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MIL-STD-7179B
24 January 2019
SUPERSEDING
MIL-STD-7179A
10 August 2009

DEPARTMENT OF DEFENSE STANDARD PRACTICE

FINISHES, COATINGS, AND SEALANTS, FOR THE PROTECTION OF AEROSPACE WEAPONS SYSTEMS AND SUPPORT EQUIPMENT



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FOREWORD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense (DoD).
2. This standard covers minimum requirements for methods and materials to be used for protective surface treatments of aerospace weapons systems and support equipment (see 3.5 and 6.1).
3. This standard identifies material specifications that are required for use as finishes, protective coatings, and sealants in aerospace weapons systems and support equipment. When an alternate material or process is desired, approval of the procuring activity's cognizant engineering authority (CEA) is required.
4. Comments, suggestions, or questions should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 4.1.2.2, Mail Stop 120-3, Route 547, Joint Base MDL, NJ 08733-5100, or email to michael.sikora@navy.mil. Since contact information can change, it may be necessary to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

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1. SCOPE

1.1 Scope. This standard establishes minimum requirements to be considered for finishes, protective coatings, and sealants used in the protection of aerospace weapons systems and support equipment (see 3.5, 3.6 and 6.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, and 5 of this standard, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards and handbooks 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 SPECIFICATIONS

- | | |
|-----------|--|
| TT-C-490 | - Chemical Conversion Coatings and Pretreatments for Metallic Substrates (Base for Organic Coatings) |
| TT-P-2760 | - Primer Coating: Polyurethane, Elastomeric, High Solids |

DEPARTMENT OF DEFENSE SPECIFICATIONS

- | | |
|---------------|---|
| MIL-PRF-3043 | - Resin-Coating, Permanent, For Engine Components and Metal Parts |
| MIL-DTL-5002 | - Surface Treatments and Inorganic Coatings for Metal Surfaces of Weapons Systems |
| MIL-C-5056 | - Coating, Permanent Resin, Process for Application of, to Aircraft Parts |
| MIL-DTL-5541 | - Chemical Conversion Coatings on Aluminum and Aluminum Alloys |
| MIL-A-8625 | - Anodic Coatings for Aluminum and Aluminum Alloys |
| MIL-C-8779 | - Colors, Interior, Aircraft, Requirements for |
| MIL-C-11796 | - Corrosion Preventive Compound, Petrolatum, Hot Application |
| MIL-PRF-16173 | - Corrosion Preventive Compound, Solvent Cutback, Cold-Application |
| MIL-DTL-18264 | - Finishes, Organic, Weapons Systems, Application and Control of |
| MIL-PRF-22750 | - Coating, Epoxy, High-Solids |
| MIL-PRF-23236 | - Coating Systems for Ship Structures |
| MIL-PRF-23377 | - Primer Coatings: Epoxy, High-Solids |

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- MIL-L-23398 - Lubricant, Solid Film, Air-Cured, Corrosion Inhibiting, NATO Code Number S-749
- MIL-PRF-24635 - Coating Systems, Weather-Resistant, Exterior Use
- MIL-PRF-32033 - Lubricating Oil, General Purpose, Preservative (Water-Displacing, Low Temperature)
- MIL-PRF-32239 - Coating System, Advanced Performance, for Aerospace Applications
- MIL-PRF-46010 - Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting, NATO Code S-1738
- MIL-PRF-46147 - Lubricant, Solid Film, Air Cured, Corrosion Inhibiting
- MIL-DTL-53022 - Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free
- MIL-DTL-53039 - Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant
- MIL-DTL-53072 - Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection
- MIL-DTL-64159 - Camouflage Coating, Water Dispersible, Aliphatic Polyurethane, Chemical Agent Resistant
- MIL-PRF-81309 - Corrosion Preventive Compounds, Water Displacing, Ultra-Thin Film
- MIL-DTL-81706 - Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
- MIL-PRF-81733 - Sealing and Coating Compound, Corrosion Inhibitive
- MIL-DTL-85054 - Corrosion Preventive Compound, Water Displacing, Transparent (Formerly Amlguard)
- MIL-PRF-83483 - Antiseize Thread Compound, Molybdenum Disulfide - Petrolatum
- MIL-PRF-85285 - Coating: Polyurethane, Aircraft and Support Equipment
- MIL-PRF-85322 - Coating, Elastomeric, Polyurethane, Rain-Erosion
- MIL-PRF-85582 - Primer Coatings: Epoxy, Waterborne

DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-464 - Electromagnetic Environmental Effects, Requirements for Systems
- MIL-STD-889 - Dissimilar Metals
- MIL-STD-1568 - Materials and Processes for Corrosion Prevention and Control in Aerospace Weapons Systems
- MIL-STD-2161 - Paint Schemes and Exterior Markings for U.S. Navy and Marine Corps Aircraft

DEPARTMENT OF DEFENSE HANDBOOK

- MIL-HDBK-83377 - Adhesive Bonding (Structural) for Aerospace and Other Systems, Requirements for

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

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2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications 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.

DEPARTMENT OF DEFENSE TECHNICAL MANUAL

TM-1-1500-345-23 - Paint and Marking for Army Aircraft

(Copies may be obtained online on the LOGSA Web site <https://www.logsa.army.mil/index.cfm>.)

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.

SAE INTERNATIONAL

- | | |
|-----------------|---|
| SAE-AMS2417 | - Plating, Zinc-Nickel Alloy |
| SAE-AMS2424 | - Plating, Nickel, Low-Stressed Deposit |
| SAE-AMS2759/9 | - Hydrogen Embrittlement Relief (Baking) of Steel Parts |
| SAE-AMS3144 | - Primer, Anodic Electrodeposition for Aircraft Applications. |
| SAE-AMS3265 | - Sealing Compound, Polysulfide (T) Rubber, Fuel Resistant, Nonchromated Corrosion Inhibiting for Intermittent Use to 360°F (182°C) |
| SAE-AMS3276 | - Sealing Compound, Integral Fuel Tanks And General Purpose, Intermittent Use To 360°F (182°C) |
| SAE-AMS3277 | - Sealing Compound, Polythioether Rubber Fast Curing for Integral Fuel Tanks and General Purpose, Intermittent Use to 360°F (182°C) |
| SAE-AMS3281 | - Sealing Compound, Polysulfide (T) Synthetic Rubber for Integral Fuel Tank and Fuel Cell Cavities, Low Density for Intermittent Use to 360°F (182°C) |
| SAE-AMS-C-27725 | - Coating, Corrosion Preventive, For Aircraft Integral Fuel Tanks for Use to 250°F (121°C) |
| SAE-AMS-C-83231 | - Coatings, Polyurethane, Rain Erosion Resistant for Exterior Aircraft and Missile Plastic Parts |
| SAE-AMS-C-83445 | - Coating System, Polyurethane, Non-Yellowing, White, Rain Erosion Resistant, Thermally Reflective |
| SAE-AMS-M-3171 | - Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on |
| SAE-AMS-S-4383 | - Sealing Compound, Topcoat, Fuel Tank, Buna-N Type |
| SAE-AMS-S-8802 | - Sealing Compound, Fuel Resistant, Integral Fuel Tanks and Fuel Cell Cavities |
| SAE-AMS-STD-595 | - Colors Used in Government Procurement |
| SAE-AS-12500 | - Corrosion Prevention and Deterioration Control in Electronic Components and Assemblies |

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(Copies of these documents are available online at <http://sae.org>.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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. DEFINITIONS

3.1 Exterior surfaces. All surfaces of a weapons system normally exposed to an external environment during flight or on the ground, and all interior surfaces that may become regularly wetted with water (through either intrusion or condensation) or other corrosive fluid are considered exterior surfaces. These surfaces include, but are not limited to, wheels and landing gear, wheel wells and their fairings, dive brakes, wing flaps, wing-fold areas, battery compartments, and bilge areas on aircraft with latrines.

3.2 Extreme conditions. Extreme conditions include, but are not limited to, exhaust trails, gun-blast surfaces, rocket-blast areas, leading edges, areas that may trap or be exposed to fumes from exhaust, guns or rockets, or surfaces subjected to temperatures above 250 °F (121 °C) as the result of thermal radiation, aerodynamic heating, or other sources of heat.

3.3 Fayed surface. The term "fayed surface" means two or more surfaces are joined or fitted closely or tightly together.

3.4 Frequent removal or disassembly. With regard to fasteners, frequent removal is defined as either removal or disassembly which occurs, or is anticipated to occur, within a maximum of six months.

3.5 Support equipment. Support equipment includes all types of tractors, jack stands, tow equipment, etc. used to support the operations and sustainment of aerospace weapon systems, excluding munitions and electronic equipment.

3.6 Weapons system. All types of fixed and rotary winged aircraft, manned and unmanned, and missiles are considered weapons systems.

4. GENERAL REQUIREMENTS

4.1 General. This section establishes the methods of corrosion prevention required to ensure that aerospace weapons systems (see 3.6), including those exposed to extreme conditions (see 3.2), are protected by coatings and finishes proven suitable for the intended environment.

4.2 Exceptions. Unless specifically prescribed by a particular item or accessory specification or drawing, this standard is not applicable to propellers, power plants, instruments, electronic enclosures or chassis, or contractor purchased accessories, such as electric motors, generators, switches, hydraulic valves, and similar parts.

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4.3 Finish specification. A finish specification defining the protective finish system, including cleaning and surface treatments of the item being purchased shall be developed. The finish specification is required in accordance with MIL-STD-1568. Any deviations from the requirements specified herein shall be identified and supported with technical data and information. In areas where the coating thickness requirement cannot be met (see 5.1.5), the finish specification shall indicate the specific areas of variation.

4.3.1 Special treatments. A detailed parts list of the weapons system is not required in the finish specification; however, sufficient examples shall be included so that any part of the weapon system may be properly classified as to its detailed protective treatment. All parts for which the exact treatment may be in doubt, all of the areas identified in 4.1 requiring special treatment, and all parts or assemblies with design features noted in their specifications to require maximum corrosion preventive treatment shall be included in the finish specification.

4.3.2 Cross references. When the finish specification references manufacturer's material, or other finish process specifications, or other documents, a cross reference shall be prepared as part of the specification indicating their equivalence to, or deviations from, existing Government and non-Government specifications and standards. Copies of any originated referenced documents shall be required with the proposed finish specification.

4.3.3 Alternate materials. Where there is a choice of coatings or finish materials or processes herein, the finish specification shall be tailored to identify only those intended to be used. Alternate materials shall not be used without the written approval of the CEA.

4.3.4 Non-standard coatings and finishes. The finish specification (see 4.3) shall identify any proposed deviations from, or additions to the requirements specified herein by marking with an asterisk. These shall be considered non-standard. The affected materials or processes shall be replaced with coating or finishing systems that have been proven suitable for the intended environment. Environmentally driven usage of organic primers containing non-chromate corrosion inhibitors is one example where the product must have been proven to have acceptable performance to the CEA.

4.4 General precautions.

4.4.1 Metal particles. Fabrication and assembly procedures shall be established such that the retention of metal particles or pieces, such as chips, slivers, and filings, or other foreign objects, in structure(s) is precluded. A vacuum cleaner with strong suction may be used for frequent cleaning operations in inaccessible areas. Metal cutting or filing is not permitted on an assembly after it has been accepted, except upon specific approval by the local government representative. When such action has been approved, those areas shall be retouched in accordance with the detailed paint schedule for the part.

4.4.2 Use of abrasive materials. The selection of the correct abrasive material and size is dependent upon the material/surface to be treated and the purpose for which the abrasive material is to be used. In areas where control or removal of generated debris can cause failure of the weapons system, the abrasive shall not be used. Applicable technical orders, bulletins, and

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manuals shall be consulted prior to selection of any abrasive material. Any abrasive material that may produce a surface finish that would degrade the fatigue life of the part shall not be used. Abrasives used on one metal or alloy shall not be used on different metals or alloys unless it can be proven to the CEA that the media recycling process eliminates damaging contaminants.

4.4.3 Welding, brazing, and soldering. When welding, brazing, or soldering is permitted on an assembly after it has been finished, inspected, and accepted, the surface shall be refinished. Any pre-cleaning or post-cleaning processes associated with welding, brazing, or soldering operations shall be compatible with subsequent finish processes and shall be compatible with the joining materials (filler materials, solder, fluxes, or brazing alloys). Any surface refinishing shall cover a large enough area to ensure correction of any damage resulting from the joining operation. The finish requirements in the joined area shall be equivalent to the basic part finish requirements.

5. DETAILED REQUIREMENTS

5.1 Aerospace protective finish system requirements. Protective finishing system requirements for aerospace weapon systems shall be in accordance with MIL-STD-1568.

5.1.1 Surface treatment. All metal surfaces, regardless of whether they are to be painted or are specifically excluded from painting, shall be surface treated in accordance with MIL-DTL-5002, except as modified by 5.2.1.1c. All non-bonding anodized aluminum alloy surfaces shall be sealed regardless of any additional coating application.

5.1.2 Application of organic finishes. The application of organic coatings and finish systems prescribed herein shall be in accordance with MIL-DTL-18264 or MIL-DTL-53072, as applicable.

5.1.3 Interior surfaces. Primer coating and topcoat, where applicable, as specified in Table I, 5.2 and Table II, shall be applied to the interior surfaces of items in accordance with MIL-DTL-18264 or MIL-DTL-53072, as applicable. The primer coating shall be applied such that the dry-film thickness is in accordance with 5.1.5, with the exception that the topcoat may be applied after final assembly, subject to the requirements of 5.2.1. When a topcoat is required for interior surfaces, such as to prevent fluid intrusion or to enhance visibility, and those surfaces are primed and topcoated prior to assembly, a finish coat shall be applied after final assembly. The interior color of the aerospace weapons system shall be in accordance with MIL-C-8779. SAE-AMS-STD-595, which defines colors used in government procurement, shall be a basis for all color requirements.

5.1.4 Exterior surfaces. Primer coatings and topcoats shall be applied to the exterior surfaces of items as specified in 5.1.5 and in accordance with MIL-DTL-18264 or MIL-DTL-53072, as applicable. The exterior color of the aerospace weapons system shall be as specified by the CEA. SAE-AMS-STD-595, which defines colors used in government procurement, shall be a basis for all color requirements. The exterior color scheme of Department of the Navy and Marine Corps aircraft shall be in accordance with MIL-STD-2161. For Department of the Army aircraft only, the exterior color scheme of shall be in accordance with TM-1-1500-345-23.

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5.1.5 Coating thickness. For the coatings specified in 5.1.3 and Table I, the minimum applied dry-film thickness shall be as specified in 5.2 and Table II and the maximum applied dry-film thickness shall be as specified in 5.2 and Table III. The maximum applied dry-film thickness of coatings on the exterior surfaces of magnesium alloys and the interior surfaces of all materials, shall be as specified in 5.2 and Table III.

TABLE I. Aerospace primer-topcoat system compatibility.

| SPECIFICATION | MIL-PRF-22750 Epoxy Topcoat <u>1/</u> | MIL-DTL-53039 Polyurethane Topcoat <u>2/ 3/</u> | MIL-DTL-64159 Polyurethane Topcoat <u>2/ 3/</u> | MIL-PRF-85285 Polyurethane Topcoat <u>1/ 3/</u> |
|--|---|--|--|--|
| MIL-PRF-23377 Epoxy Primer <u>1/</u> <u>4/ 7/</u> | Y | Y | Y | Y |
| MIL-PRF-85582 Epoxy Primer <u>1/</u> <u>4/ 5/ 7/</u> | Y | Y | Y | Y |
| TT-P-2760 Polyurethane Primer <u>1/ 4/ 6/</u> | - | - | - | Y |
| MIL-PRF-32239 (Air Force use only) <u>8/</u> | Y | Y | Y | Y |

- 1/ Contains at least one type or class with a VOC of less than or equal to 340 grams/liter (2.8 pounds/gallon). Note: MIL-PRF-85285 is the preferred topcoat for exterior applications, due to the reduced weathering performance of MIL-PRF-22750.
- 2/ MIL-DTL-53039 and MIL-DTL-64159 are not approved for use on U.S. Naval and U.S. Air Force airborne weapons systems.
- 3/ Contains at least one type or class with a VOC of less than or equal to 420 grams/liter (3.5 pounds/gallon).
- 4/ These coatings are best suited for aluminum and polymer matrix composite substrates.
- 5/ This material may cause flash rusting on bare steel. Do not use on bare steel unless proven satisfactory for the intended purpose. This material shall not be used for wet-installation purposes (see 5.2.3, 5.2.4, and 5.2.12).
- 6/ TT-P-2760 is primarily intended for use on aircraft in areas where there is a high degree of structural flexing. TT-P-2760 is to be applied to a dry film thickness of 1.5 to 2.0 mils (38 to 51 μm).
- 7/ Materials conforming to MIL-PRF-23377, class N, or MIL-PRF-85582, class N, shall not be used unless prior authorization is given by the CEA. These class N designations refer to non-chromate inhibited primers or "non-chrome primers."
- 8/ MIL-PRF-32239 Materials are not approved for use on Navy, Marine Corps or Army aerospace weapons systems, unless approved by the CEA.

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5.2 Specific parts requirements. In applying the requirements of this section, the groupings of the more commonly used aircraft metals shall be selected in accordance with MIL-STD-889 and MIL-STD-1568, with the exception that the protection requirements specified for attaching parts and fasteners (see 5.2.12) shall take precedence, where applicable. Powder coatings with a cure temperature above 275 °F shall not to be used on aluminum and aluminum alloy parts. Powder coating of aluminum and aluminum alloys parts requires CEA approval. 400 series stainless steel and other alloys of similar chemistries shall be considered non-corrosion resistant.

TABLE II. Protective finish system requirements.

| Item | Material | Minimum applied dry film thickness, mil (μm) | | | |
|------|---|--|--------------------|----------|----------|
| | | Primer | | Topcoat | |
| | | Exterior | Interior | Exterior | Interior |
| 1 | All aluminum alloys (except bottoms and interior trailing edge control surfaces, for which item 7 applies). | 0.6 (15) | 1.2 (30) | 1.7 (43) | - |
| 2 | Sacrificial metal coatings and non-sacrificial coatings applied to non-corrosion-resistant metals | 0.6 (15) | 1.2 (30) | 1.7 (43) | - |
| 3 | Titanium alloys <u>1/</u> | - | - | - | - |
| 4 | Magnesium alloys <u>2/</u> | 1.2 (30) | 1.2 (30) | 1.7 (43) | 1.7 (43) |
| 5 | Armor plate – ferrous | 0.6 (15) | 1.2 (30) | 1.7 (43) | - |
| 6 | Corrosion resistant alloys <u>1/</u> | 0.6 (15) | 0.6 (15) | 1.7 (43) | - |
| 7 | All metals not covered above | 0.9 (23) | 1.5 (38) | 1.7 (43) | - |
| 8 | Polymer matrix composites | 0.6 (15) | 1.2 (30) <u>3/</u> | 1.7 (43) | - |

- 1/ For non-Naval applications, these metals do not require primer coating or topcoats for corrosion protection except for faying surfaces as noted in 5.2.1. Primer coatings and topcoats may be applied to blend with adjacent areas (use item 2 requirements from Table II).
- 2/ Magnesium surfaces shall be treated in accordance with SAE-AMS-M-3171. A resin coating, in accordance with MIL-PRF-3043 or approved alternative shall be applied, followed by a dry film thickness of primer and topcoat in accordance with 5.1.5 and Tables II and III, except for surfaces in oil, lubricating oil, hydraulic fluid and fuel, such as interior surfaces of gearboxes. During manufacture, breaches to this protection scheme shall be repaired using SAE-AMS-M-3171, type VI, followed by resin and then primer and topcoat. All faying surfaces containing magnesium shall be sealed and all the edges shall be fillet sealed with sealant conforming to MIL-PRF-81733. All fasteners in magnesium substrates shall be wet installed and over-coated with sealant conforming to MIL-PRF-81733.
- 3/ Application of primer on interior surfaces is only required at dissimilar metal interfaces (see 5.2.1.2b).

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TABLE III. Maximum applied dry film thickness. 1/

| Coating | Maximum applied exterior dry film thickness mil (μm) | Maximum applied interior surface and exterior magnesium dry film thickness mil (μm) |
|---------------|--|---|
| MIL-PRF-23377 | 0.9 (23) | 1.35 (34) |
| MIL-PRF-85582 | 0.9 (23) | 1.35 (34) |
| TT-P-2760 | 2.0 (51) | 3.0 (76) |
| MIL-PRF-22750 | 2.3 (58) | 3.5 (88) |
| MIL-DTL-53039 | <u>2/</u> | <u>2/</u> |
| MIL-DTL-64159 | <u>2/</u> | <u>2/</u> |
| MIL-PRF-85285 | 2.3 (58) | 3.5 (88) |
| MIL-PRF-32239 | 3.2 (81) | 4.8 (121) |

1/ Thicknesses for aerospace weapons systems. Support equipment thicknesses are covered in 5.2.23 and Table V.

2/ Refer to MIL-DTL-53072.

5.2.1 Fayed surfaces, joints, and seams.

5.2.1.1 Surfaces of similar metals. Seams and joints that possess fayed surfaces (see 3.3) of similar metals, as defined by MIL-STD-889 and MIL-STD-1568, shall be protected by the application of primer coating to each surface, in accordance with 5.2.1 and Tables I and II. The dry film thickness of the primer coating shall be as prescribed for interior surfaces (see 5.1.3, 5.1.5 and Table II). In addition, fayed surfaces shall be sealed with sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281 unless an alternative is approved by the CEA. A minimum gap of 0.02 in. (0.5 mm) is required at exterior surface (see 3.1) butt joints to allow for effective sealing. When liquid/cast shim is used, fay surface sealing is still required. Exceptions to the above are as follows:

- a. Where 5.1.5 and Table II specify application of a specific thickness of primer coating to fayed surfaces, apply one-half of the required thickness of primer coating to each surface being joined.
- b. Primer coating shall not be applied to resistance-welded fayed surfaces. Only weld-through sealants approved by the CEA shall be used prior to assembly. Primer coating shall be applied to fayed surfaces after spot-welding. All exterior edges shall be sealed.
- c. Fayed surfaces that are to be adhesively bonded shall be surface cleaned, treated, and processed as specified in the CEA approved bonding procedures document(s) for the assemblies concerned. Specific guidance is provided in MIL-HDBK-83377. The process specification shall specify the procedure for treatment of faying surfaces of parts to be bonded, and precautions to be taken to eliminate contamination of treated surfaces awaiting application of adhesive or primer.
- d. Titanium to titanium and corrosion resistant steel to corrosion resistant steel constructions shall be protected by application of primer coating (see 5.1.5 and Tables I and II) or sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281 (based upon application), to the fayed surfaces. Where protection against fretting is required for these constructions, a method of protection shall

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be proposed for approval by the CEA. When liquid/cast shim is used, fay surface sealing is still required.

- e. In addition to any required primer coating, all exterior seams, and edges shall be sealed with a sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281 (based upon application). A minimum gap of 0.02 in. (0.5 mm) is required at exterior surface (see 3.1) butt joints to allow for effective sealing. When liquid/cast shim is used, fay surface sealing is still required.

5.2.1.1.1 Defect filling. The use of filling material for the purpose of sealing and concealing nicks, dents, gouges, and poor joints is prohibited.

5.2.1.1.2 Surfaces of dissimilar metals. Surfaces of dissimilar metals, as defined in MIL-STD-889 and MIL-STD-1568, shall each receive a minimum of 0.6 mil (15 μ m) of primer coating in accordance with Table I, except as specified in 5.2.1.1c. When fayed surfaces are of dissimilar metals, they shall be sealed with sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281, unless prior CEA authorization for alternative sealants is provided. The thickness of the primer coating applied to each surface shall be in accordance with 5.1.5 and Table II. In addition, the following precautions shall be taken:

- a. Where magnesium is part of a dissimilar metal fayed surface, sealant conforming to MIL-PRF-81733 shall be applied between the surfaces and squeezed out of all boundaries. The excess shall be removed in a manner that ensures a fillet on all edges. Except for bushing installations, the fillet width shall be a minimum of 0.25 in. (6.4 mm). For bushings, the fillet shall be the largest practicable. Joint areas that may retain water shall be filled with sealing compound. Exceptions to these materials and requirements shall be authorized by the CEA.
- b. In joints constructed of reinforced composite containing electrically conductive phase and aluminum, or other dissimilar metal as defined in MIL-STD-889 and MIL-STD-1568, there shall be a glass barrier ply at a minimum thickness of 0.002 inch. The glass barrier ply shall extend a minimum of 1 in. (25.4 mm) beyond the metal member. For condensation polyimide based laminates (e.g., bismaleimide and cyanate ester), the glass barrier ply shall fully cover the laminate surfaces in contact. Primer coating shall be applied to each of the interface surfaces at a dry-film thickness of 1.2 to 1.8 mil (30 to 46 μ m). The surfaces of permanent joints shall be fayed and sealed with sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281 (based upon application). Joints that require separation as part of normal maintenance should have formed-in-place seals substituted for fayed surface sealing.

5.2.2 Sealing of aircraft. Exterior locations (see 3.1), openings (with the exception of drain holes at low points) which are not required for aircraft operations, shall be sealed to prevent fluid intrusion from external sources. Sealing around access plates shall be accomplished by the application of formed-in-place sealant, seals, or gaskets to the structure in a manner such that the access plates can be removed without damaging the surrounding metal. Use of gaskets for sealing shall require approval by the CEA.

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5.2.3 Slip fits. The sealing of slip fits shall be accomplished with wet primer coating conforming to MIL-PRF-23377, class C1 or C2, or wet sealant conforming to MIL-PRF-81733 or SAE-AMS3265. If design requires disassembly, primer coating conforming to MIL-PRF-23377, class C1 or C2, shall be applied and permitted to dry thoroughly prior to assembly. In instances where the above materials are incompatible with the function of the part or assembly, corrosion preventive compound conforming to MIL-PRF-16173, grade 3 or 4, shall be used. Use of MIL-PRF-23377, class N non-chrome primers on aerospace weapons systems requires approval by the CEA.

5.2.4 Press fits. The sealing of press fit component assemblies, with the exception of assemblies permanently housed in grease or oil, shall be accomplished with either wet primer coating conforming to MIL-PRF-23377, Class C1 or C2, or wet sealant conforming to MIL-PRF-81733 or SAE-AMS3265. Exterior edges of the press fit component shall be sealed with sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281, with the exception that sealing with primer coatings (see 5.1.5, 5.1.3 and Table I) may be used for bushings with walls of 0.094 in. (2.4 mm) or less. The completed assembly shall then be finished as specified in 5.1.5, 5.1.3, Table I, 5.2 and Table II. Parts permanently housed in grease or oil shall be assembled with the grease or oil to be used in the housing. Use of MIL-PRF-23377, class N non-chrome primers on aerospace weapons systems requires approval by the CEA.

5.2.5 Cut edges. The edges of all metals shall be chamfered or rounded to permit adhesion of an adequate thickness of applied paint coatings or sealants. After rounding of the edges and prior to the application of paint or sealant, chemical surface treatments shall be applied in accordance with 5.1.1.

5.2.6 Functional surfaces. Paint-type coatings shall not be applied to functional, working, or wearing surfaces; to lubricated surfaces; to adjustable screw threads; to lubrication holes; to bearing or sliding surfaces; to areas where they could be rubbed or scraped onto surfaces that must be clean and bare to function properly; or to any other surface where the application of the coating may cause malfunction of the part or system. The interior walls of drain holes shall be coated with paint-type coatings for corrosion protection.

5.2.7 Control cables and control chains. Control cables and control chains shall not be painted. However, prior to installation, control cables shall be protected with a dip-coating of corrosion preventive material conforming to MIL-PRF-16173, grade 4, with the exception of those surfaces requiring lubrication for functional purposes. Those surfaces requiring lubrication shall be cleaned and coated with the required lubricant in lieu of corrosion preventive material. After installation, the control cables and control chains shall be inspected. If touch-up of the corrosion preventive compound is necessary, touch up shall be accomplished with the same material used prior to installation. Nylon jacketed cables do not require treatment, with the exception of exposed end fittings.

5.2.8 Closely coiled springs. Springs that are closely coiled, preventing the application of plating to internal surfaces, or springs not plated for other reasons, shall receive a minimum of 1.2 mil (31 μm) of primer coating conforming to MIL-PRF-23377, type I or II, class C1 or C2,

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or shall be coated with corrosion preventive compound conforming to MIL-PRF-16173, grade 4, or MIL-C-11796, class 2. Use of MIL-PRF-23377, class N on aerospace weapons systems requires approval by the CEA.

5.2.9 Parts in oil or grease. Parts that are housed in lubricating oil, hydraulic oil, or grease shall be finished with a baked resin coating conforming to MIL-PRF-3043, applied in accordance with MIL-C-5056 or alternative approved by the CEA. Parts constructed of corrosion-resistant metals need not be coated, unless they contact dissimilar metals. Functional surfaces, such as bearing surfaces, shall not be coated.

5.2.10 Metal tanks.

5.2.10.1 Temporary and auxiliary fuel tanks. The interior surfaces of aluminum alloy tanks shall be surface treated in accordance with MIL-DTL-5541, class 1A, using materials qualified to MIL-DTL-81706, or anodized in accordance with MIL-A-8625, type II. The interior surfaces of aluminum alloy tanks shall be finished with coating conforming to SAE-AMS-C-27725, unless otherwise specified by the specific engineering directive. The interior of steel tanks shall be finished with baked resin coating conforming to MIL-PRF-3043 or approved alternative, applied in accordance with MIL-C-5056. Sealants conforming to SAE-AMS-S-8802, SAE-AMS3276, SAE-AMS3277, SAE-AMS3281, or SAE-AMS-S-4383 or coating conforming to SAE-AMS-C-27725 may be used in lieu of MIL-PRF-3043 when authorized by the CEA. Where coating conforming to SAE-AMS-C-27725 is specified, type III shall not be used unless prior authorization is given by the CEA.

5.2.10.2 Welded fuel tanks (including welded external auxiliary fuel tanks). The interior surfaces of aluminum tanks shall be thoroughly cleaned and surface treated in accordance with MIL-DTL-5541, class 1A, using materials qualified to MIL-DTL-81706, and interior surfaces that are fayed, whether sealed or not, shall be coated with 0.9 to 1.5 mil (23 to 38 μm) of corrosion preventive coating conforming to SAE-AMS-C-27725. SAE-AMS-C-27725 shall not be applied to exterior surfaces. Droppable steel tanks shall be finished on the interior with a baked resin finish conforming to MIL-PRF-3043, applied in accordance with MIL-C-5056, or coated with sealants conforming to SAE-AMS-S-8802, SAE-AMS3276, SAE-AMS3277, SAE-AMS3281, or SAE-AMS-S-4383. Coating conforming to SAE-AMS-C-27725 may be used in lieu of the finishes specified above when authorized by the CEA. Where coating conforming to SAE-AMS-C-27725 is specified, type III shall not be used unless prior authorization is given by the CEA.

5.2.10.3 Integral and riveted fuel tanks. The inside surface of integral or permanently fastened, such as riveted, fuel tanks shall be finished and sealed with sealant conforming to SAE-AMS-S-8802, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281 to prevent corrosion and leakage of fuel. Interior surfaces that are fayed, whether sealed or not, shall be coated with 0.9 to 1.5 mil (23 to 38 μm) of corrosion preventive coating conforming to SAE-AMS-C-27725. Where coating conforming to SAE-AMS-C-27725 is specified, type III shall not be used unless prior authorization is given by the CEA. SAE-AMS-C-27725 shall not be applied to exterior surfaces.

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5.2.10.4 Lubricating oil and hydraulic fluid tanks. The inside surfaces of lubricating oil tanks constructed of corrosion-resistant materials shall not be painted. Tanks of other materials shall be finished with a baked resin coating conforming to MIL-PRF-3043, applied in accordance with MIL-C-5056.

5.2.10.5 Miscellaneous aluminum alloy tanks. Interior surfaces of miscellaneous aluminum alloy tanks, with the exception of potable water tanks, shall be surface treated in accordance with MIL-A-8625, type II, or MIL-DTL-5541, class 1A, using materials qualified to MIL-DTL-81706 or alternative approved by the CEA. The interior surfaces of potable water tanks shall not be painted or conversion coated.

5.2.11 Tubing.

5.2.11.1 Nonstructural tubing. With the exception of tubing constructed of titanium alloy, corrosion-resistant steel alloy, heat-resistant steel alloy, and as otherwise specified herein, all nonstructural tubing and plumbing lines shall receive the complete interior or exterior paint system, as applicable, on the exterior of the lines, and shall be protected in accordance with Table IV. In addition, the requirements specified in 5.2.11.1.1, 5.2.11.1.2 and 5.2.11.1.3 shall apply.

5.2.11.1.1 Oxygen tubing. Surface finishes (paints, primer coatings, and other organic coatings) and conversion treatments (anodizing or non-electrochemical conversion coatings) are not to be applied to the interior of oxygen tubing. Oxygen tubing is to be thoroughly cleaned of all contaminants prior to and following any mechanical processing being performed.

5.2.11.1.2 Aluminum tubing and plumbing lines. Interior and exterior surfaces of aluminum-alloy tubing and plumbing lines shall be surface-treated in accordance with MIL-DTL-5541, class 1A, or MIL-A-8625, type II or alternative approved by the CEA. The exterior of aluminum plumbing lines in fuel tanks that are not made from either 5052 or 6061 requires the application of a corrosion preventive coating conforming to SAE-AMS-C-27725. Paint coatings shall not be applied to the interior surfaces of airspeed indicator tubing or other sensing lines. Aluminum tubing used in fire-extinguishing systems employing halogenated agents shall be finished internally and externally with a baked resin coating conforming to MIL-PRF-3043, applied in accordance with MIL-C-5056.

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TABLE IV. Tubing categories and required coatings.

| Category | Category description | Primer coating <u>1/</u> | Final paint system <u>2/</u> |
|----------|--|---|--|
| I | Single tubes having separable connections at each end. | Applied after all required forming operations have been completed and prior to fabrication of the assembly. | Topcoat applied after fabrication and prior to installation. |
| II | Assemblies made up of individual tubes permanently joined by nonseparable type fittings (brazing, welding, swaging) and having separable type connectors at each end. | Primer coating applied, followed by application of sealant (SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281) after all required bending and permanent joining has been completed and prior to final fabrication of the assembly. | Same as for category I |
| III | Single or multiple tube assemblies having one or more free ends shall be permanently joined by nonseparable type fittings. | Same as for category II. For tube assemblies employing a permanent joining process not compatible with the primer coating during fabrication, the primer coating may be omitted from the affected free ends at a distance acceptable to the CEA. | Same as for category I. For assemblies having been only partially primed, additional primer coating shall be applied as required, followed by the coating of all nonseparable joints with sealant (SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281), followed by the required exterior paint system. |
| IV | Other types of tube assemblies not covered in categories I, II, or III. For this category, a paint protection system shall be established that is acceptable to the CEA. | Not applicable. | Not applicable. |

1/ Apply primer coatings in accordance with Tables I, II and III as applicable. Assemblies in categories I, II, and III, in which sleeves or ferrules are used in the separable connection, and the sleeves or ferrules are fixed in position by deformation of one or both members into contact, the primer coating need not extend beyond the initial point of intimate contact. For all tubing categories where flare fittings are used, primer coating shall be applied to the end of the tube.

2/ Any damage occurring to the finish system during installation shall be touched up. For aluminum plumbing lines, see 5.2.11.1.2.

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5.2.11.1.3 Protection of tubing joints after installation. After installation of the tube assemblies, all remaining non-sealed joints that will not be disconnected during normal servicing, shall receive a coating of sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281, followed by the appropriate top coating. All remaining nonsealed joints that must be disconnected during normal servicing operations shall be coated with corrosion preventive compound conforming to MIL-PRF-16173, grade 4, or MIL-DTL-85054, which shall seal all exposed spaces between the parts. A second coat of the same material shall be applied to the same areas after a period of 60 minutes. Contractor-prepared maintenance instructions shall require periodic reapplication of this material in-service.

5.2.11.2 Structural tubing.

5.2.11.2.1 Structural carbon steel tubing. All exterior surfaces and all interior surfaces without completely welded or crimped ends of structural carbon steel tubular assemblies shall be finished in accordance with 5.1.3 and Table I or 5.2 and Table II, and as specified in 5.2.11.2.1a 5.2.11.2.1b, and 5.2.11.2.1c, where applicable:

- a. Assemblies completely closed by welding or to which the application of primer coating is impractical or ineffective, such as crimped-end tubing not closed by welding or tubing heat treated after assembly, shall be treated after assembly with corrosion preventive compound conforming to MIL-C-11796, classes 1 or 1A, or MIL-PRF-16173, grades 2 or 4. The corrosion preventive compound shall be applied under pressure into the hollow member through holes drilled in the tubing, or by immersion of the tubing in a bath of the preservative.
- b. For large tubing structures, interconnecting holes may be drilled between members to promote circulation of the corrosion preventive compound, described in 5.2.11.2.1a.
- c. Parts subjected to immersion in corrosion preventive oil shall be manipulated in such a manner as to ensure the absence of air pockets and shall remain in the bath until all bubbling has ceased. The members shall be thoroughly drained after treatment and all access holes drilled in the members shall be closed with cadmium plated, self-tapping screws, or blind rivets. Where cadmium alternative coatings are proposed, they are subject to approval of the CEA. The screws or rivets shall be wet installed with sealant conforming to MIL-PRF-81733 or SAE-AMS3265, and overcoated with the same after installation. The exterior surface of the tubing assemblies shall be free of oil, grease, and dirt prior to application of the prescribed finish system.

5.2.11.2.2 Structural aluminum-alloy tubing. Interior surfaces of structural aluminum-alloy tubing shall be protected in accordance with 5.1.5 and Tables I and II. The interior surfaces of structural aluminum-alloy tubing closed by welding shall be coated with primer coating conforming to MIL-PRF-23377, Types I or II, classes C1 or C2, or corrosion preventive compound conforming to MIL-PRF-16173, grade 2 or 4, applied through appropriately drilled holes. Use of MIL-PRF-23377, class N on aerospace weapons systems requires approval by the CEA.

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5.2.11.2.3 Structural copper alloy, corrosion-resistant alloy, and heat-resistant alloy tubing. Interior and exterior surfaces of structural copper alloy, corrosion-resistant alloy, and heat-resistant alloy tubing need not be painted, except as required for dissimilar metal contact.

5.2.11.3 Mechanical attachment. Tubular parts that have fittings mechanically attached shall have all edges of the attachment sealed with a sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281.

5.2.12 Attaching parts and fasteners.

5.2.12.1 General finish. Attaching parts and fasteners, such as screws, nuts, bolts, bushings, spacers, washers, rivets, high-shear rivets, self-tapping screws, sleeves for "shake-proof" fastener studs, self-locking nuts, "speed nuts," and clamps, need not be painted in detail, except when dissimilar metals are involved in the materials being joined. All attaching parts and fasteners, or the surfaces with which they are in contact, shall be wet installed with primer coating conforming to MIL-PRF-23377, class C1 or C2, or sealant conforming to MIL-PRF-81733 or SAE-AMS3265. Primer coating or sealant shall not be applied to the threaded portions of fasteners for which torque requirements are established without the coating. For new acquisitions, when installed in interior aluminum structures, all non-aluminum fasteners shall be overcoated with sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281. For legacy applications, all non-aluminum fasteners in interior aluminum structures shall also be overcoated with sealant, unless otherwise specified by local engineering directive. Dry-film thickness of sealant shall be a minimum of 6 mils (152 μ m). For magnesium dissimilar metal combinations, 5.2.1.2 shall apply. Fasteners expected to be frequently removed (see 3.4) may be installed with corrosion preventive compound if holes are first primed with MIL-PRF-23377, class C1 or C2 and allowed to completely dry prior to installing the fastener. Use of MIL-PRF-23377, class N on aerospace weapons systems requires approval by the CEA.

5.2.12.2 Close tolerance bolts. Prior to installation, close tolerance bolts shall receive application of primer coating conforming to MIL-PRF-23377, class C1 or C2, or sealant conforming to MIL-PRF-81733 or SAE-AMS3265, except where frequent removal of the bolts is required. For close tolerance bolts requiring frequent removal, use corrosion preventive compound conforming to MIL-C-11796, class 3, or MIL-PRF-16173, grade 4, or corrosion-inhibiting, solid film lubricant conforming to MIL-PRF-46010, MIL-L-23398 or MIL-PRF-46147. MIL-PRF-46010 requires heat curing and shall not be used on aluminum parts whose temper (strength) would be adversely affected. MIL-L-23398 is air curing and may be used on all types of metallic parts. When a solid film lubricant is used, it shall be applied and completely cured prior to assembly. The bolt shall then be wet installed and fillet sealed (after installation) with sealant conforming to MIL-PRF-81733 or SAE-AMS3265. Use of MIL-PRF-23377, class N on aerospace weapons systems requires approval by the CEA.

5.2.12.3 Adjustable parts. Threads of adjustable parts, such as tie rods and turnbuckles, shall be lubricated and protected, both before and after assembly, with anti-seize compound conforming to MIL-PRF-83483, corrosion preventive compound conforming to MIL-PRF-16173,

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grade 3, or lubricating oil conforming to MIL-PRF-32033, followed by corrosion preventive compound conforming to MIL-PRF-16173, grade 2.

5.2.12.4 Touch-up. All attaching parts shall receive final coating after installation. Topcoats shall be applied over the primer coating to match the color of adjacent exterior surfaces, when necessary. Nuts and heads of bolts in joints that are subsequently lubricated need not receive final finishing.

5.2.12.5 Washers. Washers constructed of aluminum alloys or high pressure phenolic laminates shall be used under machine screws, countersunk fasteners, bolt heads and nuts that would otherwise contact magnesium and shall be wet installed and fillet sealed after installation with sealant conforming to MIL-PRF-81733 or SAE-AMS3265.

5.2.13 Areas subjected to corrosive fluids. Battery compartments constructed of leakproof and corrosion resistant material require no further finishing. All other battery compartments and adjacent areas subject to vapors and spills shall be coated with a polyurethane casting resin approved by the CEA. All bilge areas, all surfaces within 24.0 in. (610 mm) of urinals, and all areas beneath lavatories and galleys shall be finished with a primer coating conforming to MIL-PRF-23377 class C1 or C2 or MIL-PRF-85582 class C1 or C2 applied to a dry film thickness of 0.9-2.0 mils (23-51 μ m) and topcoated with coating conforming to MIL-PRF-85285, in accordance with 5.1.5, 5.1.3 and Table I or 5.2 and Table II for exterior surfaces. Use of MIL-PRF-23377, class N on aerospace weapons systems requires approval by the CEA.

5.2.14 Electrical parts. All electrical parts shall be processed in accordance with SAE-AS-12500.

5.2.14.1 Connections. The exterior of electrical bonding and ground connections conforming to MIL-STD-464 shall be finished in accordance with 5.2 and Table II after installation. All permanent electrical bonds, such as jumpers and ground studs, shall be sealed after installation with sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281. Connectors not permanently sealed shall be internally and externally protected with material conforming to MIL-PRF-81309, type III, unless prohibited by the CEA. Permanently mated electrical connectors shall be sealed after installation with sealant conforming to SAE-AMS-S-8802, SAE-AMS3277, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276 or approved alternative. Alternative sealing methods that have demonstrated water tightness and corrosion protection may be used if approved by the CEA. Nickel plated aluminum connectors shall not be used.

5.2.14.2 Conduit and boxes. Electrical conduit and junction or relay boxes shall receive protection in accordance with 5.1.5 and Tables I and II. Plastic coated and braided wire shall not be coated. Aluminum conduit, junction or relay boxes shall not be nickel plated.

5.2.14.3 Electrical connector pins and sockets. Electrical connector pins and sockets shall have a thin, continuous coat of MIL-PRF-81309, type III, applied to the pins and pin receptacle end of the connector prior to mating the connector halves. The connector shells shall then be

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coated with MIL-PRF-81309, type III after mating the connector halves, unless prohibited by the CEA.

5.2.14.4 Antennas and static dischargers. External antennas and static discharger mounting bases shall be adequately sealed to prevent moisture intrusion into fuselage surface mating area. The preferred method of sealing is through use of conductive gaskets that provide maximum environmental protection from both internal and external moisture sources without introducing incompatible dissimilar metals or compromising electrical bonding requirements. A perimeter seal shall be applied using SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3277, SAE-AMS3276, SAE-AMS3265, or SAE-AMS3281, unless a waiver is approved by the CEA.

5.2.15 Surfaces and components exposed to high temperatures. Surfaces and components that are exposed to high temperatures, either on the ground or in flight, shall be finished as follows:

- a. Where primer and/or topcoat is specified in areas subjected to sustained service temperatures up to 350 °F (177 °C), primers and topcoats specified in section 5.1 and Tables I and II may be used.
- b. Where primer and/or topcoat is specified in areas subjected to sustained service temperatures in excess of 350 °F (177 °C), high-temperature resistant materials shall be used. Any alternative finishes and coatings for high-temperature applications shall be approved by the CEA prior to use. The request for approval shall include all necessary technical information concerning the proposed material and application, with data supporting the effectiveness of the coating system.
- c. Where sealants are specified in areas exposed to service temperatures in excess of 300 °F (149 °C), sealant selection for each application shall be approved by the CEA.

5.2.16 Molded plastic and ceramics. Transparent plastic parts shall not be painted. Other plastic parts (except fiberglass laminates, antennae, and radomes [see 5.2.19]) need not be painted, except for color-matching purposes. Plastic or ceramic insulators (used for radio antennae) shall not be painted. Their edges, however, shall be sealed with sealant conforming to SAE-AMS-S-8802, SAE-AMS3276, SAE-AMS3277, or SAE-AMS3281, after installation in exterior locations.

5.2.17 Finishing of ducts. The interior surfaces of aluminum alloy heating and cooling ducts need not be painted, provided that those surfaces have been anodized in accordance with MIL-A-8625, type II, and sealed. Aluminum alloy duct work treated in accordance with MIL-DTL-5541, class 1A, shall be painted as required for interior surfaces (see Table II). Prior to application of insulation material, the exterior surfaces of insulated duct work, regardless of composition, shall be coated with material to withstand the temperatures and environment of the system.

5.2.18 Reinforced plastic components. Plastic parts reinforced with fibers shall be finished for protection against erosion and environmental degradation. Leading edges of fiber-reinforced plastic radomes, antennae, and other components exposed to the air stream, shall be finished with a rain-erosion resistant coating conforming to SAE-AMS-C-83231, SAE-AMS-C-83445, or MIL-PRF-85322. Other methods of protection, such as a boot or tapes made of erosion- and high

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temperature-resistant material, may be used when approved by the CEA. In exterior locations, boot or tape edges shall be sealed with sealant conforming to SAE-AMS-S-8802, MIL-PRF-81733, SAE-AMS3265, SAE-AMS3276, SAE-AMS3277, SAE-AMS3281, or an alternative approved sealing compound. Transparent components, whether glass or plastic, shall not be painted. Plastic parts and surfaces, other than those described above may be painted for color-matching purposes.

5.2.19 Metal leading edges. Exterior surfaces of metallic leading edges exposed to speeds in excess of 500 knots shall be finished with rain erosion-resistant coatings in accordance with MIL-DTL-18264. Other methods of protection, such as a boots or tapes made of erosion and high temperature-resistant material, may be used when approved by the CEA. Exterior surfaces shall be aerodynamically smooth.

5.2.20 Helicopter rotor-blade leading edges. The finishing system used on the leading edges of helicopter rotor blades shall prevent deterioration of the underlying surfaces and shall be resistant to erosion from rain, sand particles, sea spray, and insects. This type of finishing system is not necessary when the edges are made of corrosion-resistant and erosion-resistant material, such as nickel, or stainless steel, unless specified by the CEA.

5.2.21 Rubber (natural and synthetic). Natural and synthetic rubber shall not be painted, greased, or oiled. Exceptions may be made when the part manufacturer or a relevant technical manual require parts to be greased or oiled prior to installation or when placed in long-term storage.

5.2.22 Heat exchanger. Aluminum alloy heat exchangers shall be surface treated in accordance with MIL-DTL-5541, class 1A, and shall be coated with anodic electrodeposition coat (E-coat) in accordance with SAE-AMS3144 for corrosion protection.

5.2.23 Support equipment specific finishing requirements. The requirements of this section and its subsections are applicable for aviation ground support equipment exclusively.

5.2.23.1 Environmental restrictions.

5.2.23.1.1 Heavy metals. Use of any hazardous materials, such as hexavalent chromium or cadmium, shall require approval by the CEA.

5.2.23.2 Surface finishes.

- a. Aerospace ground equipment ferrous surfaces shall use MIL-DTL-53022, Type IV, and MIL-PRF-85285, Class H, Type II. Army aerospace ground equipment ferrous surfaces shall be in accordance with MIL-DTL-53072.
- b. Aerospace ground equipment non-ferrous surfaces shall use MIL-PRF-23377, Type I, Class N and MIL-PRF-85285, Class H, Type II. Army aerospace ground equipment non-ferrous surfaces shall be in accordance with MIL-DTL-53072.

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5.2.23.2.1 Surface preparation. All surfaces shall be prepared in accordance with TT-C-490.

5.2.23.2.2 Aluminum pretreatments. Where practical, aluminum substrates shall be anodized in accordance with MIL-A-8625, Type IC, prior to organic coating application. Any anodize sealer shall not contain hexavalent chromium. Where surface geometries, component size, or other factors make anodizing impractical, aluminum surfaces shall be treated with a conversion coating conforming to MIL-DTL-5541, Type II or TT-C-490, Type III or IV. Material class shall be selected for the end-use of the item being coated: Class 1A, for maximum protection against corrosion, painted or unpainted; Class 3, for protection against corrosion where low electrical resistance is required.

5.2.23.2.3 Coating application. Primer coatings and topcoats as specified in Table V shall be applied to the exterior surfaces of support equipment, in accordance with the coating manufacturer's instructions. Unless otherwise specified, all colors shall be in accordance with SAE-AMS-STD-595. For Navy support equipment, color number 17925, white, shall be the default color, unless otherwise specified by the CEA. A primer and topcoat combination from the same manufacturer is recommended.

TABLE V. Support equipment primer-topcoat compatibility.

| Specification <u>1/</u> | MIL-PRF-22750 Epoxy Topcoat <u>2/</u> | MIL-DTL-53039 Polyurethane Topcoat <u>3/</u> | MIL-DTL-64159 Polyurethane Topcoat <u>3/</u> | MIL-PRF-24635 Class 2 | MIL-PRF-85285 Polyurethane Topcoat <u>2/</u> |
|--|---|--|--|--------------------------|--|
| MIL-PRF-23377 Epoxy Primer Class N | Y | Y | Y | -- | Y |
| MIL-DTL-53022 Type IV | Y | Y | Y | -- | Y |
| MIL-PRF-23236 Type VII Classes 5 and 7 | -- | Y | Y | Y | -- |

1/ Unless otherwise defined by the CEA, minimum thicknesses on support equipment for all coatings shall be per manufacturer's recommendation.

2/ MIL-PRF-85285 is the preferred topcoat for Navy exterior applications due to the reduced weathering performance of MIL-PRF-22750.

3/ Not for Navy or Air Force use.

5.2.23.3 Inorganic finishes.

5.2.23.3.1 Unpainted aluminum surfaces. Unpainted aluminum surfaces intended for use in a marine environment, where surfaces are susceptible to wear, shall be anodized in accordance with MIL-A-8625, Type III. All others surfaces shall be anodized with MIL-A-8625, Type II. Nickel-acetate is the recommended sealing solution.

5.2.23.3.2 Electroless nickel. Support equipment components for use in the marine environment shall not have an electroless nickel finish.

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5.2.23.3.3 Nickel plating. Nickel plating for steel or aluminum wear surfaces shall be in accordance with SAE-AMS2424. This shall include hydrogen embrittlement relief for high strength steel materials having a hardness greater than 38 HRC, in accordance with SAE-AMS2759/9.

5.2.23.3.4 Zinc-nickel plating. Zinc-nickel plating shall be in accordance with SAE-AMS2417, Type 2, Grade B. This shall include hydrogen embrittlement relief for high strength steel materials having a hardness greater than 38 HRC, in accordance with SAE-AMS2759/9.

6. NOTES

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

6.1 Intended use. This standard covers the standard methods and materials used for the protective surface treatments and finishes used on aerospace weapons systems, weapons system's parts (including spares), assemblies (such as fuselages, wings, cowlings, empennage, and rotor blades), and support equipment. This standard does not intend to address the application of solid film lubricants as a finishing system, nor does it address electroplating or other metallic coatings. This standard does not apply to munitions or equipment such as propellers, power plants, and instruments. It also does not apply to standard contractor purchased accessories (such as electric motors, generators, switches, hydraulic valves, and similar parts), unless specifically referenced in the item specification or drawing.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this standard.

6.3 Associated Data Item Descriptions (DIDs). This standard has been assigned an Acquisition Management Systems Control number authorizing it as the source document for the following DID. When it is necessary to obtain the data, the applicable DID must be listed on the Contract Data Requirements List (DD Form 1423).

| <u>DID Number</u> | <u>DID Title</u> |
|-------------------|----------------------|
| DI-MFFP-81402 | Finish Specification |

The above DID was current as of the date of this standard. The ASSIST database should be researched at <https://quicksearch.dla.mil> to ensure that only current and approved DIDs are cited on the DD Form 1423.

6.4 Subject term (key word) listing.

Corrosion prevention
Surface treatments

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

CONCLUDING MATERIAL

Custodians:

Army - MR

Navy - AS

Air Force - 20

Preparing activity:

Navy - AS

Project MFFP-2018-006

Review activities:

Army - AR, AV, MI

Navy - CG, MC

Air Force - 11, 184

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 ASSIST Online database at <https://assist.dla.mil/>.