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MIL-HDBK-808(USAF)
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SUPERSEDING
MIL-STD-808A(USAF)
18 JANUARY 1983

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MILITARY HANDBOOK

FINISH, PROTECTIVE AND CODES FOR FINISHING SCHEMES FOR GROUND AND GROUND SUPPORT AND EQUIPMENT

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DEPARTMENT OF DEFENSE
Washington, D.C. 20301

Finishes, Materials and Processes for Corrosion Prevention and Control in Support Equipment, MIL-STD-808A(USAF).

1. This Military Standard is approved for use by the Air Force Wright Aeronautical Laboratories, Department of the Air Force, and is available for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the Air Force Wright Aeronautical Laboratories, MLSA, Wright-Patterson Air Force Base, Ohio 45433 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FOREWORD

The purpose of this standard is to establish acceptable requirements for materials selection, materials processing, cleaning processes, finishing materials and finishing processes and techniques for effective protection against corrosion for support equipment excluding munitions and electronic equipment. This standard covers both organic and inorganic finishes. A finish code system is provided for identifying the selected finish on engineering drawings.

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MIL-STD-808A(USAF)

MILITARY STANDARD

FINISHES, MATERIALS AND PROCESSES FOR CORROSION PREVENTION AND CONTROL IN SUPPORT EQUIPMENT

1. SCOPE

1.1 Scope. This standard establishes minimum requirements for finish systems for Air Force support equipment and also establishes a code system to specify those finish systems in a simplified manner on drawings by Air Force engineering activities and in contractor generated drawings as required by procurement officers.

1.2 Exclusions. Electronic equipment and munitions are excluded from the requirements of this standard.

1.3 Classification. For application of finishes to support equipment, surfaces are classified as follows:

Type I (exposed)	Type I surfaces are areas either exposed directly to the environment when equipment is in operating or travelling configuration, or areas not exposed directly to the environment but subject to combined direct action of environmental elements. Environmental elements include temperature extremes, humidity extremes, rain, hail, snow, sleet, salt laden air, industrial atmospheres, direct solar radiation, dust, and the abrasive action of wind-blown sand.
Type II (sheltered)	Type II surfaces are areas not exposed directly to the environment during equipment operation and travelling configuration and are not subjected to direct action of rain, hail, snow, sleet, direct solar radiation, and wind-blown sand.

1.4 Applicability. This standard is applicable for use by all Air Force procuring activities and their respective contractors involved in the design and procurement of support equipment. The detailed drawings and detailed finish specification applies to all elements of support equipment, including spares.

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2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

L-P-410	Plastic, Polyamide (Nylon), Rigid, Rods, Tubes, Flats, Molded and Cast Parts
L-S-300	Sheeting and Tape, Reflective, Nonexposed Lense
O-A-51	Acetone, Technical
O-T-620	Trichloroethane 1,1,1, Technical, Inhibited (Methyl Chloroform)
P-D-680	Dry Cleaning Solvent
QQ-C-320	Chromium Plating (Electrodeposited)
QQ-N-290	Nickel Plating (Electrodeposited)
QQ-P-35	Passivation Treatments for Corrosion-Resisting Steel
QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-Z-325	Zinc Coating, Electrodeposited, Requirements for
TT-C-490	Cleaning Method and Pretreatment of Ferrous Surfaces for Organic Coatings
TT-M-261	Methyl Ethyl Ketone, Technical
TT-N-95	Naptha, Aliphatic
TT-P-636	Primer Coating, Alkyd, Wood and Ferrous Metal
TT-V-121	Varnish, Spar, Water Resisting

MILITARY

MIL-M-3171	Magnesium Alloy, Processes for Pretreatment
MIL-C-5410	Cleaning Compound, Aluminum Surface, Non-Flame-Sustaining
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys and Prevention of Corrosion on
MIL-S-8512	Support Equipment, Aeronautical, Special, General Specifications for the Design of
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-S-8784	Sealing Compound, Aluminum Integral Fuel Tanks and Fuel Cell Cavities, Low Adhesion, Accelerator Required
MIL-S-8802	Sealing Compound, Temperature Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion
MIL-C-8837	Coating, Cadmium (Vacuum Deposited)
MIL-H-9850	Hinge, Butt, Continuous, Piano (SUPP 1)
DOD-D-1000	Drawings, Engineering and Associated Lists
MIL-C-10578	Corrosion Removing and Metal Conditioning Compound

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MIL-C-11796	Corrosion Preventive Compound, Petrolatum, Hot Application
MIL-W-13518	Wood Preservative, Tetrachlorophenol and Pentachlorophenol, Surface Sealing Compound
MIL-S-13165	Shot Peening of Ferrous Metal Parts
MIL-P-13924	Coating, Oxide, Black for Ferrous Metals
MIL-C-16173	Corrosion Preventive Compound, Solvent Cut Back, Cold Applications
DOD-P-16232	Phosphate Coatings, Heavy, Manganese or Zinc Base (for ferrous metals)
MIL-C-17711	Coatings, Chromate, for Zink Alloy Castings and Hot-dip Galvanized Surfaces
MIL-C-23217	Coating, Aluminum, Vacuum Deposited
MIL-C-23236	Paint Coating Systems, Steel Ship Tank, Fuel and Salt Water Ballast
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-C-25769	Cleaning Compound, Aircraft Surface, Alkaline Waterbase
MIL-C-26074	Coating, Electroless Nickel, Requirements for
MIL-P-26915	Primer Coating, Zinc Dust Pigmented, For Steel Surfaces
MIL-P-27418	Plating, Soft Nickel (Electrodeposited, Sulfamate Bath)
MIL-S-38249	Sealing Compound, Firewall
MIL-C-38334	Corrosion Removing Compound, Prepaint, for Aircraft Aluminum Surfaces
MIL-P-38336	Primer Coating, Inorganic, Zinc Dust Pigmented, Self Curing, for Steel Surfaces
MIL-M-43248	Mat, Reinforcing Glass Fiber
MIL-C-43616	Cleaning Compound, Aircraft Surface
MIL-M-45202	Magnesium Alloy, Anodic Treatment of
MIL-R-46068	Resin, Polyester, Bisphenol - A Type
MIL-T-81533	1,1,1 Trichloroethane (Methyl Chloroform) Stabilized
MIL-C-81562	Coating, Cadmium and Zinc (Mechanically Deposited)
MIL-C-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-S-81733	Sealing and Coating Compound, Corrosion Inhibitive
MIL-C-81740	Coatings, Aluminum and Aluminum Alloys (Metallic Compound Decomposition)
MIL-C-81751	Coating, Metallic Ceramic
MIL-S-83286	Coating, Urethane, Aliphatic Isocyanate, for Aerospace Applications
MIL-S-83430	Sealing Compound, Integral Fuel Tanks and Fuel Cell Cavities, Intermittent Use to 360 Degrees F
MIL-C-83488	Coating, Aluminum, ION Vapor Deposited
MIL-C-83982	Compound, Sealing, Fluid Resistant

STANDARDS

FEDERAL

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

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FED-STD-595	Colors

MILITARY

MIL-STD-101	Color Codes for Pipelines and for Compressed Gas Cylinders
MIL-STD-490	Specification Practices
MIL-STD-753	Corrosion Resistant Steel Parts, Sampling Inspection and Testing for Surface Preparation
MIL-STD-889	Dissimilar Metals
MIL-STD-1504	Abrasive Blasting
MIL-STD-1568	Materials and Processes for Corrosion Prevention and Control in Aerospace Weapon Systems

DEPARTMENT OF THE AIR FORCE

AFR 400-44	Corrosion Prevention and Control Program
AFM 88-15	Air Force Design Manual - Criteria and Standards of Air Force Construction
AFOSH STD 161-2	Indistrial Ventilation
AFSC Design Handbook 2-6	Ground Equipment Facilities
T.O. 42A-1-1	Safety, Fire Precaution and Health Promotion Aspects of Painting, Doping and Paint Removal
T.O. 1-1-8	Application of Organic Coatings, Aerospace Equipment

(Copies of specifications, standards, drawings, and publications required by Manufacturers in connection with specific acquisition functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.1.2 Other documents and publications. The following other Government documents form a part of this standard to the extent specified herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	Zinc (Hot-galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
ASTM A 525	General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM F 519	Mechanical Hydrogen Embrittlement of Testing of Plating Processes and Aircraft Maintenance Chemicals

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

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STEEL STRUCTURES PAINTING COUNCIL

SSPC-SP6-63, Edition 6 Steel Structures Painting Manual, Volumes 1 and 2

(Applications for copies should be addressed to the Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburg, PA 15123).

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies).

2.1.3 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Abrasive blasted metal surfaces.

3.1.1 White metal surface finish. A white metal surface finish is defined as abrasive cleaning that removes all mill scale, rust scale, rust, adhering mill scale, casting sand, slag, weld spatter and other foreign matter. The surface produced will have a very uniform greyish metallic white color with a roughness profile conforming to the size of abrasives used. This surface is required when organic and inorganic zinc rich primers and galvanizing is applied to steel. See also MIL-STD-1504 on abrasive blasting.

3.1.2 Commercial blast metal surface finish. A commercial blast metal surface finish is defined as abrasive cleaning which will leave the surface clean and free of all adhering mill scale, corrosion products, dirt, casting sand, slag and other foreign substances and provide a dull grey slightly streaked surface. This surface finish is suitable for the application of organic coatings. See also MIL-STD-1504 on abrasive blasting.

4. GENERAL REQUIREMENTS

4.1 Finishing processes. The cleaning procedures, sealant materials, coating systems and other preservative materials covered by this standard will provide protection against corrosion and other effects of the environment and service conditions providing the finishing systems are properly planned, selected and applied during the design and manufacture of the support equipment. High performance finish

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systems are extremely critical of the surface to which they are applied. No finish system will adhere to corroded metals and alloys or improperly cleaned materials. Consequently, proper attention must be given to cleaning prior to application of any finish. Also of paramount importance is the selection of compatible finishing systems in order to insure film adhesion and eliminate lifting, blistering and wrinkling. Good workmanship and strict quality control of the mixing, application and curing of the finish system is mandatory in order to obtain acceptable protective coating systems.

4.2 Materials. All materials and processes shall conform to the requirements of the applicable specifications and shall be used in accordance with the governing documents.

4.3 Selection. The responsibility for selection and approval of all materials and processes lies with the engineering activity having engineering responsibility for the system or item. The engineering responsibility shall also include selection and approval of materials, processes and finishes which are consistent with approved corrosion control practices and Air Force inventory standardization as defined in AFR 400-44 and supplements thereto and MIL-STD-1568.

4.4 Exceptions. Materials, processes and finishes not listed in this standard may be utilized where unique functional requirements exist or when materials, processes and finishes required by this standard are not applicable. Some materials, processes and finishes referenced in this standard are not covered by either Government or Industry specifications. Information on the applicability and available sources for such materials, processes and finishes can be obtained from the engineering activity responsible for the system or item. Complete information on materials, processes, and finishes in the above cases shall be included on the applicable detailed drawings and in the finish specification.

4.5 Parts fabrication. Parts fabricated by means of lock seams, lap joints, tack welding, spot welding or other permanent fastening techniques shall be primer coated, plated or chemically treated or a combination of the treatments prior to the assembly operation, or the design shall be such that plating and other chemical solutions will drain from the part.

4.6 Holes and recesses. When it is not possible to meet thickness requirements for organic paint finishes or metallic finishes, sealant materials containing corrosion inhibitors shall be used. (See 5.11)

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4.7 Masking. Plated or base metal parts containing areas specifically intended for electrical contact or heat transmission shall have such areas masked or otherwise protected during subsequent finishing processes.

4.7.1 Items such as fabrics, plastics, rubber, working parts of machinery, and other surfaces not normally painted in good commercial practice, shall not be painted unless specified in the equipment specification. These items shall be masked or otherwise protected during subsequent finishing processes.

5. DETAIL REQUIREMENTS

5.1 Materials and finish process considerations in design.

5.1.1 Design considerations. The primary consideration in the design and construction of support equipment is the ability of the design to comply with structural and operational requirements. In addition, the support equipment is expected to perform reliably and require minimum maintenance over a specified lifetime, which includes minimizing the rate of deterioration. Therefore, in the selection of suitable materials and appropriate processing methods to satisfy functional performance and structural requirements in accordance with MIL-S-8512 and AFSC Design Handbook 2-6, consideration must also be given to those materials, processing methods and protective treatments which reduce service failures due to deterioration of parts and assemblies in service. Deterioration modes which contribute to service failures include but are not limited to pitting corrosion, galvanic corrosion, exfoliation corrosion, stress corrosion, corrosion fatigue, thermal embrittlement, fretting fatigue, oxidation, hydrogen embrittlement, weathering and fungus growth. In the entire design phase, attention shall be given to precautionary measures to minimize deterioration of individual parts and assemblies as well as the entire system. Precautionary measures include proper selection of materials, limitations of design operating stresses, relief of residual stress levels, shot peening, heat treatments which reduce corrosion susceptibility and protective coatings and finishes.

5.1.2 General design guidelines for corrosion prevention.

5.1.2.1 Exclusion of water. The design of the system shall be such as to prevent water leaking into, or being driven into, any part of the system interior when either in an operating or travelling configuration. All windows, doors, panels, covers, etc., shall be provided with sealing arrangements such that the entry of water is minimized when these items are correctly closed. Particular care shall be taken to prevent wetting of equipment, and heat and sound proofing materials. Sharp corners and recesses should be

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avoided so that moisture and solid matter cannot accumulate to initiate localized attack. Sealed floors with suitable drainage shall be provided for storage compartments, engine compartments, and other areas in the design that could collect and retain water.

5.1.2.2 Ventilation. Ventilation shall be sufficient to prevent moisture retention and buildup.

5.1.2.3 Drainage. Drain holes shall be provided to prevent collection or entrapment of water or other unwanted fluid in areas where exclusion is impractical. All designs shall include considerations for the prevention of water or fluid entrapment and insure that drain holes are located to effect maximum drainage of accumulated fluids. The number and location of drain holes shall be sufficient to permit drainage of all fluids when the unit is in a 10 degree incline in any plane. The minimum size of the drain holes shall be 0.25 inch (6.35 millimeters (mm).

5.1.2.4 Dissimilar metals. Use of dissimilar metals as defined by MIL-STD-889, in contact shall be limited to applications where similar metals cannot be used due to peculiar design requirements. When it is necessary to use dissimilar metals in contact, the metals shall be protected against galvanic corrosion. Galvanic corrosion can be minimized by interposition of a material which will reduce the overall electrochemical potential of the joint or by interposition of an insulating or corrosion inhibiting material such as sealants and organic coatings.

5.1.2.5 Insulating materials. When thermal or acoustical insulating materials are required, they shall have either a permanent baked on water repellant binder system or suitably protected with sealant to prevent any moisture absorbed by the material from contacting the metal structure. The metal to which the insulation material is attached shall have a complete finish system of primer and topcoat prior to application. After installation, all edges shall be sealed with sealant material conforming to MIL-S-81733.

5.1.2.6 Hinges. All hinges used on support equipment shall conform to MIL-H-9850 and Supplement 1 thereto. The appropriate military standard drawing shall be selected from Supplement 1 to MIL-H-9850 with the following exceptions:

a. Aluminum alloy hinges, leaves and pins, shall be used for attachment to magnesium or aluminum alloys only (Material A). See also MIL-STD-889 on dissimilar metals.

b. Hinges that are attached to low carbon steel shall be either corrosion resisting steel, leaves and pins, and shall be mechanically fastened only (Material C) or low carbon steel leaves, (Material D), plated or galvanized in accordance with Table I and Table IV by the

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hinge manufacturer after forming and other manufacturing operations have been completed. The hinge pins shall be wear resistant nylon conforming to L-P-410. The nylon pins shall be secured in the hinge nodes with button head 5000 series aluminum fasteners or button head nylon fasteners.

c. The design of the selected hinge shall have sufficient clearance from the outer face of the knuckle to the cutout of the opposite leaf to prevent the removal of paint finishes when the hinge is rotated through the entire range of its pivotal movement.

5.1.2.7 Storage compartments. Storage compartments of support equipment for hoses, ducts, tools, electrical cables, etc. shall be protected from abrasion with a pressure sensitive transparent adhesive backed polyurethane tape. The tape shall be applied over surfaces that have the final protective coating system applied.

5.1.2.8 Battery areas. Battery compartments not constructed of leakproof and corrosion resistant materials consisting of MIL-R-46068 polyester resin and MIL-M-43248 glass fibers or equivalent, shall have the battery compartment and adjacent areas which are subject to vapors and spills coated with a suitable polyurethane casting resin.

5.1.2.9 Exhaust systems. All components of exhaust systems including mufflers, spark arrestors, resonators, pipes, clamps, weather stops, bolts, nuts, fasteners and specially designed components not constructed of a suitable stainless steel alloy shall require the application of a finishing system. All exhaust systems and components constructed of low carbon steel shall be coated on both sides with a commercial grade aluminum coating or equivalent coating material that is suitable for high temperature application.

5.1.2.10 Nonstandard ferrous hardware. All ferrous (other than stainless steels) hardware such as U-bolts, fasteners, etc., not conforming to MS, AN, NAS or ANA Standards shall be cadmium plated or zinc plated in accordance with Table I or Table IV.

5.1.2.11 Closed hollow members. All closed hollow structural members, except those that transport fluids or gasses, shall have water drainage provisions at the lowest point of the member. For horizontal members, drain holes will be provided on the lower side. Vertical members shall have drain holes in the bottom end cap if the design permits. Otherwise, the drain holes shall be located on the side of the member at the lowest possible point. The drain holes shall be a minimum of 6.35mm (0.25 inch) in diameter. Drain holes in vertical hollow members shall be closed with removable Wellnut plugs or equivalent devices. All drain holes in horizontal hollow members shall be left open. The interior surfaces of vertical and horizontal hollow members shall be protected against corrosion in accordance with Table II.

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5.2 Documentation. When required by the contract or purchase order, the following documents shall be furnished by the manufacturer to the procuring agency for review and approval by the engineering activity having responsiblity for a system or item.

5.2.1 Finish process specification. The contractor shall prepare a finish process specification in compliance with MIL-STD-490 which identifies the specific cleaning processes and finishes to be used on the various substrates of all parts, components and complete assemblies to protect them against corrosion in the environments to which they will be exposed. After the document has been approved by the responsible Air Force engineering activity, the requirements contained therein shall be included in all applicable production drawings. The finish process specification shall also include the following data.

a. Designation of a person or persons in the design, engineering, and manufacturing departments as focal points for corrosion control.

b. Data justifying the contractor's materials selection and finish processes and materials selection criteria shall be presented and any special testing requirements shall be identified to insure acceptable levels of protection against corrosion.

c. Any company materials and finish process specifications shall be cross-referenced to any applicable Federal or Military specifications.

d. Any special considerations concerning system or item peculiarity, nuclear effects, chemical warfare agent effects and environmental concerns shall be stated and defined.

e. Special finishes for special areas such as engine compartments, equipment and tool storage compartments, battery compartments, surfaces exposed to high temperatures, surfaces exposed to engine exhaust gases, laminates and exterior markings.

f. Surfaces not to be treated or coated.

g. Sealing requirements in the following areas:

1. Environmental sealing.

2. Sealing for containment of fuel.

3. Sealing for containment of electrolytes.

4. Firewall sealing.

5. Heat resistant sealing.

6. Fay surface sealing.

7. Permanent fastener sealing.

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8. Drainage provisions.

9. List of sealing materials and process specifications to be used.

5.2.2 Detailed drawings. The contractor shall furnish detailed engineering drawings of parts, components and assemblies that clearly identifies the specific types of finishes to be used on the equipment. The finish system shall be identified on the drawings by the finish codes presented in this standard. All engineering drawings shall be prepared to Level 3 (Production) in compliance with DOD-D-1000.

5.2.2.1 Supplementary notes. When a specification offers options, supplementary notes on the drawing shall be required to complete the identification of a finish.

5.2.2.2 Manufacturers options. If the finish of a part is to be optional with the manufacturer, the basic code for a specification may be specified. The amount of freedom a designer or manufacturer has to select types, classes, etc., however, is still governed by the finish specification or the particular material specification.

5.2.2.3 Multiple finish. A drawing which must reflect more than one finish or a partial finish, shall contain codes and notes to identify the finishes with the appropriate areas or zones.

5.3 Cleaning requirements.

5.3.1 Precleaning. Prior to subjecting materials to cleaning processes involving mechanical or chemical removal of metal, all surfaces shall be cleaned free from preservative oils, cutting oils, greases, welding fluxes, soldering fluxes, and other soils.

5.3.1.1 Organic contamination removal. Organic soils shall be removed by emulsion cleaning, alkaline cleaning, vapor degreasing or solvent cleaning, whichever is more applicable to the nature of the soil to be removed. The materials and processes used shall be completely characterized and controlled to insure no corrosion effects. Vapor degreasing shall be done with 1,1,1 trichloroethane conforming to MIL-T-81533 or O-T-620. The condensate of each vapor degreasing unit shall be sampled weekly to determine the pH. If an acid reaction is found, the use of the installation shall be discontinued until the acid condition is corrected and also available treated parts examined for corrosion effects. If corrosion effects are noted, all parts

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processed during interval of cleaning shall be 100 percent inspected. Materials used for hand cleaning shall leave no contaminating residues or react with cleaning solvents. Solvents for hand cleaning shall be 1,1,1 trichloroethane conforming to MIL-T-81533 or O-T-620, aliphatic petroleums such as naptha conforming to TT-N-95, acetone conforming to O-A-51, methyl-ethyl-ketone conforming to TT-M-261, etc. Solvents shall be wiped from the part and shall not be allowed to dry on the part.

5.3.1.2 Flux removal. Soldering, welding, and brazing fluxes shall be completely removed. Hot water, alcohol, or dry cleaning solvents conforming to P-D-680, Type II, shall be used, as may be appropriate for the flux or by a method which will not attack metals it contacts. Methyl or wood alcohol (methanol) shall not be used for magnesium and its alloys. Acid or alkaline materials shall not be used.

5.3.2 Cleaning of surfaces.

5.3.2.1 Aluminum and its alloys. Aluminum and its alloys shall be either chemically or mechanically cleaned. The use of uninhibited alkaline materials such as sodium hydroxide solutions, and of abrasives containing iron and its oxides, steel wool and wire, and copper alloy based wire, which may become embedded and accelerate corrosion of aluminum alloys shall not be used for cleaning. Materials conforming to MIL-C-5410, MIL-C-43616, or MIL-C-25769 shall be used for chemical cleaning. Other materials or methods may be approved for use.

5.3.2.2 Low-strength steels. Steels of Rockwell hardness less than C40 shall be cleaned in accordance with TT-C-490 or by other suitable processes.

5.3.2.2.1 Abrasive blasting. Machined parts and sheet metal thinner than 0.0625 inch (16 gage U.S. standard) shall not be blasted. Blasting will not be required on component parts of equipment (such as track chain assemblies, track roller assemblies, interiors of welded type box sections, blades, bowls, and buckets for dozers and crane shovels, interior of drums of cement mixers, and interiors of aggregate driers) which are painted for protection during limited storage or from which the paint will be worn off almost immediately when the equipment is placed in use. However, the surface to be painted shall be dry and free from loose mill scale, oil, grease, dirt and rust.

5.3.2.2.2 Zinc surfaces. Electroplated zinc coated steel surfaces, hot-dipped galvanized zinc coated steel surfaces, mechanically applied zinc coated surfaces and solid zinc surfaces shall be solvent vapor cleaned, solvent washed, alkaline detergent cleaned or a combination of alkaline detergent and solvent cleaning. When aqueous alkaline detergent solutions are used for cleaning zinc surfaces, they shall be immediately and thoroughly rinsed with clean water.

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5.3.2.3 High strength steels. Steels, including corrosion and heat resistant steels, hardened by thermal treatment or by cold working to full or surface hardness level of Rockwell C40 and higher, shall be mechanically blasted for rust or scale removal.

5.3.2.4 Corrosion and heat resisting steels. Except as indicated in 5.3.2.3, corrosion and heat resisting metals and alloys shall be cleaned by suitable chemical or mechanical processes, or combinations thereof. However, materials which are susceptible to damage by hydrogen shall be mechanically cleaned. For metals and alloys which are sensitive to contamination by gaseous constituents such as hydrogen, oxygen, and nitrogen, and are exposed to atmospheres containing such materials during heat treatment, etc., sufficient metal shall be removed during manufacture to eliminate the contaminated material. Verification of elimination shall be done. Procedures for and verification of complete removal of contaminated material shall be accomplished. Where chemical cleaning methods are used, the materials shall not result in any attack of the surface, either pitting or intergranular. Daily determination for this behavior shall be made using a microscopic method with examination at a magnification which will clearly establish the condition. However, when intermittent cleaning operations exist, the frequency of examination shall be reduced accordingly but shall not be less than weekly intervals. Parts with pitted surfaces or showing intergranular attack shall be rejected.

5.3.2.4.1 Passivation treatment. The final operation for 200, 300, 400 series and precipitation-hardened corrosion resistant steels shall be a passivation treatment in accordance with QQ-P-35. Carburized or nitrided surfaces shall not be passivated. The verification of the surface passivation shall be in accordance with MIL-STD-753 for all parts.

5.3.2.5 Magnesium and its alloys. Magnesium and its alloys shall be cleaned in accordance with MIL-M-3171.

5.3.2.6 Rinsing. When either acid or alkaline materials are employed, the cleaned parts shall be given a thorough rinse with water of adequate purity to remove all acid or alkali prior to further treatment and not leave any residual contamination.

5.4 Surface treatments for metals.

5.4.1 Aluminum and aluminum alloys. All aluminum and aluminum alloys including clad aluminum alloy surfaces used in load bearing structural applications shall be anodized to produce coatings conforming to type II of MIL-A-8625. All 7000 series aluminum alloys used in any application shall be anodized to produce coatings conforming to type II of MIL-A-8625. All 2000 series aluminum alloys

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used in any application shall be anodized to produce coatings conforming to type I or type II of MIL-A-8625. All 5000 and 6000 series aluminum alloys may be anodized in accordance with type I of MIL-A-8625 or may be chemical conversion coated in accordance with class 1A of MIL-C-81706. Parts subject to wear, abrasion, erosion and severe corrosion conditions shall be anodized. Chemical conversion coated parts shall not be used where subsequent organic finishing is not specified.

5.4.1.1 Electrical parts. Chemical films conforming to Class 3 treatment of MIL-C-81706 shall be used on electrical parts where low electrical resistance is required. Table III gives electrical conductivity properties of other conversion coatings and surface passivation processes.

5.4.1.2 Touch-up. Unless otherwise specified, all surfaces which have the anodic or chemical conversion coatings, removed or damaged shall be touched up only where required with MIL-C-81706 materials approved for Class 1A treatment by Method B application (brush or swab). (See 5.7.3.7).

5.4.2 Magnesium alloys. All magnesium alloys shall be surface treated or receive an anodic coating in accordance with MIL-M-3171 or MIL-M-45202. Anodic coatings applied in accordance with MIL-M-45202 shall be used for parts subject to wear, erosion, or abrasion.

5.4.2.1 Touch-up. All surfaces which have the anodic or chemical film removed or damaged shall be touched up, using either the Type I or Type VI process of MIL-M-3171.

5.5 Inorganic coatings.

5.5.1 Metallic coatings application. Metallic coatings shall be applied by electrodeposition, vacuum deposition, mechanical deposition, metallic compound deposition, or conventional spraying methods in conformance to applicable specifications. Where thermal application processes are used, in no case shall the temperature of the part be raised to adversely affect the mechanical, or corrosion and stress corrosion properties of the part and if the part is shot-peened prior to coating, shall not impair the effectiveness of the shot-peening operation.

5.5.1.1 Limitation on use of protective metallic coatings. Soft surface coatings such as cadmium, nickel-cadmium, and aluminum shall not be used for sliding or wear applications. Cadmium plated surfaces shall not be used in applications where surface temperature exceeds 450°F (232°C). The use of chromium plating for corrosion

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protection of alloy steel wear surfaces in interior environments is acceptable. For applications involving exposure to the exterior environment, chromium plating shall be considered an acceptable corrosion protection of alloy steel wear surfaces only when the chrome plating is periodically lubricated (fluid or grease types only) or a 0.04mm (0.0015 inch) minimum layer of nickel plating is applied under the chrome. All chrome plated steel parts used in fatigue applications shall be shot peened prior to plating. Chrome plated surfaces shall not be used in applications where service temperatures exceed 700°F (370°C).

5.5.1.2 Coatings for corrosion control. Non-corrosion resistant steels shall be coated as follows:

a. With cadmium by vacuum deposition in accordance with MIL-C-8837.

b. With aluminum by vacuum deposition in accordance with MIL-C-23217.

c. With cadmium or zinc by mechanical deposition in accordance with MIL-C-81562.

d. With electrodeposited zinc conforming to QQ-Z-325 or electrodeposited cadmium conforming to QQ-P-416.

e. With aluminum and aluminum alloys by metallic compound deposition in accordance with MIL-C-81740.

f. With ion vapor deposited aluminum in accordance with MIL-C-83488.

g. With metallic-ceramic coating conforming to MIL-C-81751.

Steels heat treated to an ultimate tensile strength of 1230 megapascals (mpa) (180,000 psi) or above shall not be coated with zinc. Electrodeposited cadmium may be used on high strength steel, 1230 mpa (180,000 psi) Ultimate Tensile Strength (UTS), provided the process can be demonstrated by satisfactory behavior of specimens prepared and tested in accordance with ASTM F519 using Type 1A notched round bars, stressed in tension, under constant load. Unless otherwise specified, to assure continuous control of the process to prevent detrimental hydrogen embrittlement during production, the satisfactory behavior of specimens, prepared and tested in accordance with ASTM F519, shall be made for each production lot of coated steel parts. If evidence of hydrogen embrittlement of specimens is shown, the use of the process shall be discontinued until the process conditions are corrected.

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5.5.1.3 Cadmium plating and coating. Cadmium plating shall be in accordance with QQ-P-416. Cadmium coatings shall be in accordance with MIL-C-8837 or MIL-C-81562. Unless otherwise specified, cadmium coating or plating shall be Class 2 thickness 0.008mm (0.0003 inch). Cadmium plating and coating shall not be used in the following application.

a. Parts which may be in contact with hydraulic fluids, fuels, lubricating oil and other petroleum base products.

b. Parts in frictional contact where gouging or binding may be a detrimental factor.

c. In confined spaces, in the presence of organic materials which give off corrosive and damaging vapors.

d. Parts which will be subsequently soldered.

5.5.1.3.1 Parts which cannot be processed to completely remove pre-plate and plating fluids shall be vacuum coated in accordance with MIL-C-8837 or mechanically coated in accordance with MIL-C-81562.

5.5.1.3.2 Cadmium plated or coated parts shall be supplementary chromate treated in accordance with MIL-C-17711.

5.5.1.4 Zinc plating and coating. Zinc plating shall be in accordance with QQ-Z-325. Mechanically applied zinc coatings shall be in accordance with MIL-C-81562. Hot dipped galvanized coatings for low carbon structural steel such as beams, channels, etc. shall be in accordance with ASTM A123. Hot dipped galvanized coatings for low carbon steel sheet shall be in accordance with ASTM A525. Zinc plating and mechanically applied zinc coatings shall be a minimum thickness of 0.025mm (0.001 inch). Hot dip galvanized coating for low carbon steel structural members shall be a minimum thickness of 0.086mm (0.0034 inch). Hot dip galvanized coating for low carbon steel sheet shall be a minimum of G90 in accordance with ASTM A525. Zinc coating and plating shall not be used in the following applications.

a. Where the temperature of coated parts or surfaces they are in contact with exceed 500°F (260°C).

b. Parts in contact with structural fabric surfaces.

c. Parts in contact where corrosion products might interfere with normal functioning.

d. Grounding contacts where the increased electrical resistance of zinc-plated surfaces would be objectionable.

e. Parts and assemblies constructed of steel heat treated to an ultimate tensile strength of 1230 mpa and above (180,000 psi).

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5.5.1.4.1 Inorganic zinc rich primer. Inorganic zinc rich primer shall be in accordance with MIL-P-38336 or MIL-P-23236 Type 1, Class 3. The primer shall be applied only to low strength steel, 150 KSI, UTS or below, that has been abrasively blasted to a white metal condition. Inorganic zinc rich primer shall be applied to a minimum dry film thickness of 0.090mm (0.0035 inch). The same limitations apply to the use of inorganic zinc rich primer as specified for zinc plating, mechanically applied zinc coating, and hot dip galvanized coating in paragraph 5.5.1.4.

5.5.1.4.2 Zinc plated surfaces, mechanically zinc coated surfaces, hot dip galvanize coated surfaces and inorganic zinc rich primer coated surfaces shall be chromate treated in accordance with MIL-C-17711 prior to application of any organic coatings.

5.5.2 Coatings for functional purposes. Coatings for functional purposes shall be as specified in 5.5.2.1 through 5.5.2.3. Unless otherwise specified, where the selected coating does not provide protection against corrosion for the basis metal and the coated surface or portion thereof is exposed to corrosive environment, an undercoat of 0.025mm to 0.040mm (0.001 to 0.0016 inch) of nickel on steel and zinc parts or an undercoat of 0.020mm to 0.025mm (0.0008 to 0.001 inch) nickel on copper alloy parts in accordance with QQ-N-290 shall be used. The same restrictions that are applicable to steel parts, coated by chemical or electrochemical deposition and having a tensile strength of 1230 mpa (180,000 psi) and over, as stated in 5.5.1.2 shall be applicable to coatings for functional use except for chromium (see 5.5.2.1).

5.5.2.1 Chromium plating. Chromium plating shall be used for all surfaces subject to wear or abrasion, except where other surface hardening processes are used such as nitriding, carburizing or where other wear and abrasion resistant coatings are specified. Chromium plating shall be in accordance with QQ-C-320, Class 2 (engineering) with a minimum of 0.050mm (0.002 inch). When chromium plating is specified, it shall be used on only one of two contacting surfaces.

5.5.2.2 Nickel plating. Nickel plating shall be used for the following applications only:

(a) Where temperatures do not exceed 1000°F (530°C) and other coatings would not be suitable.

(b) To minimize the effects of crevice corrosion with unplated corrosion-resisting steel or stainless steel in contact with other stainless steel.

(c) As an undercoat for other functional coatings.

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(d) To restore dimensions by building up worn surfaces.

(e) For resistance to sand erosion.

Where nickel plating of parts or surfaces is specified, it shall be such as to produce coatings in accordance with QQ-N-290. Nickel plating, except where used as an underplating, shall be Class 2 (engineering) with a minimum thickness of 0.076mm (0.003 inch).

5.5.2.2.1 Where applications require low residual tensile stress in the plated nickel, plating shall be in accordance with MIL-P-27418.

5.5.2.2.2 Electroless nickel coating. Where specified, electroless nickel coating shall be in accordance with MIL-C-26074.

5.5.2.3 Aluminum coating. Aluminum and aluminum alloy coatings shall be used where the properties of these materials present distinct protective advantages in comparison with other coatings and platings at temperatures in excess of 450°F (232°C) surface treatment of aluminum and aluminum alloy coatings, when required, shall be as specified herein (see 5.3). Aluminum and aluminum alloy coatings shall be in accordance with MIL-C-81740, MIL-C-23217 or MIL-C-83488.

5.5.3 Inorganic nonmetallic coatings.

5.5.3.1 Phosphate treatments. Phosphate treatments may be used on steel surfaces where it is impractical to apply metallic coating. Phosphate treatments, that conform to DoD-P-16232 or TT-C-490, shall be used.

5.5.3.2 Hard anodic coatings for aluminum and its alloys. Hard anodic coatings shall conform to Type III of MIL-A-8625. They shall be used on parts where the functional purpose is to provide a wear resistant surface. Hard anodic coatings shall not be used on parts where subject to rework and to overhauling.

5.6 Shot peening and other residual compressive stress-inducing treatments. Shot peening, in accordance with MIL-S-13165, and other compressive stress-inducing treatments may be used to obtain improved fatigue behavior and stress corrosion cracking resistance, using controlled procedures. The maximum temperatures for use of any part shall not exceed 50°F (10°C) less than the recovery temperature of the stressed surface of the material involved. Procedure details shall be prepared and listed on the applicable drawings or applicable reference documents for parts. Specific attention shall be paid to use of recognized procedures, equipment, materials, and control methods.

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5.6.1 Processing. Steel parts plated with hard coatings, such as nickel and chromium and combinations thereof, shall be processed as follows:

5.6.1.1 Plated parts below Rockwell C40 hardness and subject to static loads or designed for limited life under dynamic loads, or combinations thereof, need not be shot peened prior to plating or baked after plating.

5.6.1.2 Plated parts below Rockwell C40 hardness which are designed for unlimited life under dynamic loads shall be shot peened in accordance with MIL-S-13165 prior to plating. Unless otherwise specified, the shot peening shall be accomplished on all surfaces for which the coating is required and on all immediately adjacent surfaces when they contain notches, fillets, or other abrupt changes of section size where stresses will be concentrated.

5.6.1.3 Plated parts which have a hardness of Rockwell C40, or above, and are subject to static loads or designed for limited life under dynamic loads, or combinations thereof, shall be baked at $375^{\circ} \pm 25^{\circ}F$ ($191^{\circ}C \pm 4^{\circ}C$) for not less than 3 hours, within 4 hours or as soon as practicable after plating.

5.6.1.4 Plated parts which have a hardness of Rockwell C40, or above, and are designed for unlimited life under dynamic loads, shall be shot peened in accordance with MIL-S-13165 prior to plating. Unless otherwise specified, the shot peening shall be accomplished on all surfaces for which the coating is required and on all immediately adjacent surfaces when they contain notches, fillets, or other abrupt changes of section size where stresses will be concentrated. The plated parts shall be baked at $375^{\circ} \pm 25^{\circ}F$ ($191^{\circ} \pm 4^{\circ}C$) for a minimum of 3 hours within 4 hours or as soon as practicable after plating.

5.6.2 Plating finish selection. Plating finisnes for application to equipment or parts thereof shall be in accordance with Table I. Specific finishes shall be selected with due regard to surface classification (type I or II) and the base metal to be protected. Plating finishes are designated by the letter "P" followed by a number. Thus P-102 is a plated nickel finish for use on iron or iron-base alloy parts to be subjected to type I exposure. As specified in Table I finish P-102 consists of 0.010mm (0.0004 inch) (minimum) nickel over 0.019mm (0.00075 mil minimum) copper undercoat over the base metal. Other metallic coatings shall be selected in accordance with Table IV.

5.7 Organic coatings.

5.7.1 Selection. The selection of organic coatings shall be in

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accordance with this standard and as otherwise directed by the contract or purchase order.

5.7.2 Facilities and equipment for organic coatings application.

5.7.2.1 Facilities. The facilities in which organic coatings are applied to support equipment, including complete assemblies, subassemblies and parts, shall meet the ventilation requirements of AFOSH Standard 161-2, the fire protection standards of the National Fire Protection Association (NFPA) and AFM 88-15 and the general safety precautions of T.O. 42A-1-1. The engineering activity is responsible for approval of organic coatings application facilities.

5.7.2.2 Environmental controls. All organic coating materials shall be applied at environmental conditions (temperature and humidity) in accordance with T.O. 1-1-8, Application of Organic coatings.

5.7.2.3 Application equipment. Application equipment shall be either conventional air atomization, airless spray or airless electrostatics spray equipment. The spray equipment, the air supply and the spray booths shall be maintained in accordance with T.O. 1-1-8, Application of Organic Coatings.

5.7.3 Organic coatings application.

5.7.3.1 Material. Unless otherwise specified, all materials used in the finishing and coating of support equipment and parts shall conform to the requirements of the applicable specifications, and as specified herein. The addition to the paints of any materials other than thinners is prohibited. Contractors shall conduct such check tests as necessary to ensure suitability of the materials.

5.7.3.2 Mixing. Finishing materials shall be prepared for application under clean conditions with clean equipment. Coating materials shall be allowed to equalize to standard conditions before mixing. The materials shall be thoroughly stirred or shaken prior to thinning or mixing and application. Mixing shall be controlled by weight, volume, or viscosity to ensure complete uniformity of all material prepared for use. The mixing of paints of the same specification but supplied by different manufacturers is prohibited to avoid problems of incompatibility in the liquid and drying phases. Every effort should be made to assure that a primer of a single manufacturer is employed on the item to be finished and similarly, the topcoat should be restricted to a product of a single manufacturer.

5.7.3.3 Selection of thinners. The thinner required in the applicable process specifications shall be used. Adjust the amount of thinner, as necessary, to obtain the prescribed thickness of coating, but avoid excessive thinning which could produce runs and sags. Temperature and humidity conditions should be determined and thinning adjusted as required by the applicable specification, for such atmospheric conditions. Other thinners as recommended by the paint manufacturer for his particular product may be used.

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5.7.3.4 Storage of paint materials. Support equipment finishing materials shall be stored in a cool, dry place, indoors if possible, and should not be stored at a temperature lower than 50°F (10°C) or higher than 80°F (27°C) for long periods and may approach, but should not exceed, 100°F (38°C) for shorter periods not exceeding 4 months. Where high temperatures are unavoidable, the quantity on hand shall be held to a minimum, since temperatures exceeding 100°F (38°C) will produce marked degradation of certain of these materials.

5.7.3.5 Cleaning, general. The meticulous cleaning and surface treatment of support equipment prior to all painting operations cannot be overemphasized, since this factor is of prime importance in obtaining a satisfactory paint finish. Reclaimed paint thinner or other reclaimed thinners shall not be used for cleaning purposes, since these materials may leave soils which will cause poor adhesion of the next coat. All abrasive or foreign particles must be removed after sanding or cutting operations before application of paint-type materials. Cleaning shall be accomplished with solvents, detergents, and processes which have no deleterious effect on the surface and which produce surfaces satisfactory for receiving subsequent finishes. Cleaning materials which may be effective against one type of contaminant may be ineffective against others. Therefore, multiple cleaning procedures may be required to provide the required water-break-free surface. Acid cleaners or surface treatments shall not be allowed to contact materials susceptible to hydrogen embrittlement. (See 5.3)

5.7.3.6 Tests for surface condition. The following tests shall be conducted on the support equipment before surface retreatment and painting.

5.7.3.6.1 Reaction of surface. The surface shall have a neutral or slightly acid reaction. Red litmus paper moistened with distilled water when applied to the surface shall not turn blue, otherwise a 0.20 to 0.25 percent chromic acid solution shall be applied and shall be permitted to remain on the surface for 2 to 5 minutes followed by a water rinse, and the surface then wiped dry with clean, lint-free cloths. The surface shall then be retested with red litmus paper.

5.7.3.6.2 Water-break test. Representative areas of the surface to be treated shall be tested for ability to support an unbroken film of distilled water. A mist of distilled water shall be atomized on the surface under test, representative of the larger surface being tested, employing any convenient small atomizing device. If the water gathers into discrete droplets within 25 seconds, in other words, if the surface shows a "water-break" within that time, then the surface shall be considered as having failed the test. If the water forms a continuous film by flashing out suddenly over a large area, then this shall be considered indicative of the presence of an impurity on the surface, such as free alkali, residual detergent, etc., and the surface shall be considered as also having failed the test. If the water droplets coalesce into a continuous film of water without a sudden flashout and form a lens, then the surface shall be considered as having satisfactorily passed the water-break test.

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5.7.3.7 Manually applied surface treatment and touchup. For support equipment already assembled, manually applied surface retreatment is required on all surfaces before painting. For aluminum surfaces, MIL-C-81706 manually applied surface retreatment is required. For magnesium surfaces retreatment is required. For magnesium surfaces, MIL-M-3171, Type VI, or other approved equivalent manually applied surface treatment is required. For other metals, the contractor shall determine the necessary treatment to assure adequate paint adhesion. Manually applied surface retreatment shall be applied after final cleaning and draining of the surface preferably within 8 hours but not more than 72 hours prior to application of the finish. Special precaution shall be taken where treated magnesium surfaces are scratched. Such scratched areas inadequately surface treated shall be carefully touched up with MIL-M-3171 manually applied chemical treatment, or approved equivalent, prior to coating application, otherwise bubbling would be encountered when coatings are applied to these surfaces. (See 5.4.1.2 and 5.4.2.1.)

5.7.3.8 Aluminum and magnesium surfaces shall be examined to determine that the optimum thickness of surface treatment has been applied. Paint will not bond to treated aluminum surfaces which are too dark, nor will it adhere to the brown powdery surface of excessively treated magnesium or aluminum.

5.7.3.9 Final preparation for painting. After application, and drying, of the surface retreatment the surface shall be flushed with clear water and tested in accordance with 5.7.3.6. If additional cleaning is necessary, it shall be done in such manner that the surface treatment will not be damaged.

5.7.3.10 Special precautions. Painting should begin immediately after cleaning to ensure application to a water-break free surface. Solvent cleaning of the surface is a requirement if there is a break in the painting sequence on the support equipment of overnight, or longer. Additional cleaning consisting of at least an additional wash with solvent followed by a wash with detergent solution in hot water or steam will usually be required. A final hand wipedown shall be performed immediately before painting the support equipment to ensure scrupulous cleanliness and a proper paintable surface. All surfaces shall be thoroughly dry before receiving paint-type materials, taking special precautions to assure dryness of crevices, faying surfaces, and difficulty accessible areas.

5.7.3.10.1 General requirements. Surfaces shall be conditioned to standard temperature before painting. Unless otherwise specified herein or in the detail process specifications, paint-type protective coatings may be applied by spraying processes or any other approved method which will ensure the application of a smooth, continuous film that is free of imperfections, such as dried overspray, runs, sags, blisters, or orange peel.

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5.7.3.11 Production spray test panels. Prior to the spraying operation, the suitability of materials for the entire system shall be determined experimentally on test panels. The panels shall be coated under prevailing conditions with the finish system that is to be applied to the support equipment. If the finish system applied to the experimental panel is satisfactory, then full scale operation may begin. Defects found in the experimental application, such as blushing, poor adhesion, excessive orange peel, sagging, etc., shall be corrected prior to large scale application.

5.7.3.12 Final dry of the finish. The support equipment, after painting, shall be permitted to dry in a dust-free atmosphere for a sufficient time prior to moving the equipment, to insure that the paint is adequately dry and to avoid damage to the finish. Painted support equipment or parts shall also be protected from condensing moisture and rain during the first 22 hours after painting. This time may vary somewhat depending on the temperature and type of paint used. The engines of the painted support equipment shall not be operated for at least 48 hours after painting.

5.7.3.13 Application of subsequent coats to previously painted surfaces. Assemblies and subassemblies that have been previously painted shall be cleaned prior to further application of paint. A cleaning agent that will not adversely affect the existing paint and provide a surface that will be satisfactory for furthur application of paint shall be used. Upon evaporation of the cleaning agent, all soils shall have been removed. Care shall be exercised to remove all cleaning agent from crevices and recesses.

5.7.3.14 Finish code selection. Paint finishes for application to equipment or parts shall be in accordance with tables II, V, VI and VII. Table II specifies basic paint finishes by F numbers. A basic paint finish is a system involving steps 1 through 3 of table II and lacks only the final film, step 4 of table II, for a complete finish designation. Table II also specifies finishes by FF numbers, these are complete finishing systems. Tables V, VI and VII provide the final film color requirements by letter designation. Thus a semi-gloss green system for ferrous alloys is specified as F-100ES, F-101ES, F-102ES, or F-103ES. In this case F-100, F-101, F-102, and F-103 are the basic green paint finish numbers and ES is the color designation (No. 24052 conforming to FED-STD-595). Either the basic designation or the final film designation may be specified independently. For example, detail drawings may specify a F-100 paint finish, in which case, the assembly drawing would call for a final film, such as film AG. Two coats of final paint are required for type I or II exposure unless noted in table II.

5.7.3.15 Finish selection. Complete finishes applied to equipment shall be one specified in table I, II, or VIII. Insofar as possible, selection of finishes for any particular application may be made in accordance with table IX.

5.7.4 Colors. Unless otherwise specified all colors shall be in accordance with FED-STD-595.

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5.7.4.1 Color coding. The following color coding of support equipment shall be utilized.

a.	Red	-	Fire protection equipment such as fire extinquishers, barricades, danger and stop signs.
b.	Yellow	-	Physical hazard that might cause tripping stumbling, etc., obstacles, caution signs, etc.
c.	Green	-	Safety and first aid equipment, first-aid boxes (a green cross on white background) stretchers, etc.
d.	Orange	-	High voltage areas, interior of switches and fuse boxes.
e.	Blue	-	Covered electrical outlets, fuse box exteriors or as otherwise specified.
f.	Black, white and gray	-	Paint large stationary machinery a medium dark gray, use black and white for direction signs.
g.	Yellow with black side bands	-	Fuel cell repair equipment.

5.7.4.2 Pipelines and compressed gas cylinders. Pipelines and compressed gas cylinders shall be color coded in accordance with MIL-STD-101 (see table II/FF-904).

5.7.4.3 Authorized colors.

5.7.4.3.1 Exterior surfaces. Unless otherwise specified by the procuring activity, support equipment exterior surfaces shall be finished in the following colors:

Color	FED-STD-595 Color Number	Type of Equipment
Lime Green	13670	Crash rescue and fire-fighting vehicles, including fire marshall vehicles, assigned for fire protection.

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Color	FED-STD-595 Number	Equipment
Yellow	13538	Cargo handling vehicles such as fork lifts, trucks, tugs, tractors, and trailers operated exclusively in warehouse docks.
Aircraft Gray	16473	Hanger equipment
Insignia Red	11136	Safety and protective equipment (attached to aircraft on ground).
Strata Blue	15045	Vehicles (personnel carriers, multistop vans, etc).
Insignia White	17875	Garbage and refuse collection trucks.
Black (Lusterless)	37038	Sunglare protection. When specified, hoods on vehicles to be used in areas where snow or sand terrain is prevalent may be painted with lusterless black.
Green	24052	All mobility coded vehicular equipment. Flight-line equipment.

5.7.4.3.2 Interior surfaces. Unless otherwise specified by the procuring activity, support equipment interior surfaces shall be finished in the following colors:

Color	FED-STD-595 Number	Equipment
Insignia White	17875	a. Ambulance b. Closed type vehicles
		(1) Equipment van and trailer interiors
Gray	36440	(a) Floors
Green	34670	(b) Walls

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Color	FED-STD-595 Number	Equipment
White	37886	(c) Ceilings
		(2) Storage cabinets
Green	24300	(a) Exterior
Gray	26622	(b) Interior
		(3) Equipment racks
Green	24300	(a) Exterior
Gray	26622	(b) Interior
		(4) Consoles
Green	24300	(a) Exterior
Gray	26622	(b) Interior
Gray	36492	(c) Console panels
Black	37038	(d) Panel lettering and marking

5.8 Marking.

5.8.1 Reflectorized adhesive sheeting. Unless otherwise specified, flight line equipment shall be marked with reflectorized adhesive sheeting conforming to L-S-300.

5.6.2 Stenciling. When stenciling is required for marking of equipment, paint conforming to MIL-C-83286 shall be utilized as follows:

a. Lusterless black, color 37038, on yellow, white, all mobility coded vehicular equipment and flight line equipment.

b. Yellow, color 33538, on strata blue or gray.

c. Insignia white, color 37875, on red, dark or olive drab surfaces.

5.9. Other finishes.

5.9.1 Electrical components. Electrical components of equipment not otherwise governed by applicable specifications shall be treated and painted as specified by the contract or purchase order.

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5.9.2 Open hollow members. The interior surfaces of all hollow and tubular steel, aluminum alloy, and magnesium alloy parts or members having open ends shall be coated in accordance with Table II.

5.9.3 Closed hollow members. The interior surfaces of all hollow steel, aluminum alloy, and magnesium alloy parts or members having closed ends shall be protected by the application of a corrosion-preventive compound (see procedure listed for each metal in Table II). However, steel parts or members that are subsequently plated shall not be treated. (See 5.1.2.11)

5.9.4 Wood surfaces to be painted. Wood surfaces to be painted shall be smooth, dry, and thoroughly cleaned of all dirt, grease, and other foreign substances.

5.9.5 Nonmetallic surfaces. All nonmetallic surfaces to be painted shall be smooth, dry, and thoroughly cleaned of all dirt, grease and other foreign substances.

5.9.6 Surfaces not requiring paint. Fabrics, plastics, rubber, working parts of machinery, and other surfaces shall not be painted unless so specified in the equipment specification. Such items shall be masked or protected during treatment and painting to prevent damage.

5.10 Environmental sealing.

5.10.1 General requirements. Environmental sealing is utilized to provide protection from corrosion by excluding moisture and other corrodants from joints. It is important that the areas to be coated with sealant be adequately cleaned before sealant is applied.

5.10.2 Detail requirements. All joints and seams located in exterior or interior corrosive environments, including equipment compartments, storage compartments, engine compartments, mating surfaces joined by spot, projection, tack, or skip welding shall be faying surface sealed with sealant conforming to MIL-S-81733, MIL-C-83982, MIL-S-8802 or MIL-S-83430. The MIL-S-81733 specification covers a sealant which contains a soluble chromate content of 3 to 6 percent for corrosion inhibition. For sealing high temperature areas, MIL-S-38249, firewall sealant, shall be used. The use of sealants not covered by a Military Specification must be approved by the procuring activity. Removable panels and access doors shall be sealed, either by mechanical seals or separable fay surface sealant MIL-S-8784. High adhesion sealant such as MIL-S-8802 may also be used for access door sealing providing a suitable parting agent is used on one surface. Mating surfaces which are joined by mechanical fasteners shall be assembled wet with MIL-S-81733 sealant.

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5.11 Fastener installation.

5.11.1 Detail requirements. All permanently installed fasteners (all fasteners not normally removed for regular access or servicing) used in areas up to 107°C (225°F) shall be wet installed with either a corrosion inhibiting sealant conforming to MIL-S-81733 or an epoxy primer conforming to MIL-P-23377. In high temperature areas, exceeding 107°C (225°F), MIL-P-23377 epoxy primer, or a sealant which is suitable for the thermal environment shall be used.

5.11.2 Removable fasteners. Quick release fasteners and removable fasteners penetrating exterior surfaces shall be designed and installed so as to provide a seal to prevent moisture or fluids from entering. Holes for these fasteners shall be primed with MIL-P-23377 epoxy primer and allowed to dry prior to installing the fastener.

5.11.3 Monel and stainless steel fasteners. Monel fasteners or stainless steel fasteners shall be coated with cadmium or aluminum when used in contact with aluminum components.

6. INSPECTION

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

6.2 General inspection requirements. All equipment being processed shall be inspected at the various stages of cleaning, surface treating, painting, electroplating, and application of other types of finishes, coatings and sealants to ascertain that each process is done in strict accordance with this standard and individual specifications. The inspections and tests covered in this section shall not be considered restrictive. Any condition not in full accord with the applicable drawings and specifications shall be regarded as defective.

6.2.1 Tests. Materials, prior to their use, shall be inspected, sampled and tested in accordance with the applicable specification and standard to determine compliance with the requirements of the particular specification.

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6.3.2 Test specimens. When available, test specimens shall be actual production items, or parts of the items. When approved by the contracting officer, coating systems may be tested on an approved number of test panels of the same metal and coated identically and concurrently with the manufactured parts they represent.

6.3 Condition of surface prior to painting. All surfaces shall be examined just prior to painting to assure that the previously cleaned and pretreated surface is dry and free from soil or contamination of any kind. Poor adhesion of paint shall be construed as evidence of improper cleaning. When poor adhesion is indicated, paint on the entire part shall be removed and the part repainted.

6.4 Continuity and uniformity of coatings. All coatings, inorganic, and organic shall be visually examined for continuity and uniformity.

6.5 Thickness of coatings. All coatings, inorganic and organic, shall be checked for dry film thickness as required by this standard, the applicable specification or drawing. The correct dry film thickness of coatings is very important. Small steel panels prepared with films, too thick, too thin, and correct, may serve as visual color guides for primers and top coats. Film thickness gages shall be used for other coatings.

6.6 Paint application. The temperature and humidity conditions shall be checked during application of paint for conformance to this standard. (See 5.7.2.2)

6.7 Paint adhesion. The painted items, or specimen panels shall be examined for adhesion in accordance with TT-C-490 or the coating specification, after the coated items or specimen panels have dried for a minimum of 24 hours for quick-drying systems, and for a minimum of 72 hours for all other systems.

6.8 Color. The color of painted surfaces shall be checked against the standard color chip representing the specified color in FED-STD-595 or other standard as furnished by the procuring activity. Color comparisons shall be made using the applicable test method of FED-STD-141.

6.9 Hiding power, gloss, and smoothness of paint. The painted surfaces (when dry) shall be checked visually for hiding power, gloss, and smoothness against samples (when available) furnished or approved by the procuring activity.

6.10 Data requirements. When this standard is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL) the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in

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accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n) (2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this standard are as follows:

Paragraph no.	Data requirements	Applicable DID no.	Options
(a) 5.2.1	Finish Process Specification	DI-E-3130	
(b) 5.2.2	Engineering Drawing	DI-E-7031	Level 3

(Copies of DID's required in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

Custodian:
Air Force - 20

Review activities:
Air Force - 79, 99, 14

Preparing activity:
Air Force - 20

(Project No. MFFP-F234)

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TABLE I. Plating finishes (P).

Finish Number	Type Exposure	Plate Description	Minimum Plating Thickness in millimeters		Applicable Specifications
			Intermediate Plates	Final Plates	
		FOR USE ON IRON OR IRON-BASE ALLOYS			
P-100	I	Heavy nickel	0.025 copper	0.025 nickel	QQ-N-290, Class 1, Grade C (heavy bright finish)
P-102	I	Nickel	0.019 copper	0.010 nickel	QQ-N-290, Class 1, Grade F (bright finish)
P-103	I	Dull nickel	0.019 copper	0.010 nickel	QQ-N-290, Class 1, Grade F (matte finish)
P-104	I	Engineering nickel	None	0.076 nickel	QQ-N-290, Class 2
P-106	I	Bright chrome	0.015 nickel over 0.017 copper	0.025 chromium	QQ-N-290, Class 1, Grade E plus QQ-C-320, Type I, Class 1
P-107	I	Satin chrome	0.010 nickel over 0.019 copper	0.025 chromium	QQ-N-290, Class 1, Grade F, QQ-C-320, Type II, Class 1
P-108	I	Engineering chrome	None	0.050 chrome	QQ-C-320, class 2
P-114	I	Chromate treated cadmium (must be painted)	None	0.013 chromium	QQ-P-416, Type II, Class 1
P-115	I	Olive-drab chromate treated cadmium	None	0.013 cadmium	QQ-P-416, type II, Class 1
P-115	I	Chromate treated zinc (must be painted)	None	0.025 zinc	QQ-Z-325, Type II, Class 1
P-117	I	Olive-drab chromate treated zinc	None	0.025 zinc	QQ-Z-325, Type II, Class 1
P-152	II	Nickel	0.019 copper	0.010 nickel	QQ-N-290, Class 1, Grade F (bright finish)

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TABLE I. Plating finishes (P). - Continued

Finish Number	Type Exposure	Plate Description	Minimum Plating Thickness in millimeters		Specifications
			Intermediate Plates	Final Plates	
		FOR USE ON IRON OR IRON-BASE ALLOYS			
P-153	II	Dull nickel	0.019 copper	0.010 nickel	QQ-N-290, Class 1, Grade F (matte finish)
P-155	II	Bright chrome	0.010 nickel over 0.019	0.025 chromium	QQ-N-290, Class 1, Grade F plus QQ-N-302, Type I or II, Class 1
P-161	II	Chromate treated cadmium (must be painted)	None	0.008 cadmium	QQ-P-416, Type II, Class 2
		SMALL FERROUS PARTS - BOLTS, SCREWS, NUTS, WASHERS, ETC., EXCEPT HIGH TENSILE BOLTS			
P-170	II	Cadmium	None	0.008 cadmium	QQ-P-416, Type II, Class 2
P-171	II	Zinc	None	0.005 zinc	QQ-Z-325, Type II, Class 3
		FOR USE ON ALUMINUM ALLOYS			
P-102	I	Nickel	See P-102 for details and Note 1/		
P-103	I	Dull nickel	See P-103 for details and Note 1/		
P-106	I	Bright chrome	See P-106 for details and Note 1/		
P-152	II	Nickel	See P-152 for details and Note 1/		

1/ Prior to plating, all aluminum alloys require treatment to remove oxide films. All surfaces shall be given a suitable treatment to insure good adhesion of plates.

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TABLE II. Paint finishes (F and FF).

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Ferrous alloys other than stainless steel (Tank cleaning and Pretreatment is practical)	F-100	I or II	1. After cleaning, conditioning not required. 2. Pretreat with a phosphate film per TT-C-490 type I. 3. Prime with one coat of MIL-P-23377 0.015mm to 0.023mm (0.6 - 0.9 mil) dry film thickness. 4. Finish - Paint with compatible final film from table V, VI, or VII of this standard.
	F-101	I or II	1. After cleaning, condition by abrasive blasting in accordance with commercial practice per Steel Structure Painting Council Vol. 2, Sec. 2, No. 6 (SSPC-SP6-63) and MIL-STD-1504. 2. Pretreatment not required. 3. Prime with one coat of MIL-P-26915 to 0.076mm to 0.089mm (3.0 to 3.5 mil) dry film thickness. 4. Finish - Paint with compatible finish film from table V, VI or VII of this standard.
	F-102	I or II	1. After cleaning, condition by abrasive blasting in accordance with commercial practice per Steel Structure Painting Council Vol. 2, Sec. 2, No. 6 (SSPC-SP6-63) and MIL-STD-1504. 2. Pretreatment not required. 3. Prime with one coat of MIL-P-38336 or MIL-P-23236 type 1, class 3 to 0.089mm to 0.114mm (3.5 to 4.5 mil) dry film thickness. 4. Chromate conversion coat the applied primer with material conforming to MIL-C-17711. 5. Finish - Paint with compatible finish film from table V, VI or VII of this standard.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
All ferrous alloys (Tank cleaning and pretreatment is not practical)	F-103	I or II	1. After cleaning, condition physically by abrasive blasting or with phosphoric-acid etch per MIL-C-10578. 2. Prime with one coat of MIL-P-23377 to 0.015mm to 0.022mm (0.6 to 0.9 mil) dry film thickness. 3. Finish - Paint with compatible final film from table V, VI, or VII of this standard.
	F-101	I or II	For finish procedure see F-101.
	F-104	I or II	1. After cleaning, condition physically by abrasive blasting in accordance with commercial practice per Steel Structure Painting Council, Vol. 2, Sec. 2, No. 6 (SSPC-SP-6-63) and MIL-STD-1504. 2. Prime with one coat of MIL-P-38336 or MIL-P-23236 type 1, class 3 to 0.089mm to 0.114mm (4.0 to 4.5mil) dry film thickness. 3. Chromate conversion coat the applied primer with material conforming to MIL-C-17711. 4. Finish - Paint with compatible final film from table V, VI, or VII of this standard.
	F-105	I or II	1. After cleaning, condition physically by abrasive blasting in accordance with commercial practice per Steel Structure Painting Council Vol. 2, Sec. 2, No. 10 (SSPC-SP-6-63) and MIL-STD-1504. 2. Pretreatment not required. 3. Prime with one coat of MIL-P-26915 to 0.076mm to 0.089mm (3.0 to 3.5mil) dry film thickness. 4. Finish - Paint with compatible finish film from table V, VI or VII of this standard.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESS
Interior surfaces of open hollow members (Ferrous alloys)	F-106	I or II	1. After cleaning, treat interior surfaces with MIL-C-10578, Type III phosphoric acid etch or TT-C-490 Type I zinc phosphate. 2. Apply MIL-C-11796, Class I corrosion preventive compound to interior surfaces.
Interior surfaces of closed hollow members (Ferrous alloys)	F-107	I or II	1. After cleaning and prior to closure, treat interior surfaces with MIL-C-10578, Type III phosphoric acid etch or TT-C-490, Type I zinc phosphate. 2. After closure, except those hollow members that transport gasses or fluids, apply MIL-C-11796, class I or MIL-C-16173, grade 1 corrosion preventive compound to interior surfaces. Application of the compound to the interior surfaces of vertical and horizontal closed hollow members, except those hollow members which transport gasses or fluids, may be done through permanent drain holes or holes that have been drilled specifically for application of the corrosion preventive compound. The holes shall be spaced to permit complete coverage of the internal surfaces and consequent drainage of the excess coating material. All holes that were drilled expressly for application of the corrosion preventive compound shall be closed with self-tapping steel screws. Solder shall not be used to close these holes. Drain holes in vertical hollow members shall be closed with removable wellnut plugs or other equivalent devices. All drain holes in horizontal hollow members shall be left open.

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TABLE II. Paint finishes (F and FF) - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Exterior surfaces of open and closed hollow members (Ferrous alloys)	F-100	I or II	For finish procedure see F-100
	F-101	I or II	For finish procedure see F-101
	F-102	I or II	For finish procedure see F-102
	F-103	I or II	For finish procedure see F-103
	F-104	I or II	For finish procedure see F-104
	F-105	I or II	For finish procedure see F-105
Ferrous alloy surfaces coated with the following metallic coatings. a. Electroplated zinc b. Hot dip galvanize c. Mechanically deposited zinc d. Electroplated cadmium e. Vacuum deposited cadmium f. Mechanically applied cadmium g. Vacuum deposited aluminum h. Ion vapor deposited aluminum	F-108	I or II	1. After cleaning, conditioning not required. 2. Pretreat with chromate conversion coating conforming to MIL-C-17711 if not previously chromate conversion coated in accordance with the respective coating specification. 3. Prime with one coat of MIL-P-23377 to 0.015mm to 0.022mm (0.6 to 0.9mil) dry film thickness. 4. Finish - Paint with compatible final film from table V, VI or VII of this standard.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Ferrous alloy surfaces coated with electroplated chromium	F-109	I or II	After cleaning, no conditioning, pretreatment, or other coating required.
Interior surfaces of ferrous alloy open hollow members coated with the following metallic coatings. a. Electroplated zinc b. Hot dip galvanize c. Mechanically deposited zinc. d. Electroplated cadmium e. Vacuum deposited cadmium f. Mechanically applied cadmium g. Vacuum deposited aluminum. h. Ion vapor deposited aluminum	F-110	I or II	1. After cleaning, conditioning not requried. 2. Chromate conversion coat the applied metallic coatings with material conforming to MIL-C-17711 if not previously chromate conversion coated in accordance with the respective metallic coating specification. 3. Apply corrosion preventive compound conforming to grade I of MIL-C-16173 to interior surfaces.
Interior surfaces of ferrous alloy closed hollow members coated with the following metallic coatings: a. Electroplated zinc b. Hot dip galvanize	F-111	I or II	1. After cleaning, conditioning not required. 2. Chromate conversion coat the applied metallic coatings with material conforming to MIL-C-17711 if not previously chromate conversion coated in accordance with the respective metallic coatings specification.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Interior surfaces of ferrous alloy (Cont.) c. Mechanically deposited zinc d. Electroplated cadmium e. Vacuum deposited cadmium f. Mechanically applied cadmium g. Vacuum deposited aluminum h. Ion vapor deposited aluminum	F-111	I or II	3. After closure, except those hollow members that transport gasses or fluids, apply MIL-C-11796, class 1 or MIL-C-16173, grade 1 corrosion preventive compound to interior surfaces. Application of the compound to the interior surfaces of vertical and horizontal closed hollow members, except those hollow members which transport gasses or fluids, may be done through permanent drain holes or holes that have been drilled specifically for application of the corrosion preventive compound. The holes shall be spaced to permit complete coverage of the internal surfaces and consequent drainage of the excess coating material. All holes that were drilled expressly for application of the corrosion preventive compound shall be closed with self-tapping steel screws. Solder shall not be used to close these holes. Drain holes in vertical hollow members shall be closed with removable wellnut plugs or other equivalent devices. All drain holes in horizontal hollow members shall be left open.
Exterior surfaces of ferrous alloy open and closed hollow members coated with the following metallic coatings: a. Electroplated zinc b. Hot dip galvanize c. Mechanically deposited zinc	F-112	I or II	For finish procedure see F-108.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Exterior surfaces of ferrous alloy (Cont.) d. Electroplated Cadmium e. Vacuum deposited cadmium f. Mechanically applied cadmium g. Vacuum deposited aluminum h. Ion vapor deposited aluminum	F-112	I or II	For finish procedure see F-108.
Austenitic 300 series corrosion resistant stainless steels	F-200	I and II	1. After cleaning, conditioning not required. 2. Passivate with types I, II, III or IV passivation treatments of QQ-P-35. 3. No finish required.
Martensitic 400 series corrosion resistant stainless steels used in applications where temperatures do not exceed 649°C(1200°F) (such as exhaust systems for gasoline and diesel engines used for support equipment)	F-201	I or II	1. After cleaning, conditioning not required. 2. Passivate with appropriate passivation treatment of QQ-P-35. 3. No finish required.

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TABLE II. Paint finishes (F and FF) - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Martensitic 400 series corrosion resistant stainless steels used in applications where temperatures do not exceed 649°C(1200°F) (Applications other than exhaust systems)	F-202	I or II	1. After cleaning, condition by abrasive blasting in accordance with Steel Structures Painting Council, Vol. 2, Sec. 2, No. 6 (SSPC-SP6-63). 2. Passivate with appropriate passivation treatment of QQ-P-35. 3. Final finish with aluminum coating conforming to either MIL-C-23217, MIL-C-81740, MIL-C-81751 or MIL-C-83488.
Martensitic 400 series corrosion resistant stainless steels used in applications where temperatures do not exceed 371°C (700°F)	F-203	I or II	1. After cleaning, condition by abrasive blasting in accordance with Steel Structures Painting Council, Vol.2, Sec.2, No. 6 (SSPC-SP6-63). 2. Passivate with appropriate passivation treatment of QQ-P-35. 3. Final finish with 0.089mm to 0.114mm (3.5 to 4.5 mil) dry film thickness of inorganic zinc rich primer conforming to MIL-C-38336 or MIL-P-23236 type 1, class 3.
Martensitic 400 series corrosion resistant stainless steels used in applications where temperatures do not exceed 159°C (300°F)	F-204	I or II	1. After cleaning, conditioning not required. 2. Passivate with appropriate passivation treatment of QQ-P-35. 3. Prime with 0.015mm to 0.023mm (0.6 to 0.9mil) dry film thickness of epoxy primer conforming to MIL-P-23377, type I. 4. Finish - Coat with compatible finish material from table V, VI or VII of this standard.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
High strength steels with a hardness level of Rockwell C40 and higher 1230 MPA (180,000 KSI) ultimate tensile strength	F-300	I or II	1. After cleaning, conditioning not required. 2. Cadmium plate in accordance with QQ-P-416, type II, class 2 or cadmium coat in accordance with either MIL-C-8837 or MIL-C-81562. Aluminum coatings in accordance with either MIL-C-23217 or MIL-C-83488 are acceptable substitutes for cadmium. 3. Prime with 0.015mm to 0.023mm (0.6 to 0.9mil) dry film thickness of epoxy primer conforming to MIL-P-23377, type I. 4. Finish - Coat with compatible finish material from table V, VI or VII of this standard.
High strength steels with a hardness level of Rockwell C40 and higher 1230 MPA (180,000 KSI) ultimate tensile strength	FF-301	I or II	1. After cleaning, conditioning not required. 2. Chromium plate in accordance with QQ-C-320 class 2.
Aluminum alloys. (All bare or clad aluminum alloy surfaces used in structural load bearing applications and all 2000 and 7000 series aluminum alloys used for structural load bearing or non load bearing applications)	F-400	I or II	1. After cleaning, conditioning not required. 2. Pretreat with an anodic coating conforming to type II of MIL-A-8625. 3. Prime with 0.015 to 0.023mm (0.6 to 0.9mil) dry film thickness of epoxy primer conforming to MIL-P-23377, type I. 4. Finish - Coat with compatible finish material from table V, VI or VII of this standard.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Aluminum alloys. (All bare or clad 5000 and 6000 series aluminum alloys used for non-structural, nonload bearing applications)	F-401	I or II	1. After cleaning, condition with deoxidizer conforming to MIL-C-38334. 2. Pretreat with chemical conversion coating conforming to class 1a of MIL-C-81706 applied in accordance with MIL-C-5541. 3. Prime with 0.015 to 0.023mm (0.6 to 0.9mil) dry film thickness of epoxy primer conforming to MIL-P-23377, type I. 4. Finish - Coat with compatible finish material from table V, VI, or VII of this standard.
Interior surfaces of open and closed hollow members (All bare and clad 2000, 5000, 6000, and 7000 series aluminum alloys)	F-402	I or II	1. After cleaning, conditioning not required. 2. Hollow members previously pretreated in accordance with finish codes F-400 and F-401 do not require further pretreatment. Other procedures require approval of the procuring activity. 3. After closure, except those hollow members that transport gasses or fluids, apply MIL-C-16173, grade 1 corrosion preventive compound to interior surfaces. Application of the compound to the interior surfaces of vertical and horizontal closed hollow members, except those hollow members which transport gasses or fluids, may be done through permanent drain holes or holes that have been drilled specifically for application of the corrosion preventive compound. The holes shall be spaced to permit complete coverage of the internal surfaces and consequent drainage of the excess coating material. All holes that were drilled expressly for application of the corrosion preventive compound shall be closed with self tapping aluminum screws. Solder shall not be used to close these holes. Drain holes in vertical hollow members shall be closed with removable wellnut plugs or other equivalent devices. All drain holes in horizontal hollow members shall be left open.

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TABLE II. Paint finishes (F and FF) - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Exterior surfaces of open and closed hollow members (All bare and clad 2000, 5000, 6000 and 7000 series aluminum alloys)	F-400	I or II	For finish procedure see F-400
	F-401	I or II	For finish procedure see F-401
Magnesium alloys	F-500	I or II	1. Clean with alkaline cleaner conforming to MIL-C-25769 or in accordance with MIL-M-3171 to remove all soils. 2. Pretreat with dichromate conversion coating conforming to type III of MIL-M-3171. 3. Prime with 0.025 to 0.038mm (1.0 to 1.5mil) dry film thickness of epoxy primer conforming to MIL-P-23377, type I. 4. Finish - Coat with compatible finish material from table V, VI or VII of this standard.
Magnesium alloys	F-501	I or II	1. Clean with alkaline cleaner conforming to MIL-C-25769 or in accordance with MIL-M-45202 to remove all soils. 2. Pretreat with anodic coating conforming to type II, Class A, grade 3 or class D of MIL-M-45202. 3. Prime with 0.025 to 0.038mm (1.0 to 1.5mil) dry film thickness of epoxy primer conforming to MIL-P-23377, type I. 4. Finish - Coat with compatible finish material from table V, VI or VII of this standard.
Interior surfaces of open and closed hollow members (All magnesium alloys)	F-502	I or II	1. After cleaning, conditioning not required. 2. Hollow members previously pretreated in accordance with finish codes F-500 or F-502 do not require further pretreatment. Other procedures require approval of the procuring activity.

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TABLE II. Paint finishes (F and FF). Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Interior surfaces of open and closed hollow members (All magnesium alloys) continued.	F-502	I or II	3. After closure, except those hollow member that transport gasses or fluids, apply MIL-C-11796, grade III or MIL-C-16173, grade 2 corrosion presentive compound to interior surfaces. Application of the compound to the interior surfaces of vertical and horizontal closed hollow members, except those hollow members which transport gasses or fluids, may be done through permanent drain holes or holes that have been drilled specifically for application of the corrosion preventive compound. The holes shall be spaced to permit complete coverage of the internal surfaces and consequent drainage of the excess coating material. All holes that were drilled expressly for application of the corrosion preventive compound shall be closed with self-tapping magnesium screws. Solder shall not be used to close these holes. Drain holes in vertical hollow members shall be closed with removable wellnut plugs or other equivalent devices. All drain holes in horizontal hollow members shall be left open.
Exterior surfaces of open and closed hollow members (All magnesium alloys)	F-500	I or II	For finish procedure see F-500.
	F-501	I or II	For finish procedure see F-501.
Wood surfaces	F-600	I or II	1. Thoroughly sand surfaces in accordance with best commercial practice. 2. After any necessary bonding or masking of areas to be bonded, seal with clear MIL-W-13518 with an extra coat applied to end grains. 3. Finish - Paint with compatible final film from table V, VI or VII of this standard.

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TABLE II. Paint finishes (F and FF). - Continued

FOR USE ON	FINISH CODE NUMBER	TYPE EXPOSURE	FINISH PROCESSES
Wood surfaces	F-601	I or II	1. Condition by thorough sanding in accordance with the best commercial practice. 2. Apply not less than three coats of TT-V-121 varnish.
Engines, automotive, Packette, et cetera	FF-700	I or II	1. Cleaning } 2. Pretreatment } in accordance with best 3. Priming } commercial practice, except all units 4. Finish } exposed to view shall be painted color number 24052 of FED-STD-595
Crankcase sealer (Cast iron housings of clutch, transmission, differential, final drive and brake)	FF-701	II	1. After cleaning, conditioning is not required. 2. Pretreatment is not required. 3. Primer - Paint interior surface, this does not apply to metal-to-metal or metal-to-metal lining surfaces, with one coat of TT-P-636 to 0.025 to 0.038mm (1.0 to 1.5mil) dry film thickness. A commercial crankcase sealer may be used in lieu of the above materials. 4. Finish - Not required.
Generating plant components subject to elevated temperatures of 205°C to 530°C (400°F to 1000°F) (Other than stainless steel exhaust systems)	FF-702	I or II	1. Cleaning procedure will be dependent on steel alloy. 2. Pretreatment will be dependent on steel alloy. 3. Prime with one coat of MIL-P-38336 or MIL-P-23236, type 1, class 3 to 0.089 to 0.114mm (3.5 to 4.5mil) dry film thickness. 4. Topcoat with a high temperature resistant silicone/zinc paint as approved by the procuring activity.
Pipelines and compressed gas cylinders	FF-703	I or II	1. Cleaning, conditioning, pretreatment and painting shall be as approved by the procuring activity. 2. Marking and color coding shall be in accordance with MIL-STD-101.

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TABLE III. Electrical conductivity of passivated finishes.

Material	Type Exposure	Finish Number	Finish Description	Conducting Power Frequency	Conducting RF Frequency	Remarks
Ferrous Alloy	I II	P-115 P-162	Chromate-treated cadmium	No	Yes	Electrical contact may require use of toothed type lockwashers. 1/
Ferrous Alloys	I II	P-117 P-163	Phosphate-treated zinc	No	Yes	Electrical contact may require use of toothed type lockwashers. 1/
Ferrous Alloys	I II	O-101 O-102	Phosphate-treatment	No	No	These finishes are porous, their use in contact with other metals must be restricted to those forming couples compatible with ferrous alloys (except stainless steel).
Aluminum Alloys	II	O-350	Anodized	No	No	May be used in contact with any dissimilar metals.
Aluminum Alloys	II	O-351	Chemical film	No	Yes	Electrical contact may require use of toothed type lockwashers.

1/ Chromate films, depending on thickness, have a relatively low electrical resistance from 0.0001 to 0.002 ohms over a contact area of 1 square inch with contact pressure of 100 PSI.

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TABLE IV. Metallic coatings other than electroplated coatings (M).

Finish Number	Type Exposure	Metallic Coating Description	Minimum Coating Thickness in Millimeters	Applicable Specification
M-100	I or II	Vacuum deposited cadmium	0.008	MIL-C-8837, Type II, Class 2
M-101	I or II	Mechanically deposited cadmium	0.008	MIL-C-81562, Type II, Class 2
M-102	I or II	Vacuum deposited aluminum	0.025	MIL-C-23217, Class 1
M-103	I or II	Ion vapor deposited aluminum	0.025	MIL-C-83488, Type II, Class 1
M-104	I or II	Mechanically deposited zinc	0.025	MIL-C-81562, Type II, Class 1
M-105	I or II	Hot dip zinc-coating (galvanized) (See 5.5.1.4)	0.036 (Total both sides)	ASTM A525, Regular Type, Designation G90
M-106	I or II	Hot-dip zinc-coating (galvanized) (See 5.5.1.4)	0.084	ASTM A123

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TABLE V. Final paint film - gloss.

Film Designation	Color Name	FED-STD-595 Color No.	Applicable Primer	Applicable Paint Specification
AG	Maroon	10049	MIL-P-23236 MIL-P-23377 MIL-P-26915 MIL-P-18336	MIL-C-83286
BG	Insignia Red	11136		
CG	International Orange	12197		
DG	Yellow	13538		
EG	Light Yellow	13655		
FG	Olive Drab	14087		
GG	Light Green	14187		
HG	Insignia Blue	15044		
IG	Sea Blue	15042		
JG	Light Blue	15102		
KG	Engine Gray	16081		
LG	Aircraft Gray	16473		
MG	Aircraft Cream	13594		
NG	Insignia White	17875		
OG	Jet Black	17038		
PG	Gloss Black	17038		
QG	Strata Blue	15045		
RG	Lime Green	13670		

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TABLE VI. Final paint film - semi-gloss.

Film Designation	Color Name	FED-STD-595 Color No.	Applicable Primers	Applicable Paint Specification
AS	Sea Blue	25042	MIL-P-23236 MIL-P-23377 MIL-P-26915 MIL-P-38336	MIL-C-83286
BS	Instrument Black	27038		
CS	Green	24300		
DS	Gray	25622		
ES	Green	24052		

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TABLE VII. Final paint film - Lusterless.

Film Designation	Color Name	FED-STD-595 Color No.	Applicable Primers	Applicable Paint Specification
AL	Dark Earth	30118	MIL-P-23236 MIL-P-23377 MIL-P-26915 MIL-P-38336	MIL-C-83286
BL	Sand	30279		
CL	Dull Red	30109		
DL	Insignia Red	31136		
EL	Yellow	33538		
FL	Middle Stone	30266		
GL	Medium Green	34079		
HL	Olive Drab	34087		
IL	Interior Green	34151		
JL	Sky	34424		
KL	Insignia Blue	35044		
LL	Non-Specular Sea Blue	35042		
ML	Intermediate Blue	35164		
NL	Sea Gray	36118		
OL	Azure Blue	35231		
PL	Dk Gull Gray	36231		
QL	Light Gray	36440		
RL	Lt. Gull Gray	36440		

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TABLE VII. Final paint film - lusterless (continued).

Film Designation	Color Name	FED-STD-595 Color No.	Applicable Primers	Applicable Paint Specification
SL	Insignia White	37875		
UL	Black	37038		
WL	Green	34670		
XL	White	37886		
YL	Gray	36492		

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TABLE VIII. Finishes or process other than painting or plating (D).

For Use On	Type Exposure	Finish Number	Finish Process
Plated ferrous alloys (other than stainless steels) having a Rockwell hardness greater than C-40	I or II	D-100	1. Preclean in accordance with 5.3.1. 2. Clean and condition by abrasive blasting. (See 5.3.2.3) 3. Apply applicable metallic coating in accordance with Table I or Table IV.
Ferrous alloys other than stainless steel (wearing parts lubricated in service)	II	D-101	1. After cleaning, conditioning not required. 2. Pretreat with phosphate film per MIL-P-16232, type M, class 2.
Ferrous alloys other than stainless steel (non-wearing parts not lubricated in service)	II	D-102	1. After cleaning, conditioning not required. 2. Pretreat with phosphate film per MIL-P-16232, type Z, class 2.
Machined or welded stainless steel parts	I or II	D-200	1. After cleaning, conditioning not required. 2. Passivate with applicable passivation treatment in accordance with QQ-P-35. 3. All ferritic and martensitic steels shall be chromate treated after passivation in accordance with QQ-P-35.
Corrosion-resistant steels (dull finish)	II	D-210	1. Cleaning and conditioning (see 5.3.2.4) 2. Pretreatment with black oxide per MIL-C-13924, class 4.
Aluminum alloys. (see 5.4.1)	I or II (see 1/)	D-350	1. Conditioning not required. 2. Pretreat with anodic film per MIL-A-8625, type II.
Aluminum alloys (see 5.4.1)	II	D-351	1. Conditioning not required. 2. Pretreat with chemical film per MIL-C-81706, class 1A.

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TABLE VIII. Finishes or process other than painting or plating (D). - Continued

For Use On	Type Exposure	Finish Number	Finish Process
Aluminum alloys. (See 5.4.1.1)	I or II	D-352	1. Conditioning, not required. 2. Pretreat with chemical film per MIL-C-81706, class 3.
Aluminum alloys	I or II	D-353	1. Conditioning not required. 2. Pretreat with anodic film per MIL-A-8625, type III.

1/ Anodic films are satisfactory for type I or II surfaces only on small unthreaded parts.

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TABLE IX. Finish selections.

Class of Part	Conditions Affecting Finish Selection	Type Exposure	Applicable Finish
FABRICATED FROM FERROUS ALLOYS OTHER THAN STAINLESS STEEL			
Massive structural parts and assemblies, such as the bodies of trucks, trailers, semi-trailers, and vans, special purpose vehicles of all types, large brackets, gussets, and assembly hardware.	Tank cleaning and pretreatment is practical.	I	F-100, F-101, or F-102
Large bolts, nuts, washers, and similar type hardware for assembly of massive structures.	Parts will require painting after assembly.	I	P-114, P-115, P-116, P-117, M-100, M-102 or M-103
Lesser structural parts and assemblies such as racks, cases, castings, housings, panels, brackets, etc.	Tank pretreatment is practical.	I	F-101, F-103, F-102
	Tank pretreatment is not practical.	I	F-101, F-103, F-104 or F-105
Inside of open and closed hollow members.		I	F-106, F-107
Small hardware (except threaded parts) such as hinges, fasteners, catches handles, truck corners, washers, specialty parts, etc. (See 5.1.2.6.)	Parts will be exposed to environment when assembled in equipment.	I	F-100, F-101, F-102, F-103, F-104, F-105, P-114, P-118, P-170, P-171, M-105, or M-106
	Parts will not be exposed to environment when assembled in equipment.	I	F-100, F-101, F-102 F-103, F-104, or any plate of metallic coating for type I exposure per table I or table IV.
	Parts will be painted after assembly.	I	P-114, P-115, P-116, P-117, M-100, M-101, M-102, M-103, M-105 or M-106
	Parts will be exposed to the environment when assembled and cannot be painted.	I	P-102 or P-107

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TABLE VIII. Finishes or process other than painting or plating (D). - Continued

For Use On	Type Exposure	Finish Number	Finish Process
Aluminum alloys. (See 5.4.1.1)	I or II	D-352	1. Conditioning, not required. 2. Pretreat with chemical film per MIL-C-81706, class 3.
Aluminum alloys	I or II	D-353	1. Conditioning not required. 2. Pretreat with anodic film per MIL-A-8625, type III.

1/ Anodic films are satisfactory for type I or II surfaces only on small unthreaded parts.

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TABLE IX. Finish selections.

Class of Part	Conditions Affecting Finish Selection	Type Exposure	Applicable Finish
FABRICATED FROM FERROUS ALLOYS OTHER THAN STAINLESS STEEL			
Massive structural parts and assemblies, such as the bodies of trucks, trailers, semi-trailers, and vans, special purpose vehicles of all types, large brackets, gussets, and assembly hardware.	Tank cleaning and pretreatment is practical.	I	F-100, F-101, or F-102
Large bolts, nuts, washers, and similar type hardware for assembly of massive structures.	Parts will require painting after assembly.	I	P-114, P-115, P-116, P-117, M-100, M-102 or M-103
Lesser structural parts and assemblies such as racks, cases, castings, housings, panels, brackets, etc.	Tank pretreatment is practical.	I	F-101, F-103, F-102
	Tank pretreatment is not practical.	I	F-101, F-103, F-104 or F-105
Inside of open and closed hollow members.		I	F-106, F-107
Small hardware (except threaded parts) such as hinges, fasteners, catches handles, truck corners, washers, specialty parts, etc. (See 5.1.2.6.)	Parts will be exposed to environment when assembled in equipment.	I	F-100, F-101, F-102, F-103, F-104, F-105, P-114, P-118, P-170, P-171, M-105, or M-106
	Parts will not be exposed to environment when assembled in equipment.	I	F-100, F-101, F-102 F-103, F-104, or any plate of metallic coating for type I exposure per table I or table IV.
	Parts will be painted after assembly.	I	P-114, P-115, P-116, P-117, M-100, M-101, M-102, M-103, M-105 or M-106
	Parts will be exposed to the environment when assembled and cannot be painted.	I	P-102 or P-107

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TABLE IX. Finish selections (cont.).

Class of Part	Conditions Affecting Finish Selection	Type Exposure	Applicable Finish
Small hardware (continued)	Parts were plated by manufacturer with any plate, except cadmium or zinc, and requires painting after assembly.	I	F-108
	Parts were plated by manufacturer with cadmium or zinc and requires painting after assembly.	I	F-108
Screws, bolts, nuts and threaded parts	Parts will not be exposed to environment after assembly in equipment.	I or II	P-170, P-171, M-100 M-102, or M-103
	Parts will be painted after assembly.	I or II	P-162, P-170, M-100, M-102, or M-103
	After assembly in equipment (except parts which cannot be painted.)	I or II	F-100, F-101, F-102, or F-108.
Any type of part (except threaded parts)	Parts will be subjected to temperatures in excess of 450°F.	I or II	Any plate or metallic coating for type I exposure from table I or IV except cadmium or zinc.
	Parts will not be subjected to temperatures in excess of 450°F.	II	Any plate or metallic coating for type II exposure from table I or IV.
	Parts will be in contact with uncured phenolics or subjected to phenolic vapors	II	Any plate or metallic coating for type II exposure from table I or IV except cadmium or zinc.
Wearing parts lubricated in service	Parts will be periodically lubricated.	II	D-101
	Parts will be splash or force-feed lubricated in operation.	II	D-101

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TABLE IX. Finish selections (continued).

Class of Part	Conditions Affecting Finish Selection	Type Exposure	Applicable Finish
Sliding wearing surfaces such as guide rails, et cetera, requiring electrical conductivity	Parts cannot be lubricated and will not be subjected to high bearing pressures	II	P-104 or P-108
Gears, cams, slides, et cetera.	Parts cannot be lubricated and will be subjected to high bearing pressure	II	P-108
Any type of part	An electrical conductive dissimilar metal contact is required	II	Any plate for type II exposure per table I & MIL-STD-889.
Hardened steel parts such as coil springs, washers, etc., subject to hydrogen embrittlement.	Plating is required for protection due to equipment design	I	Any plate or metallic coating for type I exposure from table I or IV except zinc plus D-100
		II	Any plate or metallic coating for type II exposure from table I or IV except zinc plus D-100.
FABRICATED FROM STAINLESS STEEL ALLOYS			
Large parts	Parts will be exposed to environment in assembled equipment	I	F-200, F-201, F-202, F-203, F-204
	Parts will not be exposed to environment in assembled equipment	I	No finish required.
Small parts	Parts will be exposed to environment in assembled equipment	I	F-200, F-201, F-202, F-203, F-204.
	Parts will not be exposed to environment in assembled equipment	I	No finish required
Welded or machined parts made of stainless steel			D-200
Any type parts including interior surfaces of hollow members		II	No finish required
Exhaust systems		[illegible]	No finish required

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TABLE IX. Finish selections (continued).

Class of Part	Conditions Affecting Finish Selection	Type Exposure	Applicable Finish
FABRICATED FROM ALUMINUM-BASE ALLOYS			
Massive structural parts and assemblies brackets, gussets, and hardware assemblies	Tank pretreatment is practical	I	F-400, F-401, D-350, or D-353.
	Tank pretreatment is not practical	I	F-400, F-401, D-350, or D-353
Any type parts	Parts will be subjected to high degree of abrasion when functioning	I or II	D-353
Lesser structural parts and assemblies such as racks, cases castings, housings, panels, brackets, etc.	Tank pretreatment is practical	I	F-400, F-401, F-402, D-350, D-353
	Tank pretreatment is not practical	I	F-401
Small hardware such as hinges, fasteners catches, handles, screws, nuts, bolts, washers, etc.	Parts will be exposed to the environment when assembled in the equipment	I	F-400, F-401 or F-402.
	Parts will be exposed to the environment when assembled in equipment and cannot be painted	I	D-350, D-351, D-353
	Parts will not be exposed to the environment when assembled in the equipment	I	Any plate for type II exposure per table I or D-350.
Internal structural parts such as chassis for electrical equipment, brackets, inside of panels, clamps, clips, hinges, etc.	None	II	D-350, D-351, D-353
	A non-conducting surface is required	II	D-350, F-306, or D-353.
	Plating is required for contact with dissimilar metals	II	Any plates for type I exposure per table I and MIL-STD-889.

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TABLE IX. Finish selections (continued).

Class of Part	Conditions Affecting Finish Selection	Type Exposure	Applicable Finish
Parts made from 5000 and 6000 alloys	A power electrical conducting surface is required	II	D-352
Open hollow members (Interior surfaces)		I or II	F-402
Closed hollow members (Interior surfaces)		I or II	F-402
PARTS FABRICATED FROM MAGNESIUM-BASE ALLOYS			
All parts		I II	F-500 F-501
Open hollow members (Interior surfaces)		I or II	F-502
Closed hollow members (Interior surfaces)		I or II	F-502
	FABRICATED FROM WOOD		
All wood surfaces unless otherwise specified		I or II	F-600 or F-601
Varnished surfaces		I or II	F-601
	OTHER APPLICATIONS		
Engines, automotive, packette, etc.		I or II	FF-700
Crankcase sealer-cast iron housings of clutch, transmissions differentials, final drives, and brakes		II	FF-701

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TABLE IX. Finish selections (continued).

Class of Part	Conditions Affecting Finish Selection	Type Exposure	Applicable Finish
	OTHER APPLICATIONS		
Generating plant components subject to high temperatures (400°F to 1,000°F)		I	FF-702
Pipelines and compressed gas cylinders		I or II	FF-703

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