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SUPERSEDING
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25 October 2004

DETAIL SPECIFICATION

CHEMICAL CONVERSION MATERIALS FOR COATING ALUMINUM AND ALUMINUM ALLOYS

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

1. SCOPE

1.1 Scope. This specification covers chemical conversion materials used in the formation of coatings by the reaction of the material with the surfaces of aluminum and aluminum alloys.

1.2 Classification. The chemical conversion materials and application methods are of the following types, classes, material forms, and methods.

1.2.1. Types. The chemical conversion materials are of the following types (see 6.2).

Type I – Compositions containing hexavalent chromium.
Type II – Compositions containing no hexavalent chromium.

1.2.2 Classes. The materials, which form protective coatings by chemical reaction with aluminum and aluminum alloys, are of the following classes (see 6.2).

Class 1A - For maximum protection against corrosion, painted or unpainted.
Class 3 - For protection against corrosion where low electrical resistance is required.

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 491000B120-3, Highway 547, Lakehurst, NJ 08733-5100 or emailed to thomas.omara@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil.

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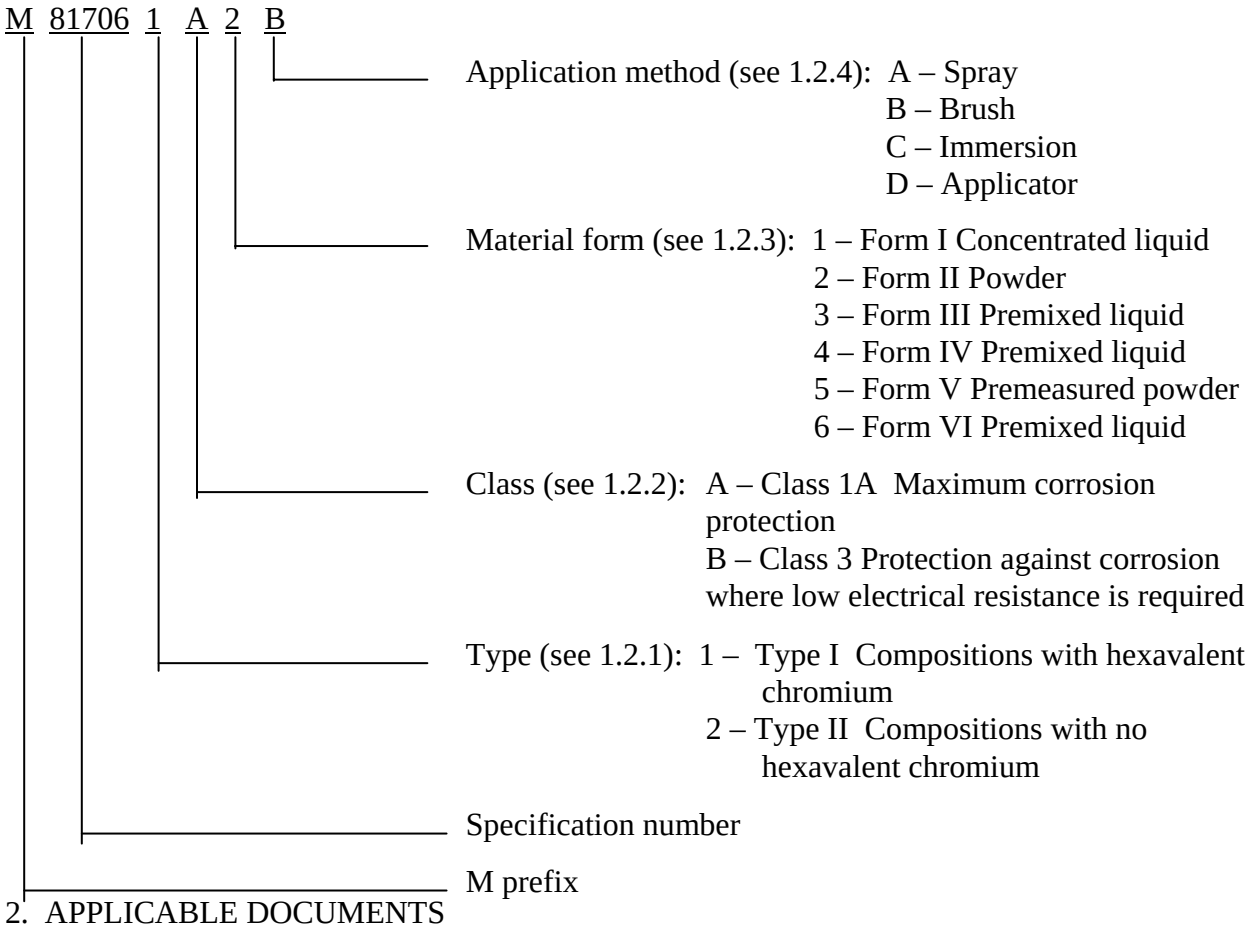
1.2.3 Material forms. Chemical conversion materials are of the following forms (see 6.2).

Form I – Concentrated liquid
Form II – Powder
Form III – Premixed liquid (ready for use touch-up brush application)
Form IV – Premixed liquid, thixotropic (ready for use)
Form V – Premeasured powder, thixotropic (ready for use after addition of water)
Form VI – Premixed liquid (ready for touch-up use in self-contained applicator device)

1.2.4 Application methods. Chemical conversion materials are of the following application methods (see 6.2).

Method A – Spray
Method B – Brush-on or wipe-on
Method C – Immersion
Method D – Applicator pen or presaturated applicator device

1.3 Part or identifying number (PIN). PINs to be used for the chemical conversion materials for coating aluminum and aluminum alloys acquired to this specification are created as follows:



2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-141	-	Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-23377	-	Primer Coatings: Epoxy, High-Solids
MIL-PRF-85285	-	Coating: Polyurethane, Aircraft and Support Equipment
MIL-PRF-85582	-	Primer Coatings: Epoxy, Waterborne

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

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

ASTM-B117	-	Salt Spray (Fog) Apparatus, Operating. (DoD adopted)
ASTM-D3359	-	Adhesion by Tape Test, Measuring

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

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SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) INTERNATIONAL

SAE-AMS4027	-	Aluminum Alloy, Sheet and Plate, 1.0Mg-0.60Si-0.28Cu-0.20Cr, (6061; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated. (DoD adopted)
SAE-AMS4037	-	Aluminum Alloy, Sheet and Plate, 4.4Cu-1.5Mg-0.60Mn, (2024; -T3 Flat Sheet; -T351 Plate), Solution Heat Treated.
SAE-AMS4045	-	Aluminum Alloy, Sheet and Plate, 5.6Zn-2.5Mg-1.6Cu-0.23Cr, 7075: (-T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated. (DoD adopted)

(Copies of these documents are available from the SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.)

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

3. REQUIREMENTS

3.1 Qualification. The chemical conversion materials furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.5).

3.2 Coating materials. All ingredients used in the chemical conversion materials shall meet the requirements of this specification. Type I materials shall be formulated from hexavalent chromium compounds, other inorganic salts such as phosphates or fluorides, catalysts, activators, and accelerators. Type II materials shall be formulated from salts, catalysts, activators, and accelerators that contain no hexavalent chromium. The materials, in an aqueous solution, shall form a conversion coating nonelectrolytically.

3.3 Application. The material, after proper mixing, shall be a material selected for treatment of the prepared metal in accordance with the supplier's instructions, by spray, brush, immersion, or applicator (see 1.2.4 and 6.2). Class 1A material, furnished premixed in liquid forms III and IV shall be in the concentration required for treatment and shall require no further dilution. Type I conversion coatings shall not be subjected to a surface temperature greater than 140 °F (60 °C) during drying or curing. Type II conversion coatings shall not be subjected to a surface temperature greater than 250 °F (120 °C), or to a surface temperature greater than recommended in accordance with the supplier’s instructions, whichever is lower, during drying or curing. No conversion coated component shall be subjected to a surface temperature greater than 250 °F (120 °C) during drying or curing. After application, the coating shall be continuous and substantially free from powdery and loose areas. The coating shall also be free from breaks, scratches, flaws, or other defects that will reduce serviceability or be detrimental to appearance,

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protective value, or paint bonding characteristics. The material shall deposit a conversion coating visibly discernible in daylight.

3.4 Toxicity. The material and processing baths or solutions shall have no adverse effect on the health of personnel (see 6.5.2), when used for the intended purpose in accordance with local process specifications (see 6.1).

3.5 Performance characteristics.

3.5.1 Corrosion resistance. After testing in accordance with 4.5.1 for applicable salt spray exposure periods specified in table I, the specimens shall show no evidence of corrosion when compared to unexposed control panels using the naked eye. Areas within 0.25 inch (6.35 millimeters [mm]) from the edges of the panel, the identification markings, and the panel holding points during processing or salt spray exposure shall not be evaluated. Differences in color between the test panels and the control panels shall not be cause for rejection.

TABLE I. Schedule for corrosion resistance properties of unpainted chemical films.

Corrosion Resistance Inspection	Class	Aluminum Alloy To Be Conversion Coated	Salt Spray Exposure (Hours)
Qualification	1A	2024-T3, 7075-T6	1/ 336
	3	6061-T6	168
Conformance	1A	2024-T3	168
	3	6061-T6	168

1/ Exposure time for class 1A, form VI, method D materials shall be 168 hours.

3.5.2 Paint adhesion (wet tape). After application of the epoxy polyamide primer in accordance with 4.4.4, no intercoat separation shall occur between the paint system, the conversion coating, or the base metal, when tested in accordance with 4.5.2.

3.5.3 Paint adhesion (wet tape) after repair (applies to nonimmersion methods). After panel repair and immersion in test fluid as specified in 4.5.3, the scribed panels shall exhibit no peel-away and be rated at not less than 4A in accordance with ASTM-D3359. There shall be no blistering of the unscribed coated area.

3.6 Coating weight (class 1A only). When tested in accordance with 4.5.4, type I coating weight shall be not less than 40 milligrams per square foot (430 milligrams per square meter) of surface area. Class 1A, type I, form VI, method D coating weight shall be not less than 10 milligrams per square foot of surface area (107.5 milligrams per square meter). Class 1A, type II coating weight shall be not less than 10 milligrams per square foot of surface area (107.5 milligrams per square meter).

3.7 Contact electrical resistance properties (class 3 only). When tested in accordance with 4.5.5, the contact electrical resistance of aluminum alloy panels treated with class 3 materials under an applied electrode pressure of 200 pounds per square inch (psi) shall be not greater than

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5,000 microhms psi as applied and 10,000 microhms psi after salt spray exposure specified in 4.5.1. Individual readings not greater than 20 percent in excess of the specified maximums shall be acceptable, provided that the average of all readings does not exceed the specified maximum resistance.

3.8 Vertical adherence weight (forms IV and V only). After testing in accordance with 4.5.6, forms IV and V shall have an average adherence weight of 2.8 to 6.5 grams. The materials shall cling uniformly to the test panel with no visual evidence of excessive runoff or lack of coverage.

3.9 Storage stability. The storage life of the materials conforming to this specification shall be not less than 12 months (see 6.7). Products for which storage stability is to be determined shall be furnished in containers as specified by the qualifying activity. Storage samples shall not be opened or agitated during the stipulated storage period. After storage stability the product shall be easily mixed or diluted in accordance with the supplier's instructions, and shall conform to all applicable requirements of this document. Only those products that have been tested and initially found to meet all applicable requirements of this specification shall be evaluated for storage stability (see 4.5.7).

3.10 Unit of issue. To interface with existing equipment and system part lists and meet the required storage characteristics, the units of issue shall be as specified in 3.10.1 and 3.10.2.

3.10.1 Bulk materials. Form I unit of issue shall be one gallon, shipped in plastic lined containers of up to 55 gallon capacity. Form II unit of issue shall be one pound, shipped in plastic lined or plastic containers of up to 175 pound capacity. All containers shall be sealed to prevent moisture intrusion.

3.10.2 Ready-to-use or premeasured materials. Units of issue for forms III and IV shall be one pint or one quart plastic containers with plastic lined screw cap. Unit of issue for form V shall be one quart plastic container with plastic lined screw cap. The plastic container shall be marked with the powder level and the added liquid level. All containers shall be sealed to prevent moisture intrusion. Unit of issue for form VI, method D, shall be one applicator device.

3.11 Warning label. For type I, forms I through V, the following warning shall appear on each container:

WARNING: Chemical conversion materials are strongly oxidizing and present a potential fire and explosion hazard when in contact with flammable materials such as paint thinners. Avoid storing or mixing these materials in containers that previously contained flammable products.

Type II chemical conversion materials shall be labeled in accordance with Department of Transportation (DOT) or National Fire Protection Association (NFPA) regulations for solid and liquid compositions.

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3.12 Instructions for use. All containers shall have specific instructions for mixing, using, and applying the chemical conversion materials. The instructions shall be either marked or labeled on the container, or included on an instruction sheet in a plastic envelope attached securely to the outside of the container. The methods and materials used to provide the marking or labeling, for all forms except form VI, shall be water-repellent to ensure that the instructions remain legible under the exposure conditions of the container.

3.13 Workmanship. The chemical conversion materials shall be uniform in composition and quality, and be free from impurities and other defects that impair usability and adversely affect performance. The chemical conversion materials furnished in this specification shall be identical in composition and coating characteristics to the qualification sample.

4. VERIFICATION

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

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

4.2 Qualification inspection. Qualification inspection shall consist of all tests specified in table II.

4.2.1 Samples. The qualification test samples for application methods A, B, and C (see 1.2.4) shall consist of individual containers of premeasured material to make up the following:

a. Four individual ten-gallon baths for immersion application.
b. Four individual one-gallon baths for spray application.
c. Four individual one-gallon baths for brush application.

The qualification sample for application method D (see 1.2.4) shall consist of twelve applicator devices, ready for use.

NOTE: The qualifying activity (see 6.5) does not measure any of the individual component chemicals. They only add water, if applicable, to the premeasured quantity (forms I, II, and V). The qualifying activity does, however, furnish the necessary test panels for qualification inspection. The samples shall be forwarded as directed in the letter of authorization (see 6.5) and be identified by securely attached tags marked with the following information:

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Samples for qualification inspection
CHEMICAL CONVERSION MATERIALS FOR COATING ALUMINUM AND ALUMINUM ALLOYS
Name of manufacturer
Manufacturing facility
Product code number
Batch number
Date of manufacture
Submitted by (name) (date) for qualification inspection in accordance with MIL-DTL-81706B under authorization of (reference authorizing letter).

TABLE II. Qualification inspections.

Inspection	Class	Alloys To Be Tested 1/	Number Of Panels 2/	Panel Identification Numbers 3/	Rqmt Para.	Test Para.
Corrosion Resistance	1A	2024-T3	5	1A through 6A	3.5.1	4.5.1
		7075-T6	5	1B through 6B		
	3	6061-T6	5	1C through 6C		
Electrical Contact Resistance After Salt Spray Exposure	3	6061-T6	5	4/ 1C through 5C	3.7	4.5.5
Electrical Contact Resistance Without Salt Spray Exposure	3	6061-T6	5	7C through 11C	3.7	4.5.5
Paint Adhesion Initial	1A	2024-T3	2	7A and 8A	3.5.2	4.5.2
		7075-T6	2	7B and 8B		
	3	6061-T6	2	12C and 13C		
Paint Adhesion After Repair 5/	1A	2024-T3	18	9A through 26A	3.5.3	4.5.3
		7075-T6	18	9B through 26B		
Coating Weight	1A	2024-T3	3	27A through 29A	3.6	4.5.4
		7075-T6	3	27B through 29B		
Vertical Adherence of Thixotropic Forms (IV and V)	1A	7075-T6	3	30B through 32B	3.8	4.5.6
Storage Life 6/	---	---	---	---	3.9	4.5.7

1/ 2024-T3, 7075-T6, and 6061-T6 shall conform to SAE-AMS4037, SAE-AMS4045, and SAE-AMS4027, respectively.
2/ Panel dimensions and preparations shall be in accordance with 4.4.
3/ Panels 6A, 6B, 6C shall be used as the corrosion resistance test control panels (unexposed to salt spray).
4/ Reuse class 3 salt spray panels for electrical contact resistance after salt spray exposure.
5/ Requirement for class 1A, form VI, method D materials only.

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6/ Conduct all qualification inspections on material exposed to the storage life test. Do not repeat storage life test.

4.3 Conformance inspection. Conformance inspection shall consist of testing chemical conversion materials from each lot (see 4.3.1) to perform all inspections specified in table III.

TABLE III. Conformance inspections.

Inspection	Class	Alloys To Be Tested 1/	Number Of Panels To Be Tested 2/	Panel Identification Numbers 3/	Rqmt Para.	Test Para.
Corrosion Resistance	1A	2024-T3	5	1A through 6A	3.5.1	4.5.1
	3	6061-T6	5	1C through 6C		
Paint Adhesion	1A	2024-T3	2	7A and 8A	3.5.2	4.5.2
	3	6061-T6	2	12C and 13C		
Coating Weight	1A	2024-T3	3	9A through 11A	3.6	4.5.4
Vertical Adherence of Thixotropic Forms (IV and V)	1A	7075-T6	3	12B through 14B	3.8	4.5.6

1/ 2024-T3, 7075-T6, and 6061-T6 shall conform to SAE-AMS4037, SAE-AMS4045, and SAE-AMS4027, respectively.
2/ Panel dimensions and preparations shall be in accordance with 4.4.
3/ Panels 6A and 6C shall be used as the corrosion resistance test control panels (unexposed to salt spray).

4.3.1 Lot. Unless otherwise specified in the contract or purchase description (see 6.2), a lot of the chemical film material shall consist of one production run, produced by one manufacturer under the same processing conditions, without change in ingredients or ingredient lots and offered for delivery at one time (see 6.5.3). If the material cannot be identified by lot, a lot shall consist of not more than 1,500 gallons of liquid or 2,000 pounds of powder material offered for delivery at one time.

4.4 Preparation of test panels.

4.4.1 Alloys, required number of panels, identification markings, and dimensions. The alloys to be tested, the number of panels required for each test, and the identification marking for each panel are specified in table II for qualification testing and in table III for conformance inspection testing. Panel dimensions, after repair paint adhesion, shall be 5 x 3 x 0.032 inch (12.7 x 7.6 x 0.08 mm). All other panels shall be 10 x 3 x 0.032 inch (24.4 x 7.6 x 0.08 mm). The aluminum used to fabricate the panels shall be free of pits, scratches, mill markings, or imperfections due to irregularity of heat treatments.

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4.4.2 Panel cleaning.

4.4.2.1 Panel cleaning prior to conversion coating . Test panels shall be cleaned with materials that remove soil without damaging the metal. The panels shall be cleaned to remove oxides and all foreign substances. Acid solutions, when required, shall be used for removal of oxides and the characteristic surface smut. The panels shall be rinsed thoroughly with water prior to coating application. Abrasives containing iron, such as steel wool, iron oxide rouge, or steel wire are prohibited for all cleaning operations as particles from them may become embedded in the metal and accelerate corrosion. The panels shall be handled during all cleaning and subsequent treatments so that mechanical damage or contamination is avoided.

4.4.2.2 Vertical adherence panels (forms IV and V only). The 7075-T6 aluminum panels required for the vertical adherence shall be cleaned with an acetone rinse. The panels shall then be marked with a pencil line 4 inches (101 mm) from one end, prior to testing for vertical adherence in accordance with 4.5.6.

4.4.3 Conversion coating application. Panels prepared and cleaned in accordance with 4.4.1 and 4.4.2, except for class 1A, form VI, method D, shall be conversion coated on all surfaces in accordance with the manufacturer's instructions. All panels shall be dried at temperatures between 70 to 90 °F (21 to 32 °C) for 24 hours prior to testing, except panels to be used for coating weight determination (see 4.5.4). For class 1A, form VI, method D, panels prepared and cleaned in accordance with 4.4.1 and 4.4.2 shall be conversion coated on one side in accordance with the manufacturer's instructions. All panels shall be dried at ambient conditions for not less than 24 hours. Panels 1 through 5 exposed to salt spray shall have edges protected by wax or other method approved by the qualifying activity.

4.4.4 Panel finishing.

4.4.4.1 Paint adhesion panels. Test panels prepared, cleaned, and conversion coated in accordance with 4.4.1 through 4.4.3 shall be finished with one coat of a volatile organic compound (VOC) compliant epoxy-polyamide primer conforming to MIL-PRF-23377 and MIL-PRF-85582 to a dry film thickness of 0.0006 to 0.0009 inch (0.6 to 0.9 mil). Panels prepared from class 1A, form VI, method D, shall be air dried for 14 days before testing. All other panels shall be allowed to dry in accordance with the primer specification, prior to testing for paint adhesion in accordance with 4.5.2.

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4.4.4.2 Paint adhesion panels (after repair).

4.4.4.2.1 Panels 9 through 17. Panels prepared, cleaned, and conversion coated in accordance with 4.4.1 through 4.4.3 shall be finished with one coat of epoxy primer conforming to MIL-PRF-23377. After the primer has dried for 5 hours, a polyurethane topcoat conforming to MIL-PRF-85285 shall be applied. Panels shall be air dried for 14 days before testing.

4.4.4.2.2 Panels 18 through 26. Panels prepared, cleaned, and conversion coated in accordance with 4.4.1 through 4.4.3 shall be finished with one coat of epoxy primer conforming to MIL-PRF-85582. After the primer has dried for 6 hours, a polyurethane topcoat conforming to MIL-PRF-85285 shall be applied. Panels shall be air dried for 14 days before testing.

4.5 Test methods.

4.5.1 Corrosion resistance. Panels prepared in accordance with 4.4 shall be used for corrosion resistance testing of class 1A and class 3 materials. The selected specimens shall be subjected to a 5 percent salt spray test in accordance with ASTM-B117, except that the significant surface shall be inclined 6 degrees from the vertical. Specimens being qualified or for lot acceptance (see 4.3.1) shall be exposed for the number of hours specified in table I. After exposure, specimens shall be cleaned in running water with a temperature not greater than 100 °F (38 °C), blown with clean dry unheated air, and compared with the unexposed specimen for the presence of corrosion to determine compliance with 3.5.1. Differences in color between test panels and unexposed control specimens shall not be cause for rejection. Specimens from class 3 material, after exposure and cleaning, shall be allowed to air dry for 24 hours at room temperature before testing for contact electrical resistance properties in accordance with 4.5.5 for compliance with 3.7.

4.5.2 Paint adhesion (wet tape). Panels prepared in accordance with 4.4.4.1 shall be tested for paint adhesion in accordance with FED-STD-141, Method 6301.3.

4.5.3 Paint adhesion (wet tape), after repair (applies to nonimmersion methods).

4.5.3.1 Repair procedure. Panels 9 through 26, finished as specified in 4.4.4.2, shall be abraded to a shiny substrate using a Scotch Brite wheel or pad (see 6.6), or equivalent, as approved by the qualifying activity. The abraded area shall be 4 square inches. The remainder of the topcoat shall be lightly abraded to accept refinish primer. Class 1A, form VI, method D material shall be applied to the abraded entire panel and conditioned in accordance with the manufacturer’s instructions. The entire surface of panels 9 through 17 and panels 18 through 26 shall be refinished as specified in the applicable section of 4.4.4.2.

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4.5.3.2 Immersion procedure. Painted panels shall be immersed in distilled water as follows:

3 panels of each substrate and finish for 24 hours at room temperature.
3 panels of each substrate and finish for 96 hours at 120 ±2 °F (49 ±1 °C).
3 panels of each substrate and finish for 168 hours at 150 ±2 °F (65.5 ±1 °C).

Upon completion of the immersion period, the panels shall be removed from the water, dried using a clean, dry soft cloth, and be immediately evaluated as specified in 4.5.3.3.

4.5.3.3 Evaluation procedure. Panels prepared in accordance with 4.4.4.1 shall be tested for paint adhesion in accordance with FED-STD-141, Method 6301.3, except that the scribed area shall include the original paint, overlap area, and the repair area.

4.5.4 Coating weight (class 1A). Panels prepared as specified in 4.4.3 shall be tested as specified herein for conformance to the requirements in 3.6. For type I coatings, within 3 hours after applying the conversion coating, the panels shall be weighed to the nearest 0.1 milligram. The coating shall not be aged for more than 3 hours since it will become difficult to remove and the results will be inaccurate. Immediately after weighing, the specimens shall be immersed for 60 seconds in freshly made nitric acid solution, composed of equal parts by volume of concentrated nitric acid (70 percent HNO_3) and deionized water, maintained at room temperature. Coating removal can be facilitated by brushing the specimen with a clean cotton swab. For type II coatings, the method specified for type I coatings shall be used, unless an alternative method is specified by the manufacturer. After removal of the conversion coating, the specimen shall be rinsed thoroughly in deionized or distilled water, blown dry with clean, filtered oil-free air, and reweighed. The weight of the chemical conversion film in milligrams per square foot shall be calculated as follows:

Film Weight = $(W_1 - W_2) \times 2.4$ for milligrams/ft^2 (25.8 for milligrams per square meter)

where: W_1 = Initial weight in milligrams
W_2 = Final weight in milligrams

4.5.5 Contact electrical resistance (class 3 only). Panels prepared as specified in 4.4 (before and after the salt spray exposure [see 4.5.1]) shall have the contact electrical resistance of the coating determined for conformance to 3.7. Test equipment and circuitry as shown on figures 1 and 2 shall be used for measuring the electrical resistance of the class 3 material specimens. The applied load shall be within one percent of the calculated 200 psi applied pressure. The contacting electrodes shall be copper or silver-plated copper with a finish not rougher than that obtained by the use of 000 metallographic abrasive paper. The electrodes shall be flat enough so that when the load is applied without a specimen between them, light will not be visible through the contacting surface. The area of the upper electrode shall be one square inch (25 square mm) and the area of the lower electrodes shall be larger. Ten measurements shall be made on each panel in the areas shown on figure 3.

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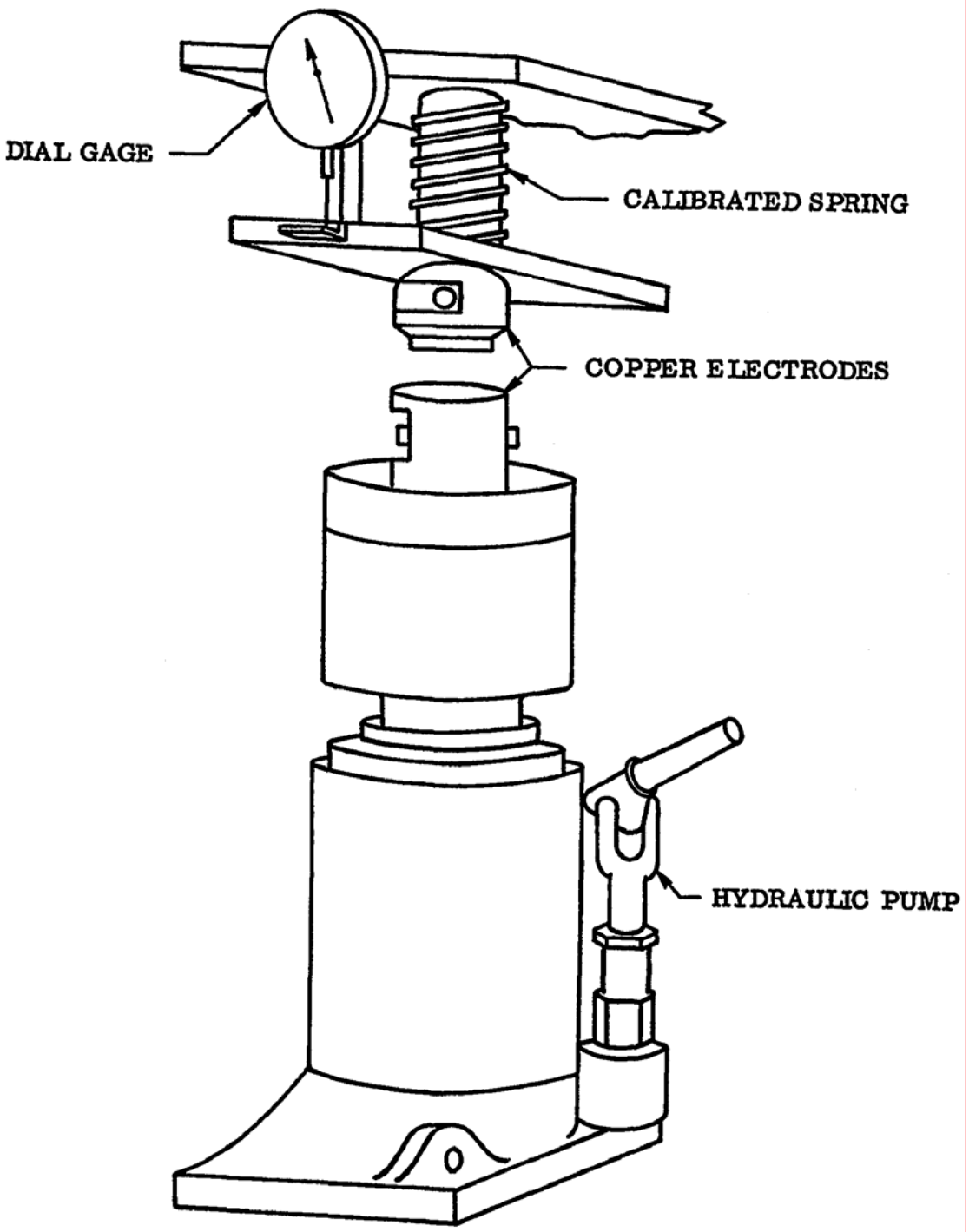

FIGURE 1. Sketch of equipment for measuring electrical resistance of chemical film.

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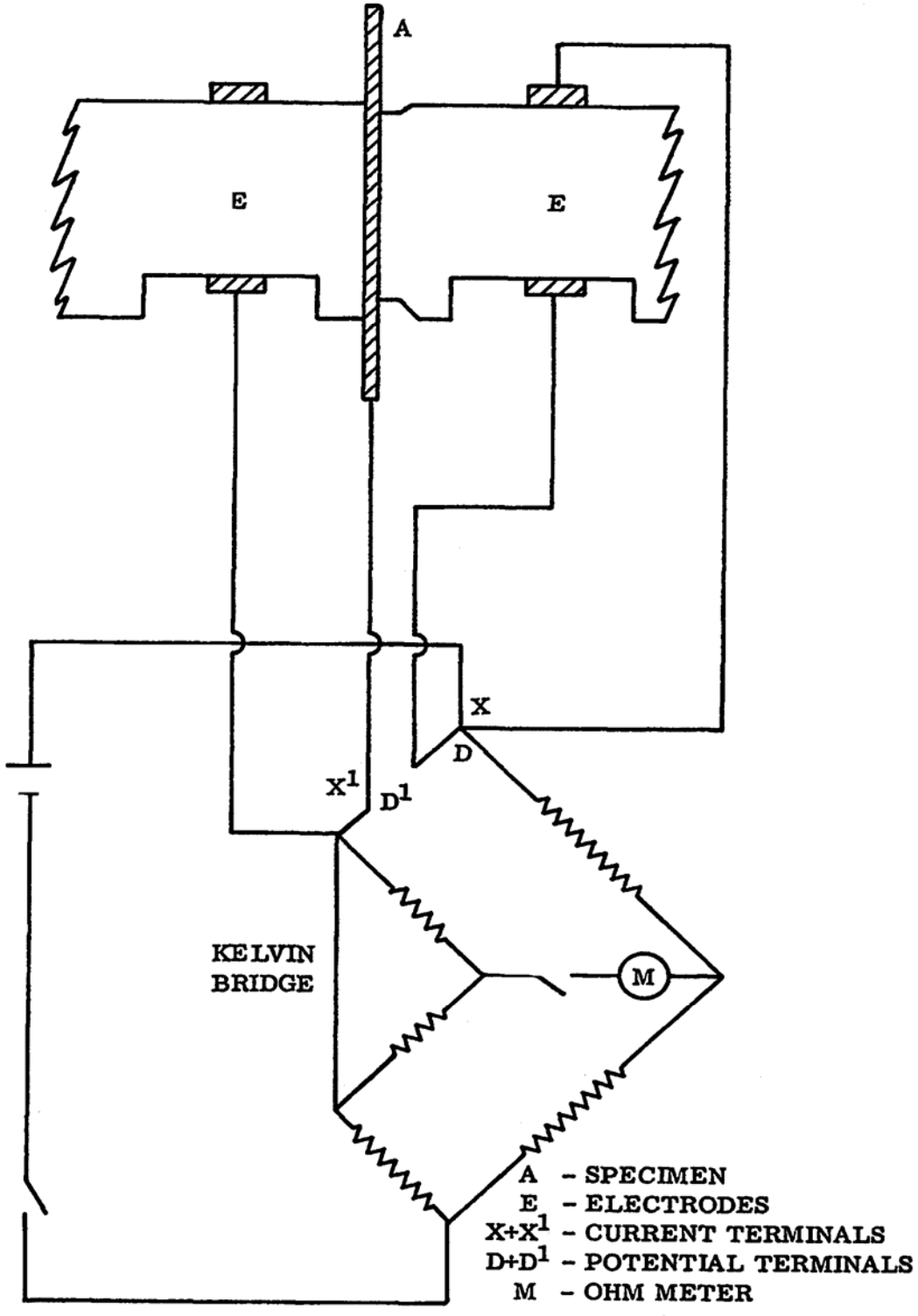

FIGURE 2. Circuit diagram for contact resistance measurements.

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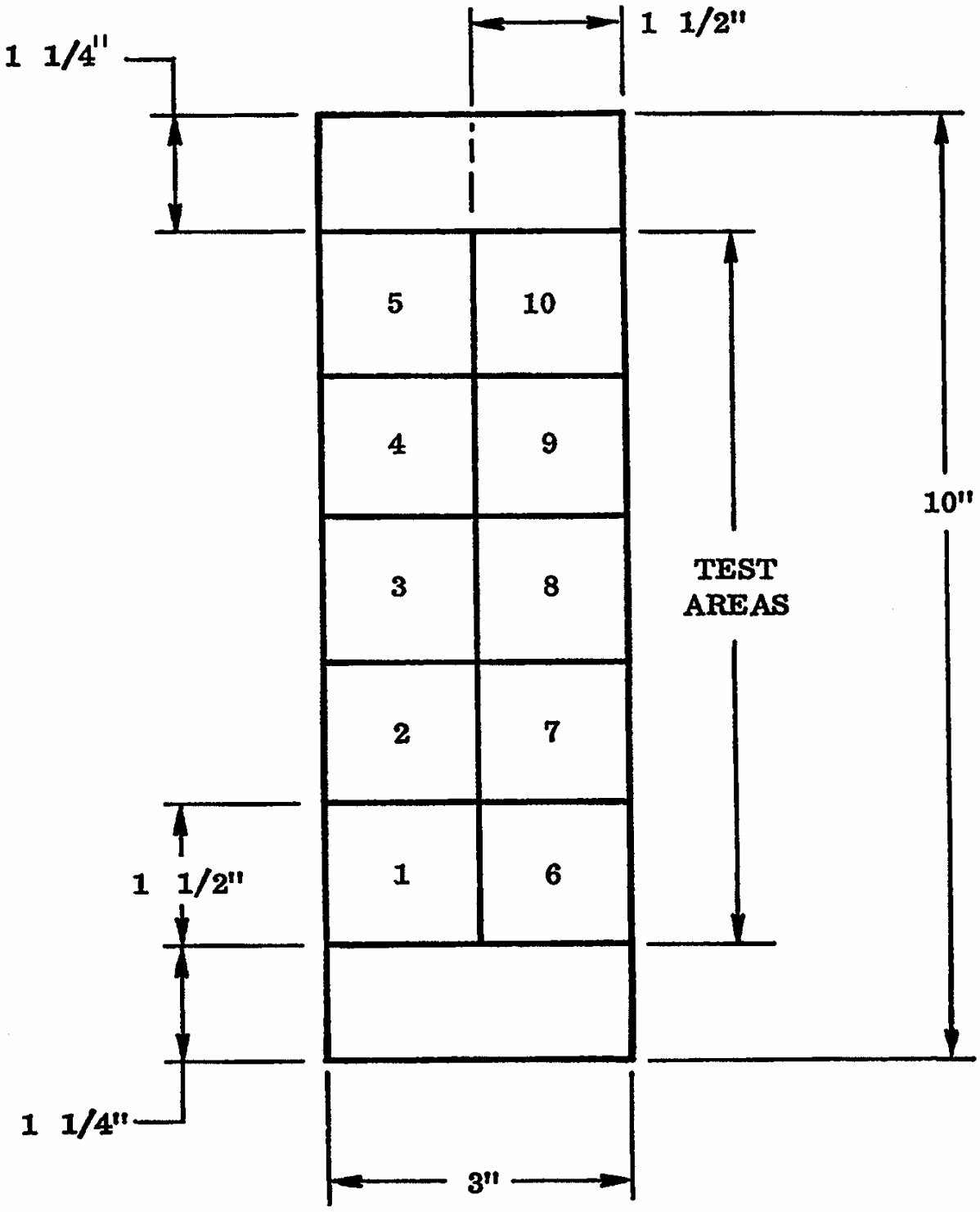

FIGURE 3. Areas for measurements of electrical resistance on treated panels.

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4.5.6 Vertical adherence (forms IV and V only). Each panel prepared as specified in 4.4.2.2 shall be placed in a 600 ml beaker and weighed with the beaker to the nearest 0.1 gram. The weight for each panel shall be recorded. One quart of the form IV or form V material (with the required water added) shall be thoroughly mixed and allowed to stand for not less than 24 hours. After the 24-hour period, an amount of material shall be transferred to a 600 ml plastic beaker (not the beaker used in the weight determinations) such that the beaker is almost filled. Four inches (up to the pencil line) of each panel shall be immersed, one at a time, in the coating material. The panel shall then be lifted vertically above the surface of the material and allowed to drain for 45 seconds. The panel shall then be transferred without rinsing to the beaker in which it was originally weighed and the coated panel with the beaker shall be reweighed to the nearest 0.1 gram. The vertical adherence weight shall be determined for each panel by subtracting the original weight of the panel and the beaker from the weight of the coated panel and beaker. The results obtained for each panel shall be averaged to determine compliance to 3.8.

4.5.7 Storage stability. After having been stored in its original container for the specified time period (see 3.9) under daily mean temperatures within 35 to 95 °F (2 to 35 °C), with peak ambient air temperature not exceeding 115 °F (46 °C), the product shall be tested in accordance with table I to determine compliance to 3.9.

5. PACKAGING

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

6. NOTES

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

6.l Intended use. The conversion coatings covered by this specification are intended for use, throughout the Department of Defense, on aluminum and aluminum alloy substrates that are not anodized. They are used to repair anodize coatings on aluminum. They are designated as a post treatment to ion-vapor deposition (IVD) aluminum used on many military platforms as a cadmium alternative or galvanic corrosion inhibitor. Type I and II conversion coatings provide corrosion protection on unpainted items, as well as improve adhesion of paint finish systems on aluminum and aluminum alloys. Conversion coatings covered by this specification exceed commercially available products due to the nature of their use on aircraft. All conversion coating applications in accordance with this specification are assumed to use type I unless the

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use of
type II is specified. Type II may not be substituted for type I, for either Class IA or Class 3, unless authorization for its use is given by the acquisition activity or engineering authority for the system or item on which the conversion coating is applied.

6.1.1 Class 1A. Class 1A materials covered by this specification are intended for use in the formation of chemical conversion coatings which are corrosion preventive films and will improve adhesion of paint finish systems to aluminum and aluminum alloys.

6.1.1.1 Class 1A, form VI, method D. Class 1A, form VI, method D materials covered by this specification are intended for use in the formation of conversion coatings for repair or touch-up applications which are corrosion preventive and will improve adhesion of paint finish systems to aluminum and aluminum alloys.

6.1.2 Class 3. Class 3 materials covered by this specification are intended for use in the formation of chemical conversion coatings which are corrosion preventive films for electrical and electronic applications where low resistance contacts are required.

6.1.3 Relationship with MIL-C-5541. The materials that have been approved in accordance with the requirements of this document and have been accepted for listing on the applicable qualified products list are used to produce coatings conforming to MIL-C-5541. MIL-C-5541 covers the requirements for chemical conversion coatings formed by the reaction of materials qualified to this specification and applied to the surfaces of articles, items, parts, or components made of aluminum and aluminum alloys.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.

b. Type and class required (see 1.2.1 and 1.2.2).

c. Form and application method of material to be furnished (see 1.2.3 and 1.2.4).

d. Unit of issue required (see 3.10).

e. Quantity required.

f. Lot size (see 4.3.1).

g. Packaging requirements (see 5.1).

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6.3 Interchangeability. The various products approved under this specification are interchangeable within each class insofar as performance is concerned, but are not interchangeable from a chemical standpoint, that is, different products cannot be mixed. The product from one manufacturer should not be mixed or used to strengthen an existing solution from another supplier. As the chemical film materials are proprietary products, the ingredients, processes, the method of application (for example, spray, brush, and immersion), and the equipment required for application vary with the different products. Contractors and military activities should take this into account in procurement, in the design of parts, and in the establishment of facilities. Detail drawing of parts requiring treatment with materials conforming to this specification should specify the required class, 1A or 3, and optionally, the required type, I or II.

6.3.1 Field use. Products used for brush application method B and pen or wipe application method D are available for field use in repainting and the repair of existing corroded areas, and are listed in the applicable qualified products list. Products used for touch-up brush application, already premixed, are available for field use in kits. The chemical conversion materials are one of the products to be used in treating small areas of corrosion on weapons systems.

6.4 Other alloys. The acquisition activity may select other alloys and other types of specimens more representative of production work for the conformance inspection of corrosion resistance of the chemical conversion material. Criteria should be supplied by the acquisition activity.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL-81706 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Naval Air Warfare Center Aircraft Division, Materials Division, Bldg. 2188, Patuxent River, MD 20670-1908.

6.5.1 Retention of qualification. In order to retain qualification of a product approved for listing on the qualified products list (QPL), the manufacturer will verify by certification to the qualifying activity, that the manufacturer’s product complies with the requirements of this specification. Unless otherwise specified, the time of periodic verification by certification will be in two-year intervals from the date of the original qualification, and will be initiated by the qualifying activity. No change will be made in formulation, raw materials or supplier(s) of raw materials, methods of manufacture, equipment, or geographic location without prior written Government approval. The Government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

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6.5.2 Information required to accompany qualification samples. When authorizing the forwarding of qualification samples, the qualifying activity will request the manufacturer to submit the qualification inspection sample, the Material Safety Data Sheet (MSDS), and a test report showing that the material conforms to the requirements of this specification. An MSDS must be prepared and submitted in accordance with FED-STD-313. The MSDS must also meet the requirements of 29 CFR 1910.1200. The 29 CFR 1910.1200 requires that the MSDS for each hazardous chemical used in an operation must be readily available to personnel using the material. Questions pertinent to the effect(s) of these conversion coatings on the health of personnel using them can be referred by the procuring activity to the appropriate medical service, who will act as its adviser. Contracting officers will identify the activities requiring copies of the MSDS.

6.5.3 Conformity to qualified sample. All lots of chemical conversion materials supplied under this specification must be manufactured using the same formulation, raw materials and supplier(s) of raw materials, methods of manufacture, equipment, and geographic location as the qualification sample, unless changes have been approved by the qualifying activity.

6.6 Source of items for tests. Type 250 tape, Scotch Brite wheels, and pads are available for purchase from the 3M Company, Minneapolis, MN.

6.7 Shelf life. This specification covers items where shelf life is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order. The shelf-life codes are contained in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from *DoD 4140.27-M, Shelf-life Management Manual,* or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points (ICPs), and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: http://www.shelflife.hq.dla.mil/.

6.8 Subject term (key word) listing.

Chromates
Chromium
Phosphates

6.9 Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations

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CONCLUDING MATERIAL

Custodians:
Army - MR
Navy - AS
Air Force - 99

Preparing activity:
Navy - AS
(Project MFFP-2006-003)

Review activities:
Army - AT, MI
Navy - OS, SH
Air Force - 11, 84

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

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