

MIL-P-85582A
8 February 1988
~~SUPERSEDING~~
MIL-P-85582
29 September 1983

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 waterborne, epoxy type, corrosion inhibiting, chemical and solvent resistant primer coatings, formulated primarily for application by various spray techniques. The primer shall be compatible with aliphatic polyurethane topcoats and shall contain 340 grams per liter (2.84 pounds per gallon) or less of volatile organic compounds (VOC), as applied.

1.2 Classification. The primer coatings shall be furnished in the following types, classes and components, as specified (see 6.2.1):

- | | | |
|---------|---|----------------------------------|
| Type I | - | Standard pigments |
| Type II | - | Low infrared reflective pigments |
| Class 1 | - | Barium chromate inhibitor |
| Class 2 | - | Strontium chromate inhibitor |

1.2.1 Components. The primer coatings shall consist of two components, as specified (see 3.4):

- | | | |
|-------------|---|---|
| Component A | - | Shall consist of a resin solution and shall contain all of the pigments and corrosion inhibitors. |
| Component B | - | Shall consist of an unpigmented resin or curing agent solution. |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Systems Engineering and Standardization Department (Code 53), Naval Air Engineering Center, 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.

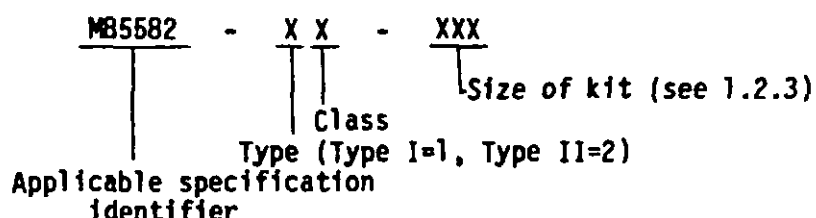
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FSC 8010

MIL-P-85582A

1.2.2 Part numbers. Part numbers for cataloging purposes under this specification shall be coded as follows:



1.2.3 Kit size. The primers covered by this specification should be purchased by volume, the unit being a kit containing two components. The kit sizes available are 1 pint (touch-up kit) (.47 liters), 1 quart (.95 liters) or 1 gallon (3.79 liters). The kit components need not be the same size. The 1 pint touch-up kit may be mixed to a total volume, when applied, of less than 1 pint (.47 liters). The kit size shall be identified in accordance with the following:

<u>Kit Size</u>	<u>Part Number Designation</u>
1 pint (.47 liters)	01P
1 quart (.95 liters)	01Q
1 gallon (3.79 liters)	01G

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

O-N-350	Nitric Acid, Technical
O-H-795	Hydrofluoric Acid, Technical
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
QQ-M-44	Magnesium Alloy Plate and Sheet
PPP-P-1892	Paint, Varnish, Lacquer and Related Materials, Packaging, Packing and Marking of

MIL-P-85582A

SPECIFICATIONS (Continued)

MILITARY

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-T-9046	Titanium and Titanium Alloy, Sheet, Strip and Plate
MIL-C-22750	Coating, Epoxy-Polyamide
MIL-P-23377	Primer Coatings: Epoxy-Polyamide, Chemical and Solvent Resistant
MIL-L-23699	Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL-C-46168	Coating, Aliphatic Polyurethane, Chemical Agent Resistant
MIL-C-53039	Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant
MIL-R-81294	Remover, Paint, Epoxy and Polyurethane Systems
MIL-C-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-T-81772	Thinner, Aircraft Coating
MIL-H-83282	Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft
MIL-C-83286	Coating, Urethane, Aliphatic Isocyanate, for Aerospace Applications
MIL-C-85285	Coating, Polyurethane, High Solids

STANDARDS

FEDERAL

FED-STD-141	Paint, Varnish, Lacquer and Related Materials; Method of Inspection, Sampling and Testing
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MIL-P-85582A

STANDARDS (Continued)

FEDERAL

FED-STD-313 Material Safety Data Sheets, Preparation and Submission of

MILITARY

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

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

CODE OF FEDERAL REGULATIONS

29 CFR 1910.1200 Material Safety Data Sheet; Preparation and Submission of

49 CFR 171-178 Regulations for the Transportation of Hazardous Materials

(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.)

(Copies of specifications, standards and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI Z 129.1 Precautionary Labeling of Hazardous Industrial Chemicals

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 117 Salt Spray (Fog) Testing

ASTM D 476 Titanium Dioxide Pigments

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) (Continued)

ASTM D 523	Specular Gloss
ASTM D 1193	Reagent Water
ASTM D 1200	Viscosity of Paints, Varnishes and Lacquers by Ford Viscosity Cup
ASTM D 1210	Fineness of Dispersion of Pigment-Vehicle Systems
ASTM D 1296	Odor of Volatile Solvents and Diluents
ASTM D 1475	Density of Paint, Varnish, Lacquer and Related Products
ASTM D 1640	Drying, Curing or Film Formation of Organic Coatings at Room Temperature
ASTM D 2197	Adhesion of Organic Coatings
ASTM D 2243	Freeze-Thaw Resistance of Latex and Emulsion Paints
ASTM D 2369	Volatile Content of Coatings
ASTM D 2803	Filiform Corrosion Resistance of Organic Coatings on Metal
ASTM D 3335	Low Concentrations of Lead, Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy
ASTM D 3792	Water Content of Water Reducible Paints by Direct Injection Into a Gas Chromatograph

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

(Nongovernment standards and other publications are normally available from the organizations which prepare or which 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 (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The primers 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 set for opening of bids (see 4.3 and 6.3). Any change in the formulation of a qualified product will

MIL-P-85582A

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. A Material Safety Data Sheet shall be prepared and submitted in accordance with FED-STD-313 and shall meet the requirements of 29 CFR 1910.1200. When FED-STD-313 is at variance with the CFR, 29 CFR 1910.1200 shall take precedence, modify and supplement FED-STD-313. One copy shall accompany the samples being submitted to the Qualifying Activity for testing (see 4.3.2). Questions pertinent to the effect of these primer coatings on the health of personnel when used for its intended purpose shall be referred by the acquiring activity to the appropriate medical service who will act as adviser to the acquiring activity (see 4.3.2 and 6.2(g)). The formulation of this coating shall preclude the use of lead (see Table II).

3.4 Composition. The primers shall consist of two components, one of which shall contain a bisphenol-A type epoxy resin. Component A shall be a resin solution containing all of the corrosion inhibitors and pigments. Component B shall be an unpigmented resin solution. When the components are mixed in the proportions specified by the manufacturer and reduced with water, a product meeting the applicable requirements of this specification shall result.

3.4.1 Volatile organic compounds. The volatile organic compounds (VOC) contained in the admixed primers shall be no more than 340 grams per liter of coating, excluding water, as determined in 4.6.1. The use of methylene chloride, trichloroethane or trichlorotrifluoroethane shall not be allowed.

3.4.2 Pigment. The total pigment content of the admixed primer components shall be not less than 45 percent of the solids content, as determined in 4.6.2.1. The pigment composition of component A shall consist of ingredients in the proportions of weight specified in Table I when tested in accordance with 4.6 and 4.6.2 (see 6.6).

TABLE I. Pigment composition.

Material	Requirement (percent by weight)	
	Type I	Type II
Chromate pigment (CrO ₃ content) (min.)	15.7	15.7
Titanium dioxide (min.)	13.0	--
Siliceous extenders, anti-settling agents and other additives (max.)	46.0	46.0
Coloring pigments (min.)	--	16.0

MIL-P-85582A

3.4.3 Solids. The total solids content of the admixed primer components shall be not less than 40 percent by weight, when tested in accordance with 4.6.

3.4.4 Thinner. When thinned to application viscosity with water conforming to the type IV requirements of ASTM D 1193, the admixed primer components shall meet the applicable requirements of this specification.

3.5 Physical properties - liquid.

3.5.1 Color. The color of the admixed primers shall be light green for type I and dark green for type II.

3.5.2 Odor. The odor of the primers, 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 4.6.

3.5.3 Fineness of grind. The fineness of grind of the admixed primer at application viscosity shall be not less than 5, when tested in accordance with 4.6.

3.5.4 Pot life. The viscosity of the admixed primers when thinned initially to 14 seconds through a number 4 Ford cup and stirred constantly at 140 ± 30 rpm, shall not exceed 22 seconds after 4 hours at $23^\circ \pm 2^\circ\text{C}$ ($73^\circ \pm 5^\circ\text{F}$), when tested in accordance with 4.6.

3.5.5 Solids at application viscosity. The total solids of the admixed primer, thinned to 14 seconds through a number 4 Ford cup, shall be greater than 20 percent by weight, when tested in accordance with 4.6.

3.5.6 Condition in container. Components A and B that have been allowed to stand without agitation for at least two weeks in closed containers, shall be capable of being mixed to a smooth, homogeneous, pourable condition.

3.5.6.1 Component A. Component A shall be free from grit, seeds, lumps, abnormal thickening or livering and shall not show pigment flotation or excessive settling which cannot be reincorporated by mixing, when tested in accordance with 4.6.

3.5.6.2 Component B. Component B shall show no trace of particulate matter either suspended in solution or settled on the inner surface of the container, when tested in accordance with 4.6.

3.5.7 Storage stability. The product, as packaged by the manufacturer, shall meet all requirements specified herein for a period of one year, when tested in accordance with 4.6.

3.5.8 Accelerated storage stability. The product, as packaged by the manufacturer, shall meet all the requirements specified herein after 7 days at $49^\circ \pm 0.5^\circ\text{C}$ ($120^\circ \pm 1^\circ\text{F}$) when tested in accordance with 4.6.

3.5.9 Freeze-thaw stability. The product, as packaged by the manufacturer, shall meet all the requirements specified herein after being subjected to five cycles of freezing and thawing, then tested in accordance with 4.6. A freeze-thaw cycle shall be 16 hours at $-9.4^\circ \pm 2.8^\circ\text{C}$ ($+15^\circ \pm 5^\circ\text{F}$) followed by 8 hours at 25° (77°F).

MIL-P-85582A

3.6 Physical properties - film.

3.6.1 Surface appearance. The admixed primer, when thinned, shall spray satisfactorily on a vertical surface with no sagging, running or streaking. The dried film shall be free from grit, seeds, craters, blisters or any other surface irregularities (see 4.6.3).

3.6.2 Drying time. The applied coating shall be tack free in not more than 60 minutes and shall be dry-hard in not more than 6 hours under an air-flow of 88 feet/minute (see 4.6).

3.6.3 Gloss.

3.6.3.1 Primer only. At a 60° geometry, the specular gloss of the primer film, 24 hours after application, shall be a maximum of 10 (see 4.6).

3.6.3.2 Primer with topcoat. At a 60° geometry, the specular gloss of the primer topcoated with MIL-C-83286 gloss polyurethane coating shall be a minimum of 90 (see 4.6).

3.6.4 Lifting. There shall be no evidence of lifting or any other film irregularity upon applying a MIL-C-83286 gloss polyurethane topcoat after the primer has air dried for 2, 4 and 18 hours (see 4.6.4).

3.6.5 Adhesion.

3.6.5.1 Dry adhesion. When tested as specified in 4.6, the primer film shall have a parallel groove adhesion rating of less than 4.0 microknife adhesion units.

3.6.5.2 Wet adhesion. After 4 days in 49°C (120°F) distilled water, the primer shall not peel from the substrates nor shall the topcoat delaminate from the primer, when tested as specified in 4.6.6.

3.6.6 Flexibility. The primer film shall exhibit a minimum impact elongation of 10 percent at room temperature, when tested as in 4.6.5.

3.6.7 Strippability. At least 90 percent of the primer film shall be stripped with the use of MIL-R-81294 paint remover in 15 minutes at room temperature, when tested as specified in 4.6.7.

3.6.8 Infrared reflectance (type II). The maximum total reflectance (specular and diffuse) relative to barium sulfate, shall be less than 10 percent throughout the range of 450 to 2700 nanometers when tested in accordance with 4.6.8.

3.7 Resistance properties.

3.7.1 Water resistance. The primer and topcoated primer shall withstand 4 days immersion in distilled water at 49°C (120°F) without showing any softening, wrinkling, blistering or any other coating deficiency, when tested in accordance with 4.6.6.1.

MIL-P-85582A

3.7.2 Corrosion resistance.

3.7.2.1 Salt spray test. When the primer film and also the primer top-coated with the MIL-L-83286 gloss polyurethane coating are tested as specified in 4.6.9, the coatings shall exhibit no blistering, lifting of the coating system or substrate corrosion after exposure to 5 percent salt spray for 1000 hours. In addition, the primer film (when applied to the aluminum/graphite-epoxy test specimen) shall exhibit no pitting greater than one millimeter in depth after exposure to salt-spray.

3.7.2.2 Filiform test. The primer film, when topcoated and tested as in 4.6.10, shall exhibit no filiform corrosion extending beyond 1/4-inch from the scribe. A majority of the filaments shall be less than 1/8-inch in length.

3.7.3 Fluid resistance. The primer film shall withstand 24 hours immersion in MIL-L-23699 lubricating oil at $121^{\circ} + 3^{\circ}\text{C}$ ($250^{\circ} + 5^{\circ}\text{F}$) and MIL-H-83282 hydraulic fluid at $66^{\circ} + 3^{\circ}\text{C}$ ($150^{\circ} + 5^{\circ}\text{F}$) without showing any softening, blistering, loss of adhesion or any other coating deficiency 4 hours after removal. Discoloration of the coating is acceptable and shall not be cause for rejection (see 4.6.11).

3.7.4 Solvent resistance. The primer film shall withstand repeated rubbing by a cloth rag soaked in methyl ethyl ketone solvent when tested as in 4.6.12.

3.8 Working properties.

3.8.1 Mixing. The two components mixed in the ratio by volume recommended by the manufacturer shall homogeneously blend together when mixed by a suitable mechanical mixer, as determined in 4.6.13.

3.8.2 Dilution. When the admixed primer 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. (Transient incompatibility exhibited during the first half of water addition shall be allowed.) The primer shall not separate into visually distinct layers in less than one hour after water dilution (see 4.6.13).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections or tests set forth in the specification where such are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must 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

MIL-P-85582A

shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of 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 requirements and tests specified in Section 3.

4.3.1 Qualification samples. The test samples shall consist of a minimum of one gallon (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 6.3).

Qualification test samples.

Specification MIL-P-85582A Type I or II and Class 1 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 a test report showing that the material satisfactorily conforms to the requirements of this specification. The manufacturer shall furnish to the contracting activity the toxicological data and formulations required to evaluate the safety of the material for the proposed use through the submission of the Material Safety Data Sheet detailed in FED-STD-313 and 29 CFR 1910.1200. In addition, the manufacturer shall submit a certificate to the qualifying laboratory indicating the absence of methylene chloride, trichloroethane and trichlorotrifluoroethane from his formulation.

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 his 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 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.

MIL-P-85582A

4.4.2 Batch data. With each sample, the manufacturer shall furnish a certified test report showing that the material satisfactorily meets the quality conformance requirements (4.4). In addition, the manufacturers 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 Examinations.

4.4.3.1 Tests. The examination shall consist of all the requirements and tests specified in Section 3, with the exception of storage stability (3.5.7), accelerated storage 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.

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

4.4.3.3 Examination of packaging and marking. An examination shall be made to determine that packaging, packing and marking comply with the requirements of Section 5 of this specification. Defects shall be scored in accordance with the list below. The sample unit for this examination shall be one shipping container fully prepared for delivery except that it shall not be palletized and need not be sealed. Shipping containers fully prepared for delivery that have not been palletized shall be examined for defects of closure. The lot size shall be the number of shipping containers in the end item inspection lot. The samples for this examination shall be selected at random in accordance with MIL-STD-105, inspection level S-2 and acceptable quality level (AQL) 4.0 defects per hundred units.

<u>Examine</u>	<u>Defect</u>
Packaging	Container 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. Bulged or distorted container.
Markings	Data, including directions for use, omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

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. Defects shall be scored in accordance with the list below. The sample unit shall be one palletized unit load fully prepared for delivery. The lot size shall be the number of palletized unit loads in the end item inspection lot. The samples for this examination shall be selected

MIL-P-85582A

at random in accordance with MIL-STD-105, inspection level S-1 and acceptable quality level (AQL) 6.5 defects per hundred units.

<u>Examine</u>	<u>Defect</u>
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 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 Naval Air Development Center, Code 6062, Warminster, PA 18974. 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 as in 4.4.2 and forwarded to the testing activity.

4.5 Test panels. Panels shall be prepared under laboratory test conditions (see 4.6). With the exception of the flexibility test (4.6.6), wet adhesion test (4.6.7), and the filiform corrosion test (4.6.11), all panels used for test purposes shall be aluminum alloy conforming to QQ-A-250/4 (T3 temper), 0.020 by 3 by 6 inches in size, and shall be treated with materials meeting MIL-C-81706 to produce coatings conforming to MIL-C-5541.

4.5.1 Application of primer. The epoxy primer shall be prepared by first thoroughly mixing each of the components separately. The two components are then mixed in the volume ratio specified by the manufacturer and thinned with water according to the manufacturer's recommended procedure (water reducible primers only). Spray the panels with one cross-coat of the primer and air-dry for two hours. The dry film thickness shall be 0.0006 to 0.0009 inches (.6 to .9 mils). Whenever specified, apply the polyurethane topcoat as directed in 4.5.2. Allow at least seven days air dry or 24 hours at 66° + 3°C (150° + 5°F) before testing. Air dry for one hour before exposure to elevated temperatures.

4.5.2 Application of topcoat. Admixed MIL-C-83286 polyurethane topcoat (untinted white gloss color, FED-STD-595 color 17925) shall be reduced with MIL-T-81772 thinner and allowed to stand 30 minutes before using. Apply two full coats to a total dry film topcoat thickness of 0.0017 to 0.0023 inches (1.7 to 2.3 mils). After application of the first coat, the panels shall be air dried at standard conditions until sufficiently dry (not to exceed one hour) before application of the second coat. The panels shall be allowed at least seven days air-dry or 24 hours at 66° + 3°C (150° + 5°F) before testing. Air dry for one hour before exposure to elevated temperatures.

4.6 Test methods. The tests of this specification shall be conducted in accordance with Table II and paragraphs 4.6.1 through 4.6.13 with the test panels prepared as specified in 4.5. Ingredient materials submitted shall be tested to determine compliance with the applicable specification. Test conditions shall be as specified in the applicable test method or paragraph.

4.6.1 Volatile organic compounds (VOC). This method requires the use of unthinned, admixed primer in the proportions specified by the manufacturer. VOC shall be calculated as follows:

$$\text{VOC (in grams per liter)} = \frac{1 - \frac{X_M}{100} - \frac{W_{H_2O}}{100}}{\frac{1}{P_M} - \frac{W_{H_2O}}{100,000}}$$

Where:

- X_M = Solids content of the admixed primer in weight percent, determined in accordance with ASTM D 2369, Procedure B.
- P_M = Density of admixed primer in grams per liter, determined in accordance with ASTM D 1475.
- W_{H_2O} = Water content of the admixed primer in percent by weight, determined in accordance with ASTM D 3792.

4.6.2 Pigment composition.

4.6.2.1 Pigment content. The pigment content of the unthinned, admixed primer solids shall be calculated as follows:

$$\text{Percent pigment or solids content} = \frac{100 Y_A P_A}{X_M P_M (1 + R)}$$

Where:

- X_M = Solids content of admixed primer in weight percent, determined in accordance with ASTM D 2369, Procedure B.
- Y_A = Pigment content of component A in weight percent, determined in accordance with Method 4021 of FED-STD-141 with the following exceptions:
- (1) The extracting solvent shall be either acetone (ACS reagent grade) or absolute ethyl alcohol (ACS reagent grade), whichever gives the lowest value of Y_A , and
 - (2) The extracted pigment shall be dried in a vacuum oven at $105^\circ \pm 2^\circ\text{C}$ ($221^\circ \pm 3.6^\circ\text{F}$) and no more than 10 mm Hg for two hours.

MIL-P-85582A

TABLE II. Test methods.

Requirements Paragraph	Tests	FED-STD-141 Test Method No.	ASTM Method No.
3.3	Lead content		D 3335
3.4.1	Water content		D 3792
3.4.1, 3.4.2	Density		D 1475
3.4.2	Pigment, total <u>1/</u>	4021	
3.4.2	Titanium dioxide		D 476
3.4.3	Solids, total		D 2369
3.4.4	Water (thinner)		D 1193
3.5.2	Odor		D 1296
3.5.3	Fineness of grind		D 1210
3.5.4, 3.5.5	Viscosity, pot life		D 1200
3.5.6, 3.5.6.1, 3.5.6.2	Condition in container	3011	
3.5.7	Storage stability <u>2/</u>	3022	
3.5.8	Accelerated storage stability <u>3/</u>	3019	
3.5.9	Freeze-thaw stability		D 2243
3.6.2	Drying time		D 1640
3.6.3, 3.6.3.1, 3.6.3.2	Specular gloss		D 523
3.6.5.1	Adhesion (parallel groove) <u>4/</u>		D 2197
3.6.5.2	Adhesion (tape test)	6301	

1/ For component A, see 4.6.2.1.

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

3/ Store at 49° \pm 2.7°C (120 \pm 5°F).

4/ Method B

MIL-P-85582A

- P_A = Density of component A determined in accordance with ASTM D 1475.
- P_M = Density of admixed primer as determined in 4.6.1.
- R = Volumetric mixing ratio (as specified by the manufacturer for preparation of the admixed primer),

$$\frac{\text{volume of component B}}{\text{volume of component A}}$$

4.6.2.2 CrO₃ content.4.6.2.2.1 Reagents.

- a. Hydrochloric acid (1:5). Mix 1 volume of concentrated hydrochloric acid (HCl sp. gr. 1.19) with 5 volumes of water.
- b. Potassium iodide solution (150 g per liter). Dissolve 150 g of potassium iodide (KI) in water and dilute to 1 liter.
- c. Sodium thiosulfate, standard solution (0.1N). Dissolve 24.8 g of sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) in water and dilute to 1 liter. Standardize against potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) 1/ as follows: Weigh to the nearest 0.1 mg by difference from a weighing bottle 0.16 to 0.22 g of $\text{K}_2\text{Cr}_2\text{O}_7$ that has been finely ground and then dried to constant weight at 110°C (230°F) prior to use. Place the $\text{K}_2\text{Cr}_2\text{O}_7$ in a 500 ml flask or bottle and dissolve in 25 ml of water. Add 5 ml of HCl and 20 ml of KI solution and rotate to mix. Allow to stand for 5 minutes and then add 100 ml of water. Titrate the $\text{Na}_2\text{S}_2\text{O}_3$ solution, while shaking constantly, until the yellow color has almost disappeared. Add 1 to 2 ml of starch indicator solution and continue the titration, adding the $\text{Na}_2\text{S}_2\text{O}_3$ solution slowly until the blue color has just disappeared. Calculate the normality of the $\text{Na}_2\text{S}_2\text{O}_3$ solution as follows:

- 1/ National Bureau of Standards sample number 136 of $\text{K}_2\text{Cr}_2\text{O}_7$ is recommended for this purpose and should be treated as directed in the certificate of analysis accompanying the standard sample.

$$\text{Normality} = \frac{A \times 20.39}{B}$$

Where:

A = Grams (g) of $\text{K}_2\text{Cr}_2\text{O}_7$ used, and

B = Milliliters (ml) of the $\text{Na}_2\text{S}_2\text{O}_3$ solution required for titration of the $\text{K}_2\text{Cr}_2\text{O}_7$.

- d. Starch indicator solution. Mix 4 g of soluble starch in 50 ml of water with constant stirring. Stir until the paste is uniform. Then pour the paste into 500 ml of boiling water with constant stirring. Boil for 2 minutes, stir, and dilute to 1 liter with water.

MIL-P-85582A

4.6.2.2.2 Procedure.

- a. Weigh accurately approximately 0.2 g of the sample from the total pigment determination (4.6.2.1) into a 250 ml iodine flask. Add 50 ml of water and 50 ml of HCl (1:5); and swirl the flask for about 5 minutes. Add 20 ml of KI solution and allow the solution to stand for several minutes.
- b. Titrate the liberated iodine with 0.1N $\text{Na}_2\text{S}_2\text{O}_3$ solution until the reddish brown iodine color becomes faint. Add 1 ml of starch solution and continue the titration cautiously to the end point which is easily discernible when the color changes from blue to a light green with no blue tinge.

4.6.2.2.3 Calculation. Calculate the CrO_3 content of the pigment as follows:

$$\text{Percent CrO}_3 \text{ content} = \frac{3.334 AB}{C}$$

Where:

A = Volume of $\text{Na}_2\text{S}_2\text{O}_3$ solution (in milliliters) required for titration of the sample,

B = Normality of the $\text{Na}_2\text{S}_2\text{O}_3$ solution, and

C = Weight of sample (in grams).

4.6.2.3 Extender content.4.6.2.3.1 Reagents.

- a. Ethanol (95 percent).
- b. Hydrochloric acid (1:1). Mix one volume of ACS reagent grade hydrochloric acid (12N) with one volume of distilled water.
- c. Sulfuric acid (ACS reagent grade).

4.6.2.3.2 Procedure. Weigh about one gram (to the nearest 0.1 milligram) of the extracted pigment of 4.6.2.1 into a 250 ml beaker. Wet the sample with a few drops of 95 percent ethanol and add 40 ml of hydrochloric acid (1:1). Cover the beaker with a watchglass and boil over a bunsen burner for 5 to 10 minutes. Remove from the heat and suction filter the contents of the beaker through a pre-weighed glass filtering crucible. Transfer the crucible and contents to the original beaker, add 50 ml of concentrated sulfuric acid, cover with a watchglass and boil for an additional 5 to 10 minutes while rotating the crucible to remove solubles. Remove the crucible and wash it completely with distilled water, collecting the rinsings in a second beaker. Filter the contents of the original beaker through the crucible and wash the solids with 50 ml of concentrated sulfuric acid. Filter the contents of the second beaker and wash the solids with distilled water until neutral to litmus paper. Dry the crucible to constant weight in a 150°C (302°F) oven.

MIL-P-85582A

4.6.2.3.3 Calculation. Calculate the percentage of extender pigment as follows:

$$\text{Percent} = \frac{A - B}{C} \times 100$$

Where:

A = Weight of crucible and contents

B = Weight of crucible alone

C = Weight of solid residue sample

4.6.3 Surface appearance. The primer film on a panel prepared as specified in 4.5, without a topcoat, shall be examined for conformance to 3.6.1.

4.6.4 Lifting. Primed panels, prepared as in 4.5, shall be topcoated as specified in 4.5.2 after 2, 4 and 18 hours air-dry for the primer. Examine the panels for conformance to 3.6.4.

4.6.5 Flexibility. QQ-A-250/4 (0 temper) aluminum alloy panels, 0.020 by 3 by 6 inches in size, pretreated with MIL-A-8625, Type I anodize, shall be tested with a GE Impact-Flexibility Tester. Place the coated panel, film downward, on the rubber pad at the bottom of the impacter guide. Drop the impacter on the panel, so that the impression of the entire rim of the impacter is made in the panel. Reverse the impacter ends; and drop it on the panel adjacent to the first area of impact. Use 10 power magnification to detect fine surface cracking. Report the percent elongation corresponding to the largest spherical impression at which no cracking occurs.

4.6.6 Wet adhesion. Test panels (listed in Table III), prepared as directed in 4.5, shall be immersed for 4 days in distilled water at 49°C (120°F), removed, dried with absorbent paper tissue and tested within 3 minutes for tape adhesion (see 3.6.5.2 and 4.6).

TABLE III. Wet adhesion test panels.

Panel	Substrate	Pretreatment	Primer	Topcoat
A	QQ-A-250/4 (2024-T3)	Treated to MIL-C-5541	X	X
B	QQ-A-250/5 (Clad 2024-T3)	Deoxidized	X	
C	QQ-A-250/5 (Clad 2024-T3)	Anodized to MIL-A-8625, Type II	X	
D	QQ-M-44 (AZ31B)	Treated to MIL-M-3171, Type VIII	X	
E	MIL-T-9046	Pickled 1/	X	

1/ Pickle 1-2 minutes in a 49°C (120°F) aqueous solution 45 ounces/gallon of nitric acid (O-N-350) and 2.8 ounces/gallon of hydrofluoric acid (O-H-795).

MIL-P-85582A

4.6.6.1 Water resistance. One hour after the wet adhesion test of 4.6.6, test panels shall be examined for softening, wrinkling, blistering and any other visual coating deficiencies.

4.6.7 Strippability. Primed panels, prepared as in 4.5, with and without a topcoat, shall be artificially aged at a temperature of 99°C (210°F) for 4 days. Then they shall be placed on a rack at a 60° angle with the horizontal. The panel edges shall be masked off with aluminum foil tape. The test shall be performed in a well ventilated area maintained at room temperature. Just enough of MIL-R-81294 paint remover shall be poured along the upper edge of each panel to completely cover the primer surface. After 15 minutes exposure time, the loosened film shall be brushed off and the panels rinsed with brushing under a stream of cool water. The amount of primer removed in this manner is determined by the percentage of substrate surface area exposed (see 3.6.7).

4.6.8 Infrared reflectance. Panels prepared in accordance with 4.5, without topcoat, shall be measured for total reflectance (specular and diffuse) relative to barium sulfate using a Perkin-Elmer LAMBDA 9 spectrophotometer (or equivalent) over a range of 450 to 2700 nanometers.

4.6.9 Corrosion resistance (salt-spray). Panels shall be primed as directed in 4.5. Two intersecting lines shall be scribed diagonally across the surface of each panel, so that the bare substrate is exposed. The panels shall then be placed in a 5 percent salt-spray cabinet for 1000 hours as described in ASTM B 117 and examined for conformance to 3.7.2.1. In addition, the aluminum/graphite-epoxy test specimen shown in Figure 1 shall be prepared in the following manner. An aluminum alloy plate conforming to QQ-A-250/12 (T6 temper), 0.125 by 6 by 6 inches (3 by 152.4 by 152.4 mm) in size, shall be anodized in accordance with MIL-A-8625, Type I and primed as directed in 4.5. Two intersecting lines shall be scribed diagonally across the surface of the plate, so that the bare substrate is exposed. A graphite-epoxy panel with a 0°, 90° orientation of approximately 16 plies, 0.09375 by 3 by 3 inches (2.4 by 76 by 76 mm) in size, shall be joined to the center of the primed plate with four nylon fasteners. Four additional lines of two-inch length shall be scribed along the edge of the panel, so that the bare substrate of the plate is exposed. The assembled specimen shall then be placed in a 5 percent salt-spray cabinet for 500 hours as described in ASTM B 117 and examined for conformance to 3.7.2.1.

4.6.10 Corrosion resistance (filiform). The test panels shall be aluminum alloy conforming to QQ-A-250/5 (T3 temper), 0.020 by 3 by 6 inches in size and shall be treated with materials meeting class IA, method C (immersion), form I of MIL-C-81706 to produce coatings conforming to MIL-C-5541. They shall be primed and topcoated as directed in 4.5. Two intersecting lines shall be scribed across the surface of each panel and shall penetrate through the clad and into the base metal. The panels shall be placed vertically in a desiccator containing 12 normal hydrochloric acid for one hour at 24° + 3°C (75° + 5°F). The panels shall then be placed within 5 minutes in a humidity cabinet maintained at 40° + 1.7°C (104° + 3°F) and 80 + 5 percent relative humidity for a period of 1000 hours. The panels shall then be examined for conformance to 3.7.2.2. A description of this test method is available in ASTM D 2803. Filiform corrosion appears as threadlike filaments initiating from the exposed substrate and spreading underneath the coating film.

MIL-P-85582A

4.6.11 Fluid resistance. Panels, prepared as directed in 4.5 without a topcoat, shall be immersed for 24 hours in MIL-L-23699 lubricating oil that has been heated to $121^{\circ} + 3^{\circ}\text{C}$ ($250^{\circ} + 5^{\circ}\text{F}$). The panels shall then be allowed to cool to room temperature and examined for conformance to the requirements of 3.7.3. This test shall be repeated using MIL-H-83282 hydraulic fluid at $66^{\circ} + 3^{\circ}\text{C}$ ($150^{\circ} + 5^{\circ}\text{F}$).

4.6.12 Solvent resistance. The panels shall be prepared as directed in 4.5. A cotton, terry-cloth rag shall be soaked in methyl ethyl ketone solvent and rubbed back and forth 25 times (50 passes) over the primer film with firm finger pressure. Rubbing through the primer to bare metal indicates that it has failed to properly cure.

4.6.13 Working properties. Stir component A until completely uniform. Mix component A with component B in the volume ratio specified by the manufacturer and examine for conformance to the requirements of 3.8.1. Thin as specified by the manufacturer. Stir well and allow to dwell for 30 minutes. Examine for conformance to the requirements of 3.8.2.

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 kit shall also be as specified (see 1.2.3). 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 - Pigmented base component

Component B - Curing component

Specification MIL-P-85582A, Type I or II and Class 1 or 2
(as applicable)

Manufacturer's name and product number

Date of manufacture by month and year

Batch number/net contents

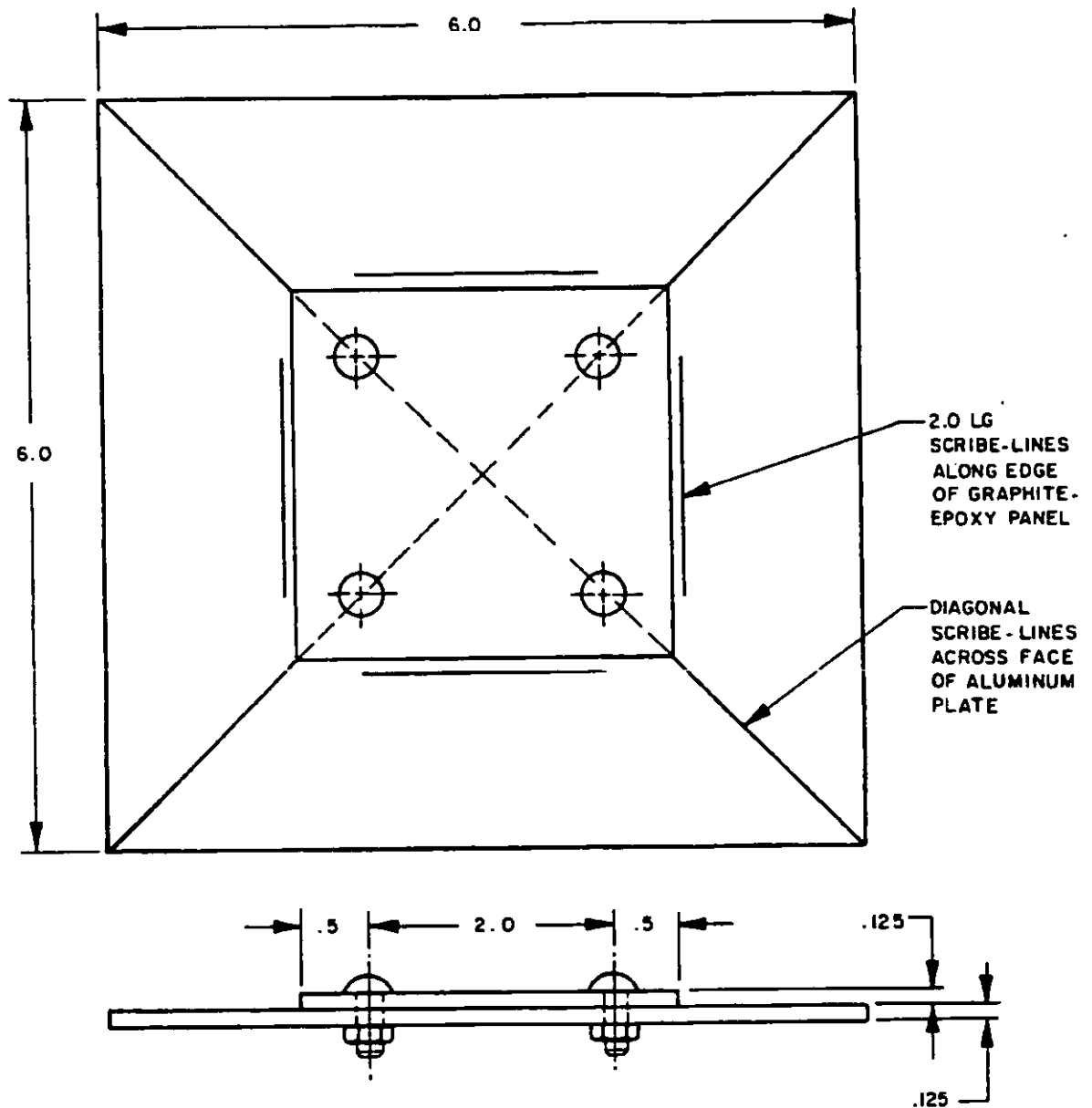
VOC content in grams/liter

Mixing and thinning instructions

Precautions

- a. The surface to be primed must be absolutely clean and free of oil, dust, etc.
- b. Equipment must be adequately grounded. Clean spray equipment immediately after use.

MIL-P-85582A



Dimensions are in inches

FIGURE 1. Aluminum/graphite - epoxy test specimen.

MIL-P-85582A

- c. Mix only that amount to be used in 4 hours.
- d. The epoxy primer from one vendor, or component thereof, shall never be mixed with that of another vendor.
- e. Apply over pretreated metal. On fiberglass-reinforced plastic surfaces, a prior coat of MIL-C-8514 pretreatment coating will facilitate stripping without damage to the fiberglass.

5.2.1 Precautionary markings. Unit, intermediate and shipping containers shall contain the following precautionary marking: "WARNING! Contains flammable volatile solvent." Shipping containers shall be marked in accordance with Department of Transportation regulations as specified in 49 CFR 171-178 and shall bear the "Flammable Liquid" red label as specified therein. All unit and intermediate packs 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, unit and intermediate containers, including unit containers that serve as shipping containers such as pails and drums, shall be marked with the applicable precautionary information detailed in American National Standard ANSI Z 129.1.

6. NOTES

6.1 Intended use. The coatings covered by this specification are intended for use on metal surfaces as corrosion-inhibitive, chemical resistant, strippable, epoxy primers that are equivalent to MIL-P-23377 primers and compatible with MIL-C-85285, MIL-C-53039, MIL-C-46168 and MIL-C-83286 polyurethane topcoats and MIL-C-22750 epoxy topcoat. Compatibility with other topcoats should be tested prior to use. Type II primer is intended for use where low infrared reflectance is required.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. Classification (Type I or II and Class 1 or 2) (see 1.2).
- c. Type and size of containers required (see 1.2.3)
- d. Quantity (see 5.1).
- e. Level of packaging and packing (see 5.1).
- f. Special markings (see 5.2).
- g. Toxicological data requirements (see 3.3 and 4.3.2).
- h. FAR clauses 23.303 and 52.223-3.
- i. Specify if palletization is required.

MIL-P-85582A

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement 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 orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Development Center, Attn: Code 6062, Warminster, PA 18974, and information pertaining to qualification of products may be obtained from that activity. It is understood that the material furnished under this specification subsequent to final approval shall be of the same composition and shall be equal to products upon which approval was originally granted. In the event that the coating furnished under contract is found to deviate from the composition of the approved product or that the product fails to perform satisfactorily, approval of such products will be subject to immediate withdrawal from the Qualified Products List.

6.4 Subject term (keyword) listing.

Aliphatic polyurethane topcoats
 Chemical resistance
 Chromate inhibitor
 Coating
 Corrosion inhibitive
 Epoxy
 Hazardous material
 Low infrared reflectance
 Primer
 Solvent resistant
 VOC compliant
 Water reducible

6.5 Material Safety Data Sheets. Contracting officers will 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. When FED-STD-313 is at variance with the CFR, 29 CFR 1910.1200 shall take precedence, modify and supplement FED-STD-313. The pertinent government mailing addresses for submission of data are listed in Appendix B of FED-STD-313.

6.6 Chromate pigments. Some chromate pigments cause blistering in the water resistance test 4.6.7.1 (see 3.4.2).

6.7 Changes from previous issue. 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.

MIL-P-85582A

Custodians:

Army - ME
Navy - AS
Air Force - 20

Preparing activity:

Navy - AS
(Project 8010-1225)

Review activities:

Army - AR, MI
Navy - OS
DLA - DS

User activities:

Army - AV, EL
Navy - SH

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL*(See Instructions - Reverse Side)*

1. DOCUMENT NUMBER		2. DOCUMENT TITLE	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
3b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		8. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
9. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	