.2.1.2 Aluminum/graphite-epoxy test panel. The primer coating, when applied to a aluminum/graphite epoxy test panel shall exhibit no pitting greater than 1 millimeter (mm) in depth after exposure to 5 percent salt spray for 500 hours, in accordance with 4.6.8.1.2.

3.7.2.2 Filiform. The topcoated primer coating, when exposed to 12 normal (N) hydrochloric acid (HCl) for one hour and then placed in a humidity cabinet (relative humidity (RH) of $80 \pm 5\%$) for 1000 hours, in accordance with 4.6.8.2, shall exhibit no filiform corrosion extending beyond 1/4 inch (in.) from the scribe. A majority of the filaments shall be less than 1/8 in. in length.

3.7.3 Fluid resistance. The primer coating shall separately withstand 24 hours immersion in lubricating oil conforming to MIL-L-23699 at $121^\circ \pm 3^\circ\text{C}$ ($250^\circ \pm 5^\circ\text{F}$) and hydraulic fluid conforming to MIL-H-83282 at $66^\circ \pm 3^\circ\text{C}$ ($150^\circ \pm 5^\circ\text{F}$), in accordance with 4.6.9 without exhibiting any softening, blistering, loss of adhesion or any other coating deficiency 4 hours after removal from the oil or hydraulic fluid. Discoloration of the coating is acceptable and shall not be cause for rejection.

3.7.4 Solvent resistance (cure). The primer coating shall withstand repeated rubbing by a cloth rag soaked in methyl ethyl ketone (MEK) solvent when tested in accordance with 4.6.10. Rubbing through to bare substrate constitutes failure of the primer coating to properly cure.

3.8 Working properties.

3.8.1 Mixing and dilution. The components of the primer coating, when admixed in the volume mixing ratio specified by the manufacturer, shall homogeneously blend when mixed by a suitable mechanical mixer, in accordance with 4.6.11. When the admixed primer coating is diluted to application viscosity with water (according to the manufacturer's instructions), there shall be no evidence of incompatibility and the material shall be suitable for spray application (see 3.8.2). (Transient incompatibility exhibited during the first half of water addition shall be allowed.) When tested in accordance with 4.6.11 the primer coating shall not separate into visually distinct layers within one hour after water dilution.

3.8.2 Application. The admixed primer coating shall be capable of being applied by conventional, airless, HVLP (high volume, low pressure), or electrostatic spray equipment installed for water systems, in accordance with 4.5.1. Application shall yield a smooth, uniform film with no runs or sags at a dry-film thickness of 0.6 to 0.9 mils (15 to 23 microns (μm)).

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 (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the

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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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

- a. Qualification inspection (4.3).
- b. Quality conformance inspection (4.4).

4.3 Qualification inspection. Qualification inspection shall consist of all the examinations and tests specified in this specification.

4.3.1 Qualification samples. The test samples shall consist of a minimum of one quart (admixed) of the coating material. The material shall be furnished in containers of the type to be used in filling contract orders. Samples shall be identified as follows and forwarded to the laboratory designated in the letter of authorization (see 6.4).

- Qualification test samples.
- Specification MIL-P-85582B, Type I or II, and Class 1A, 1B, or 2 (as applicable).
- Primer Coatings: Epoxy, Waterborne.
- Manufacturer's name and product number
- Submitted by (name and date) for qualification testing in accordance with authorization (reference authorizing letter).

4.3.2 Test report. In addition to the qualification test samples, the manufacturer shall furnish to the qualification activity: (a) one copy of the MSDS (see 3.3); (b) a certified test report showing that the material conforms to the requirements of this specification; and (c) certification that the following chemicals were not used in the formulation of this coating: methylene chloride, trichloroethane and trichlorotrifluoroethane.

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4.3.3 Retention of qualification. In order to obtain qualification of products approved for listing on the Qualified Products List (QPL), the manufacturer shall 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 shall be in two-year intervals from the date of original qualification. The certification action shall be initiated by the qualifying activity.

4.4 Quality conformance inspection.

4.4.1 Lot formation. A lot shall consist of all waterborne epoxy primer of the same color, manufactured at one time from one batch, forming part of one contract, and submitted for acceptance. A batch shall consist of all coating material manufactured during one continuous operation.

4.4.2 Batch data. When required (see 6.2), the manufacturer shall furnish with each batch and/or lot a certified test report (see 6.3) showing that the material has satisfactorily passed the quality conformance inspection (see 4.4.3). When required (see 6.2), the manufacturer shall certify that there has been no formulation or process change from that which resulted in the production of the qualification inspection sample.

4.4.3 Quality conformance examinations.

4.4.3.1 Tests. The quality conformance inspection shall consist of all the tests for requirements specified in 3.5, 3.6, and 3.7, with the exception of storage stability (3.5.6), accelerated storage stability (3.5.7), freeze-thaw stability (3.5.8), strippability (3.6.7), and corrosion resistance (3.7.2.1 and 3.7.2.2). There shall be no failures. Samples for tests shall consist of one complete unopened kit selected at random from each batch. Containers shall only be opened when being tested.

4.4.3.3 Examination of packaging and marking. An examination shall be made to determine that the packaging, marking, and container closure comply with the requirements of section 5. Samples units shall be selected from each lot in accordance with MIL-STD-105, inspection level S-2. The lot size for this examination shall be the number of kits fully prepared for delivery. Prior to palletization, kits fully prepared for delivery shall be examined for defects of closure. Acceptance criteria shall be as specified in the contract or purchase order (see 6.2 and 6.11). Defects shall be scored in accordance with the list below.

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Examine	Defect
Packaging	Containers not as specified. Closures not accomplished by specified or required methods or materials. Leakage or seepage of contents. Non-conforming component, component missing, damaged or otherwise defective. Rusted, bulged or distorted container.
Marking	Data, including directions for use, omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

4.4.3.3 Visual inspection of filled containers. Samples selected at random for examination in accordance with 4.4.3.2 shall be examined for proper filling and weight, and excessive internal pressure.

4.4.3.4 Examination for palletization. An examination shall be made to determine that palletization complies with the requirements of Section 5 of this specification. Samples units shall be selected from each lot in accordance with MIL-STD-105, inspection level S-1. The lot size shall be the number of palletized unit loads prepared for delivery. Acceptance criteria shall be as specified in the contract or purchase order (see 6.2 and 6.12). Defects shall be scored in accordance with the list below.

Examine	Defect
Finished dimension	Length, width or height exceeds specified maximum requirement.
Palletization	Not as specified. Pallet pattern not as specified. Interlocking of loads not as specified. Load not bonded with required straps as specified.
Weight	Exceeds maximum load limits.
Marking	Omitted, incorrect, illegible, of improper size, location, sequence or method of application.

4.4.4 Rejection and retest. Failure in any quality conformance test shall result in the rejection of that batch and shall constitute sufficient justification for removal from the qualified products list. Rejected material shall not be resubmitted for acceptance without written approval from the Commander, Naval Air Warfare Center - Aircraft Division, Code 6062, Box 5152, Warminster, PA 18974-0591. The application for resubmission shall contain full particulars concerning previous rejections and measures taken to correct these deficiencies. Samples for retest shall be randomly selected (see 4.4.3) and forwarded to the designated testing activity.

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4.5 Test panels. Test panels shall be prepared under laboratory test conditions (see 4.6). With the exception of the wet adhesion test (4.6.5), flexibility test (4.6.6), and the filiform corrosion test (4.6.10.2), all panels used for test purposes shall be aluminum alloy 2024 (T3 temper) conforming to QQ-A-250/4, with approximate dimensions of 0.51 by 76.2 by 152.4 mm (0.020 by 3 by 6 in.). Conversion coating shall be applied to test panel to produce coatings conforming to MIL-C-5541, Class 1A or 3.

4.5.1 Application of primer coating. The primer coating shall be prepared by:

- a. Thoroughly mixing each component separately;
- b. Mixing the components in the manufacturer's specified volume mixing ratio;
- c. Thinning with water in accordance with the manufacturer's recommended procedure (water reducible only);
- d. Allowing admixed coating to stand for 30 minutes prior to use;
- e. Spraying the test panels with primer coating to a dry-film thickness of 15 to 23 μm (0.6 to 0.9 mils)).

Where specified, apply a topcoat of coating conforming to MIL-C-83286 or MIL-C-85285 after air drying for 2 hours, in accordance with 4.5.2.

If a topcoat is not used, the primer coating shall be allowed to air dry for a minimum of 14 days, or air dry for a minimum of one hour followed by 24 hours at $65.5^\circ \pm 3^\circ\text{C}$ ($150^\circ \pm 5^\circ\text{F}$) prior to testing.

4.5.2 Application of topcoat. When required, untinted gloss white (FED-STD-595, color number 17925) coating conforming to MIL-C-83286 or MIL-C-85285 shall be mixed, reduced with thinner conforming to MIL-T-81772, Type I, if required, and allowed 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 40 to 55 minutes prior to application of the second coat. After application of the second coat, allow the coating to air dry for a minimum of 14 days, or air dry for one hour followed by 24 hours at $66^\circ\text{C} \pm 3^\circ\text{C}$ ($150^\circ \pm 5^\circ\text{F}$) prior to testing.

4.6 Test methods. The tests of this specification shall be conducted in accordance with table I and paragraphs 4.6.1 through 4.6.11 with test panels prepared in accordance with 4.5 through 4.5.1, and 4.5.2, when directed. Unless otherwise specified in the test method or paragraph, laboratory test conditions shall be in accordance with ASTM D3924.

TABLE I. Test methods.

Requirements Paragraph	Test	Test paragraph	FED-STD-141 Test method	ASTM Method
3.4	Lead Content	---	---	D3335

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TABLE IV. Test methods, continued.

3.4.1	VOC Content	4.6.1	---	---
3.4.2.2	Chromium	---	---	D3718
3.5.2	Odor	---	---	D1296
3.5.3	Fineness of grind	---	---	D1210
3.5.4	Pot life	---	---	D1200
3.5.5	Condition in container	---	3011	---
3.5.6	Storage stability 1/	---	3022	---
3.5.7	Accelerated storage stability 2/	---	---	D1849
3.5.8	Freeze-thaw stability	---	---	D2243 3/
3.6.1	Surface appearance	---	---	---
3.6.2	Drying time	---	---	D1640
3.6.3, 3.6.3.1, 3.6.3.2	Gloss	---	---	D523
3.6.4	Lifting	4.6.2	---	---
3.6.5	Adhesion (wet tape)	4.6.3	---	---
3.6.6	Flexibility	4.6.4	---	---
3.6.7	Strippability	4.6.5	---	---
3.6.8	Infrared reflectance (Type II only)	4.6.6	---	---
3.7.1	Water resistance	4.6.7	---	---
3.7.2.1.1	Salt spray corrosion - Aluminum test panel	4.6.8.1.1	---	---
3.7.2.1.2	Salt spray corrosion - Aluminum/graphite test panel	4.6.8.1.2	---	---
3.7.2.2	Filiform corrosion	4.6.8.2	---	---
3.7.3	Fluid resistance	4.6.9	---	---
3.7.4	Solvent resistance (cure)	4.6.10	---	---
3.8.1	Mixing and Dilution	4.6.11	---	---
3.8.2	Application	4.5.1	---	---

- 1/ The daily ambient air temperature at the storage location shall fall within the range of 1.7° to 46°C (35° to 115°F).
- 2/ The primer coating shall be mixed on a mechanical shaker for 10 minutes instead of 300 stirs in 2 minutes.
- 3/ One freeze-thaw cycle shall be 16 hours at -9.4° ± 2.8°C (+15° ± 5°F) followed by 8 hours at room temperature (18° to 29.5°C (65° to 85°F)).

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4.6.1 Volatile organic compound (VOC) content. The unthinned, admixed primer coating, in accordance with the manufacturers instructions, shall be used for this test. The VOC of the primer coating shall be calculated as follows:

$$\text{VOC (g/l)} = A + B$$

Where:

- A = $[(100 - X_m - W_{H_2O}) + 100]$
 B = $[(1 + P_m) - (W_{H_2O} + 100,000)]$
 X_m = Solids content of the admixed primer coating (weight percent) determined in accordance with ASTM D2369, Procedure B.
 P_m = Density of admixed primer coating (g/l), determined in accordance with ASTM D1475.
 W_{H_2O} = Water, content of the admixed primer coating (percent by weight), determined in accordance with ASTM D3792.

4.6.2 Lifting. The primer coating shall be applied to test panels in accordance with 4.5 through 4.5.1. Topcoat shall be applied in accordance with 4.5.2 to primer coating that has air dried for 2, 4, and 18 hours, respectively. After the topcoat has fully cured, the test panels shall be examined for conformance to 3.6.4.

4.6.3 Adhesion - wet tape. Primer coating shall be applied to the test panels listed in table II in accordance with 4.5.1. Topcoat shall then be applied in accordance with 4.5.2 to panel A only. The test panels shall then be immersed in distilled water for 24 hours at room temperature (18° to 29.5°C (65° to 85°F)). After removal, the test panels shall be dried with absorbent paper tissue and, within three minutes of removal from the water, be tested in accordance with FED-STD-141, Method 6301 for conformance to 3.6.5.

TABLE II. Wet adhesion test panels.

Panel	Substrate	Pretreatment	Primer Coating	Topcoat
A	Aluminum alloy 2024 (T3 temper) (QQ-A-250/4)	MIL-C-5541	X	X
B	Aluminum alloy Alclad 2024 (T3 temper) (QQ-A-250/5)	Deoxidized	X	
C	Aluminum alloy Alclad 2024 (T3 temper) (QQ-A-250/5)	MIL-A-8625, Type II	X	
D	Magnesium alloy AMS 4375	MIL-M-3171, Type VIII	X	
E	Titanium alloy	Pickled 1/	X	

1/ Pickle 1 to 2 minutes in a 49° ± 3°C (120° ± 5°F) aqueous solution 45 ounces/gallon (oz/gal) of nitric acid (O-H-350) and 2.8 oz/gal of hydrofluoric acid conforming to MIL-A-24641.

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4.6.4 Flexibility. Test panels, constructed of aluminum alloy 2024 (0 temper) conforming to QQ-A-250/4 with approximate dimensions of 0.51 by 76.2 by 152.4 mm (0.020 by 3 by 6 in.), shall be anodized in accordance with MIL-A-8625, Type I. Primer coating shall then be applied to the test panels in accordance with 4.5.1. The flexibility of the coating shall then be tested in accordance with ASTM D2794, using a Gardco GE Universal Impact Tester, Model #172, or equivalent (see 6.8), using a specialized impactor which weighs 20 lbs, and has formed on each end four convex spherical segments, each of different radii and extension (see 6.8). 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. Use 10 power magnification to detect fine surface cracking. Examine for conformance to 3.6.6. Report the percent elongation corresponding to the largest spherical impression at which no cracking occurs.

4.6.5 Strippability. Separate test panels, prepared with the primer coating only (see 4.5 through 4.5.1) and with the primer coating and topcoat (see 4.5 through 4.5.2), shall be artificially aged at 99°C (210°F) for four days. The edges of the test panels shall then be masked with aluminum foil tape and the test panels placed on a rack at 60° to the horizontal, coated side up. Remover conforming to MIL-R-81294, Type I, shall be poured along the upper edge of the test panels. Just enough remover to completely cover the coated surface of each test panel shall be used. After 15 minutes exposure to the remover, the loosened film shall be brushed off with a stiff, non-metallic, bristle brush while rinsing under a stream of cool water. The test panels shall then be examined for conformance to 3.6.7. The amount of primer coating removed in this manner is determined by the percentage of substrate surface area exposed.

4.6.6 Infrared reflectance (Type II primer coating only). The Type II primer coating shall be applied to test panels in accordance with 4.5 through 4.5.1. The total reflectance (specular and diffuse) of the primer coating relative to barium sulfate shall be measured using a Perkin-Elmer LAMBDA 9 spectrophotometer (or equivalent (ASTM E275 may be used to compare performance of the equivalent unit to the LAMBDA 9)) over a range of 450 to 2700 nm. Examine for conformance to 3.6.8.

4.6.7 Water resistance. Test panels shall be prepared with primer coating only (see 4.5 through 4.5.1) and primer coating and topcoat (see 4.5 through 4.5.2). After immersion in distilled water maintained at 49° ± 3°C (120° ± 5°F) for four days, the coatings shall be examined for softening, wrinkling, blistering, and any other visually detectable deficiency (see 3.7.1). Some discoloration shall not be cause for rejection of Class 1A or 1B primer coating only, as chromated pigments sometimes cause discoloration by leaching.

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4.6.8 Corrosion resistance.4.6.8.1 Corrosion resistance - salt-spray.

4.6.8.1.1 Aluminum test panel. The primer coating shall be applied to test panels in accordance with 4.5 through 4.5.1. Two intersecting lines shall be scribed diagonally across the surface of the primer coating, exposing the bare substrate. The test panels shall then be placed in a 5 percent salt-spray cabinet for 2000 hours, in accordance with ASTM B117. After removal from the salt-spray cabinet, the test panels shall be examined for conformance to 3.7.2.1.1.

4.6.8.1.2 Aluminum/graphite-epoxy test panel. The primer coating shall be applied to the aluminum/graphite-epoxy test specimen (see Figure 1), in accordance with the following:

- a. An aluminum alloy 7075 (T6 temper) plate conforming to QQ-A-250/12, dimensions of 3 by 152.4 by 152.4 mm (0.125 by 6 by 6 in.), shall be anodized in accordance with MIL-A-8625, Type I;
- b. Primer coating shall be applied to the test panel in accordance with 4.5.1;
- c. Two intersecting lines shall be scribed diagonally across the surface of the plate, exposing the bare substrate;
- d. A graphite-epoxy panel with a 0°, 90° orientation (Hercules AS4/3501-6 or equivalent) of approximately 16 plies, dimensions of 0.094 by 3 by 3 in. (2.4 by 76 by 76 mm), shall be joined to the center of the primer coated plate with four nylon fasteners.
- e. Four additional lines, length of 51 mm (2 in.), shall be scribed along the edge of the panel, exposing the bare substrate of the plate.

The assembled test specimen shall then be placed in a 5 percent salt-spray cabinet for 500 hours in accordance with ASTM B117 and examined for conformance to 3.7.2.1.2.

4.6.8.2 Corrosion resistance (filiform). Aluminum alloy alclad 2024 (T3 temper) test panels conforming to QQ-A-250/5, dimensions of 0.020 by 3 by 6 in. shall be conversion coated to produce coatings conforming to MIL-C-5541, Class 1A or 3. Primer coating and topcoat shall then be applied to the test panels in accordance with 4.5.1 through 4.5.2. Two intersecting lines shall be scribed across the surface of each test panel and shall penetrate through the clad and into the base metal. The test panels shall be placed vertically in a desiccator containing 12 N HCl acid for one hour at $24^{\circ} \pm 3^{\circ}\text{C}$ ($75^{\circ} \pm 5^{\circ}\text{F}$). Within five minutes of removal from the desiccator, the test panels shall be placed in a humidity cabinet maintained at $40^{\circ} \pm 1.7^{\circ}\text{C}$ ($104^{\circ} \pm 3^{\circ}\text{F}$) and relative humidity (RH) of 80 ± 5 percent for 1000 hours. The test panels shall then be examined for conformance to 3.7.2.2. Filiform corrosion appears as thread-like filaments initiating from the exposed substrate and spreading underneath the coating film. A general description of filiform growth appears in ASTM D2803.

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4.6.9 Fluid resistance. The primer coating shall be applied to test panels in accordance with 4.5 through 4.5.1. The test panels shall then be separately immersed for 24 hours in the following:

- a. Lubricating oil conforming to MIL-L-23699, maintained at $121^{\circ} \pm 3^{\circ}\text{C}$ ($250^{\circ} \pm 5^{\circ}\text{F}$);
- b. Hydraulic fluid conforming to MIL-H-83282 maintained at $66^{\circ} \pm 3^{\circ}\text{C}$ ($150^{\circ} \pm 5^{\circ}\text{F}$).

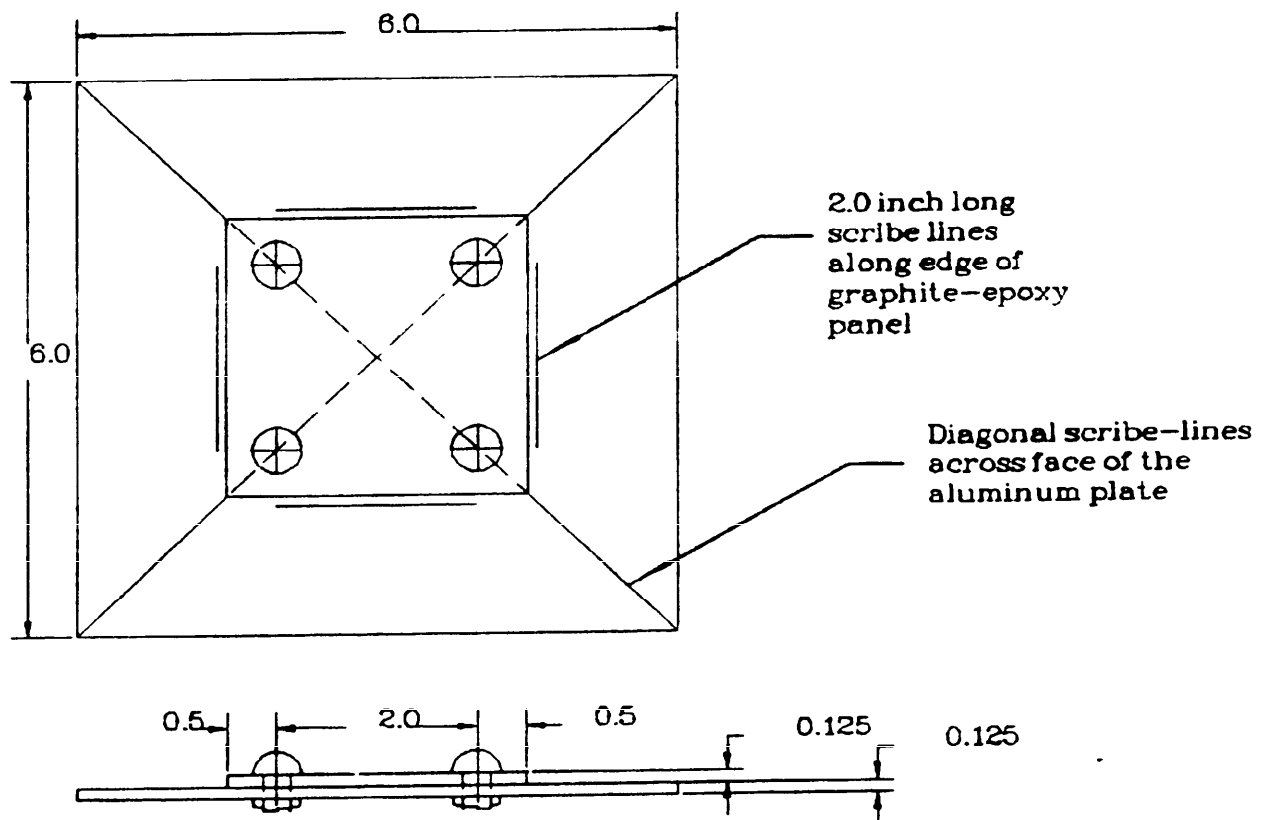
After removal from the test fluids, cool the test panels to room temperature (18° to 29.5°C (65° to 85°F)) and examine for conformance to 3.7.3.

4.6.10 Solvent resistance. The primer coating shall be applied to test panels in accordance with 4.5 through 4.5.1. The primer coating shall then be examined for cure, as follows:

- a. Soak a cotton, terrycloth rag in MEK solvent (see 6.13).
- b. Rub the coating with the soaked rag for 50 passes (25 times) with firm finger pressure.
- c. Examine coating for conformance to 3.7.4.

4.6.11 Mixing and dilution. Stir Component A until completely uniform. Mix Component A with Component B in the volume mixing ratio specified by the manufacturer and examine for conformance to 3.8.1. Thin as specified by the manufacturer. Stir and allow the admixed primer coating to sit for 30 minutes. Examine for conformance to 3.8.2.

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All dimensions are in inches

FIGURE 1. Aluminum/graphite - epoxy test specimen.

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5. PACKAGING

5.1 Packaging and packing. The primer coatings shall be packaged, packed, and marked in accordance with PPP-P-1892. The level of preservation shall be A or C and the level of packing shall be A, B, or C, as specified (see 6.2). The size of the components in one kit need not be the same.

5.2 Marking and labeling. In addition to the marking specified in PPP-P-1892, individual cans and containers (see 5.2.1) shall bear printed labels showing the following nomenclature and information, as applicable:

- Component Identification
 - Component A - Base component
 - Component B - Curing component
- Specification MIL-P-85582B, Type I or II, Class 1A, 1B, or 2 (as applicable)
- Manufacturer's name and product number
- Date of manufacture by month and year
- Batch number/net contents
- VOC content in grams/liter
- Mixing and thinning instructions

The following is to be included on a printed sheet 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.
 - c. Mix only the amount of primer coating to be used within 4 hours.
 - d. Primer coating from one vendor, or individual component, shall never be mixed with that of another vendor.
 - e. Apply over pretreated metal. On fiberglass-reinforced plastic surfaces, a prior coating of metal pretreatment conforming to MIL-C-8514 will facilitate stripping without damage to the fiberglass.

5.2.1 Precautionary markings.

5.2.1.1 Unit markings. Unit containers for Component A, shall contain the following precautionary marking, if applicable:

"WARNING! COMBUSTIBLE."

Unit containers for Component B shall contain the following precautionary marking, if applicable:

"WARNING! FLAMMABLE."

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All unit containers of toxic and hazardous chemicals and materials shall be labeled in accordance with the applicable laws, statutes, regulations or ordinances, including Federal, State and Municipal requirements. In addition, all unit containers (including unit containers that serve as shipping containers) shall be marked with the applicable precautionary information detailed in ANSI Z129.1

5.2.1.2 Intermediate and shipping container marking. Intermediate and shipping containers shall contain the following precautionary marking, if applicable: "WARNING! FLAMMABLE." Shipping containers shall be marked in accordance with 49 CFR 171-178 and shall bear the "Flammable Liquid" red label as specified therein. All intermediate containers of toxic and hazardous chemicals and materials shall also be labeled in accordance with the applicable laws, statutes, regulations or ordinances, including Federal, State and Municipal requirements. In addition, intermediate containers shall be marked with the applicable precautionary information detailed in ANSI Z129.1.

6. NOTES

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

6.1 Intended use. The primer coatings covered by this specification are corrosion-inhibitive, chemical resistant, and strippable and are intended for use on most metal surfaces. This coating may be used as an alternative to MIL-P-23377, "Primer Coatings: Epoxy, High-Solids," for many applications. However, primer coatings containing water, such as this, should not be used on iron or bare carbon steel, nor for the wet installation of fasteners or faying surfaces. Type II primer coating is intended for use where low infrared reflectance is required.

6.2. Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification, including any amendments.
- b. Classification (Type I or II, and Class 1A, 1B, or 2, as applicable) (see 1.2 and 6.7).
- c. Issue of DODISS to be cited in the solicitation, and, if required, the specific issue of individual documents referenced (see 2.1 and 2.2).
- d. Data requirements (see 6.3).
- e. Quantity and kit size (see 6.7.1).
- f. Levels of packaging and packing required (see 5.1).
- g. Marking and labeling required (see 5.2 through 5.2.1.2).
- h. Specify if palletization is required.
- i. Acceptance criteria (see 6.11 and 6.12).
- j. FAR clauses 23.303 and 52.223-3.

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6.3 Consideration of data requirements. The following Data Item Descriptions (DID's) must be listed, as applicable, on the Contract Data Requirements List (DD Form 1423) when this specification is applied on a contract, in order to obtain the data, except where DOD FAR Supplement 227.405-70 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.3.2	DI-MDTI-80809A	Test/Inspection Reports	---
3.3, 4.3.2, 4.4.2	DI-MISC-80678	Certification Data Sheet	---
4.4.2	DI-R-4026	Quality conformance test report	Use contractor format

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Qualification. With respect to products requiring qualification, awards will only be made for products which are qualified for inclusion in the applicable Qualified Products List at the time set for opening of bids, whether or not such products have actually been so listed by that date. The attention of manufacturers and suppliers is called to this requirement. Manufacturers are urged to arrange having the products that they propose to offer to the Federal Government tested for qualification in order to be eligible for award of contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Commander, Naval Air Systems Command (AIR-5304), Arlington, VA 22243; however, information pertaining to qualification of products should be obtained from the Commander, Naval Air Warfare Center - Aircraft Division, Code 6062, Box 5152, Warminster, PA 18974-0591.

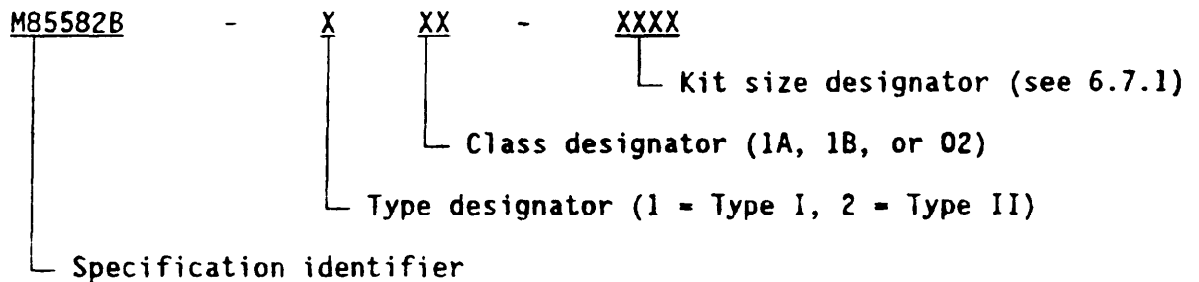
6.5 Subject term (keyword) listing.

Barium chromate
 Strontium chromate
 Corrosion inhibitive
 Hazardous material
 Hydrochloric acid
 Low infrared reflectance
 Methyl ethyl ketone (MEK) solvent
 Water reducible

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6.6 Material safety data sheets. 29 CFR 1910.1200 requires that the MSDS for each hazardous chemical used must be readily available to personnel using this coating. Contracting officers should identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313 and meeting the requirements of 29 CFR 1910.1200.

6.7 Part numbers. Part numbers for cataloging purposes under this specification may be coded as follows:



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. The 1 pint touch-up kit may be mixed to a total volume, when applied, of less than 1 pint (0.47 liters). When 6.7 is used as the part numbering system, the kit size is to be identified as following:

<u>Kit size</u>	<u>Kit size designer</u>
1 pint (0.47 liters)	001P
1 quart (0.95 liters)	001Q
1 gallon (3.79 liters)	001G

6.8 Impact tester source. The instrument used for 4.6.4 uses an impacter which weighs 20 lbs, and has formed on each end four convex spherical segments, each of different radii and extension. A suitable instrument for conducting ASTM D2794 (see 4.6.4) is the Gardco GE Universal Impact Tester, Model #172, available from the Paul N. Gardner Company, 316 N.E. First Street, P.O. Box 10688 Pompano Beach, FL 33061-6688. There may be other instruments equivalent to this unit.

6.9 Compatibility. The primer coatings covered by this specification are compatible with coatings conforming to the following specifications: MIL-C-22750, "Coating, Epoxy, High-Solids," MIL-C-46168, "Coating, Aliphatic Polyurethane, Chemical Agent Resistant," MIL-C-53039, "Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant," MIL-C-83286, "Coating, Urethane, Aliphatic Isocyanate, for Aerospace Applications," MIL-C-85285, "Coating: Polyurethane, High-Solids," and TT-P-2756, "Coating: Self-Priming Topcoat, Low Volatile Organic Compounds." Compatibility with other coatings should be tested prior to use.

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6.10 Cross-reference of classes from this MIL-P-85582A to MIL-P-85582B. Class 1 of MIL-P-85582A is Class 1A of MIL-P-85582B. Class 2 of MIL-P-85582A is Class 1B of MIL-P-85582B. MIL-P-85582B, Class 2, was not covered by MIL-P-85582A.

6.11 Acceptance criteria for packaging and marking. Previous revisions of this document specified an acceptable quality level (AQL) of 4.0 defects per hundred units, in accordance with MIL-STD-105.

6.12 Acceptance criteria for palletization. Previous revisions of this document specified an acceptable quality level (AQL) of 6.5 defects per hundred units, in accordance with MIL-STD-105.

6.13 Safely handling MEK solvent. To minimize exposure to MEK solvent, it is recommended that personnel conducting the solvent resistance (cure) test (see 4.6.6) wear either butyl rubber or Teflon gloves and a half-face respirator equipped with organic vapor cartridges.

6.14 Changes from previous issues. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - ME

Air Force - 99

Preparing activity:

Navy - AS

(Project No. 8010-0535)

Review activities:

Army - AV, MD, MR

Navy - OS, SH

Air Force - 11, 84

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.
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.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER

MIL-P-85582B

2. DOCUMENT DATE
(YYMMDD)

940523

3. DOCUMENT TITLE

PRIMER COATINGS: EPOXY, WATERBORNE

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE
(Include Area Code)

7. DATE SUBMITTED
(YYMMDD)

(1) Commercial:

(2) DSN:

(If Applicable)

8. PREPARING ACTIVITY

a. NAME
COMMANDER
NAVAL AIR WARFARE CENTER
AIRCRAFT DIVISION

b. TELEPHONE NUMBER (Include Area Code)

(1) Commercial
(908) 323-7488

(2) DSN
624-7488

c. ADDRESS (Include Zip Code)
CODE 8R3
HIGHWAY 847
LAKEHURST, NJ 08733-8100

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