

MIL-STD-186D
NOTICE 4
19 April 1986

MILITARY STANDARD

PROTECTIVE FINISHING FOR ARMY MISSILE WEAPON SYSTEMS

TO ALL HOLDERS OF MIL-STD-186D:

1. The following pages of MIL-STD-186D have been revised and supersede the pages listed:

New Page	Date	Superseded Page	Date
1	19 April 1986	1	3 December 1976
2	20 June 1980	2	REPRINTED WITHOUT CHANGE
7	19 April 1986	7	25 June 1982
8	25 June 1982	8	REPRINTED WITHOUT CHANGE
9	19 April 1986	9	25 June 1982
9a	19 April 1986	9a	25 June 1982
12a	19 April 1986	12a	20 June 1980
12b	20 June 1980	12b	REPRINTED WITHOUT CHANGE
12c	19 April 1986	12c	20 June 1980
12d	19 April 1986	12d	20 June 1980
19	19 April 1986	19	25 June 1982
19a	3 December 1976	19a	REPRINTED WITHOUT CHANGE
23	19 April 1986	23	10 November 1975
24	20 June 1980	24	REPRINTED WITHOUT CHANGE
27	19 April 1986	27	25 June 1982
27a	19 April 1986	27a	25 June 1982
31	19 April 1986	31	25 June 1982
32	25 June 1982	32	REPRINTED WITHOUT CHANGE
33	19 April 1986	33	25 June 1982
34	19 April 1986	34	25 June 1982
43	25 June 1982	43	REPRINTED WITHOUT CHANGE
44	19 April 1986	44	25 June 1982

2. Retain this Notice and insert before table of contents.

AMSC: N/A

FSC MFFP

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3. Holders of MIL-STD-186D will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or cancelled.

Custodian:
Army - MI

Preparing activity:
Army - MI

Review Activities:
Army - ME, MR

(Project MFFP-A337)

MIL-STD-186D(MI)
NOTICE 4

MILITARY STANDARD

PROTECTIVE FINISHING FOR ARMY MISSILE WEAPON SYSTEMS

1. SCOPE

1.1 Scope. This standard establishes the minimum requirements for procedures, materials, and systems for cleaning, plating, painting and finishing metals, wood, electronic materials, parts and assemblies for rockets, guided missiles and components to protect them from deterioration.

1.2 Selection of finishing system. Unless otherwise specified, the responsibility for selecting the cleaning method, surface treatment, metal coating, part system or other finish shall rest with the activity responsible for the end item. The materials treatment and finishes shall be selected from those listed herein and shall be referenced on drawings, in contracts, and item specifications by the appropriate finish numbers of MIL-STD-186. This does not preclude the acceptance of a proven commercial finish selected by the manufacturer, supplier or contractor and which is concurred in by the procuring activity. Numerous finish codes are contained in tables that are not referenced in the requirement sections, i.e., sealants, conformal coatings, lubricants, adhesives, that are satisfactory for use. Where the finish or corrosion protection processes are not adequately defined, the problem shall be brought to the attention of the procuring activity.

CODE NUMBER SYSTEM

Cleaning Methods	100 Numbers
Surface Treatment	200 Numbers
Metallic Coatings	300 Numbers
Organic Coatings	400 Numbers
Sealing and Bonding	500 Numbers
Encapsulants & Potting	600 Numbers
Lubrication & Preservation	700 Numbers
Miscellaneous	800 Numbers

1.2.1 Cross reference. A cross reference table IX is provided to relate the present code numbers with the paint finish numbers contained in the superseded "B" issue of this standard.

2. REFERENCED DOCUMENTS

2.1 Government documents.

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

Supersedes page 1 of Notice 1, dated 3 Dec 76

MIL-STD-186D(MI)**SPECIFICATIONS****FEDERAL**

0-C-1889	Cleaning Compound, Solvent
0-T-236	Tetrachlorethylene (Perchloroethylene) Technical Grade
P-C-436	Cleaning Compound, Alkali, Boiling Vat (Soak) or Hydrosteam
QQ-C-320	Chromium Plating (Electrodeposited)
QQ-N-290	Nickel Plating (Electrodeposited)
QQ-P-416	Plating, Cadmium (Electrodeposited)
TT-C-490	Cleaning and Pretreatment of Ferrous Surfaces for Organic Coatings
TT-E-527	Enamel, Alkyd, Lustreless
TT-E-529	Enamel, Alkyd, Semigloss
TT-E-776	Ethylene Glycol Monobutyl Ether (for use in organic coatings)
TT-I-1795	Ink, Marking, Stencil, Opaque (Porous and Nonporous Surfaces)
TT-I-735	Isopropyl Alcohol
TT-L-54	Lacquer, Spraying, Acid Resistant (For Aluminum Surfaces Around Storage Batteries)
TT-P-1757	Primer Coating, Zinc Chromate, Low Moisture Sensitivity
TT-T-266	Thinner, Dope and Lacquer (Cellulose Nitrate)
TT-W-571	Wood Preservation, Treating Practices
TT-W-572	Wood Preservative, Water-Repellant
VV-L-800	Lubricating Oil, General Purpose, Preservative (Water Displacing Low Temperature)

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MIL-L-46010	Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting
MIL-I-46058	Insulating Compound, Electrical (for Coating Printed Circuit Assemblies)
MIL-R-46085	Rhodium Plating, Electrodeposited
MIL-A-46146	Adhesive-Sealant, Silicon RTV, Non-Corrosive (for Use with Sensitive Metals and Equipment)
MIL-C-46168	Coating, Aliphatic Polyurethane, Chemical Agent Resistant
MIL-P-46843	Printed Circuit Assemblies, Design and Production of
MIL-S-46844	Solder Bath Soldering of Printed Wiring, Assembly, Automatic Machine Type
MIL-L-46147	Lubricant, Solid-Film, Air-Cured (Corrosion Inhibiting)
MIL-P-46847	Plastic Material, foamed Polyurethane for Encapsulating Electronic Components
MIL-P-46856	Primer, Coating Epoxy, Process for Application
MIL-C-47267	Cleaning and Surface Preparation, Vapor Blast
MIL-P-47298	Polyurethane Molding Compound Chemically Cured, (Polyether Based)
MIL-D-50000	Diocetyl-P-Phenyleamine (antiozonant)
MIL-L-52043	Lacquer, Semigloss
MIL-P-52192	Primer, Epoxy

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MIL-N-55392	Nickel-Carbon, Porous, Electrodeposited, for Camouflage
MIL-A-81236	Adhesive, Epoxy Resin with Polyamide Curing Agent
MIL-C-81302	Cleaning Compound, Solvent, Trichloro- trifluoroethane
MIL-C-81309	Compound, Corrosion Preventive, Water Displacing, Ultra-Thin Compound
MIL-T-81533	Trichlorethane, 1,1,1 (Methyl Chloroform) Inhibited, Vapor Degreasing
MIL-C-81562	Coating, Cadmium and Zinc (Mechanically Deposited)
MIL-P-81728	Plating, Tin Lead (Electrodeposited)
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-C-81797	Coating, Inorganically Bonded Aluminum (Electrophoretically Deposited)
MIL-A-81801	Anodic Coatings for Zinc and Zinc Alloys
MIL-R-81841	Rotary Flap Peening of Metal Parts
MIL-C-83286	Coating, Urethane, Aliphatic ISOCYANATE, for Aerospace Applications

STANDARDS**FEDERAL**

Fed Std No. 595 Colors

**Fed. Test Method Std. No. 141 Paint, Varnish, Lacquer, and
related Materials; Methods of Inspection, Sampling and Testing**

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MIL-STD-186D(MI)**MILITARY**

MIL-STD-276	Impregnation of Porous nonferrous Metal Castings
MIL-STD-865	Brush Plating, Electrodeposition
MIL-STD-870	Cadmium Plating, Low Embrittlement (Electrodeposition)
MIL-STD-1250	Corrosion Prevention and Deterioration Control in Electronic Components and Assemblies
MIL-STD-1501	Chromium Plating, Low Embrittlement (Electrodeposition)

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

PUBLICATIONS**ARMY**

MIS 13918	Preparation of Surfaces for adhesive Bonding, Process for
MIS 28744	Chromate Conversion Coating on Copper, Brass or Bronze (Applications for copies of MIS13918 and MIS28744 should be addressed to: Commander, U.S. Army Missile Command, ATTN: AMSMI-WDR, Redstone Arsenal, AL 35898-5000).
RIA-PD-636	Coating, Protective, Thermally Fused, Epoxy Plastic (for Metal Surfaces) (Applications for copies of RIA-PD-636 should be addressed to Commander, U.S. Army Armament Munitions and Chemical Command, ATTN: AMSMC-LEE-S(R), Rock Island, IL 61299).

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

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2.2 Other publications. The following document(s) form a part of this standard to the extent specified herein. Unless otherwise specified, the issue of the documents which are DOD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. The issues of documents which have not been adopted shall be those in effect on the date of the cited DoDISS.

ASTM B 253	Preparation of and Electroplating Aluminum Alloys
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(Application for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

NFPA No. 30	Storing
NFPA No. 33	Spray Finishing
NFPA No. 34	Dip Tank

(Application for copies should be addressed to the National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.)

2.3 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 Definitions. For the purposes of this standard, the following definitions apply.

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- (e) Cadmium plating (see paragraph 4.16).
- (f) Unsealed joints, except ground or lapped joints affecting accuracy of alignment.
- (g) Leather as a seal or packing material, except in contact with chromium.
- (h) Undrained hardware that is prone to any moisture collection or retention, except gear boxes, etc., containing grease or oil.
- (i) Vinyl wire insulation, shielding, and sleeving (see paragraph 4.20).
- (j) Cut, unpainted, or unplated edges on metallic materials.
- (k) Acid-core solder or corrosive flux.
- (l) Stainless steel wool in cleaning aluminum that will not be anodized.
- (m) Snap rings or lock washers, except in main power train or running gear.
- (n) Magnesium alloy, except as specified in 4.12.
- (o) Dry-film lubricants containing graphite.
- (p) 2024-T3 or T4 aluminum alloy; use 5000 or 6000 series aluminum alloys rather than 2000 or 7000 series. Use of 2000 or 7000 series aluminum alloys with proper tempers in accordance with MIL-STD-1587 and MIL-H-6088 is acceptable.

4.12 Magnesium alloys. Whenever the contractor determines that magnesium alloys are to be used in a component, subassembly, or assembly, the contractor will, in each instance, furnish sufficient justification for the use of these alloys and obtain user approval prior to design incorporation. When magnesium alloys are used, the contractor shall specify a protective system that will insure long duration deterioration prevention, and so design the structures that extensive disassembly will not be required, during the life of the equipment, whenever corrosion inspections are performed.

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4.13 Tubing.

4.13.1 Plumbing lines. No paint coating shall be applied to the interior surfaces of plumbing lines.

4.13.2 Copper, corrosion-resisting, and heat-resisting alloy tubing. Interior and exterior surfaces of copper, corrosion-resisting, and heat-resisting alloy tubing need not be painted, except as required for dissimilar metal contact.

4.13.3 Steel, aluminum, and magnesium alloy tubing (small). Interior surfaces of sealed steel, aluminum, and magnesium alloy tubing used in structural applications shall be corrosion protected in accordance with the general schedule, insofar as practicable. Assemblies completely closed shall be treated after assembly with a volatile crystalline corrosion inhibitor, code 711, or by a corrosion preventive compound, code 702, with preference given to the VCI (code 711) material. The corrosion-inhibiting material shall be applied through appropriately drilled holes. When using the code 702 treatment, the member(s) shall be thoroughly drained after treatment and wiped free of corrosion preventive compound on all exterior surfaces. Access holes drilled in the member(s) shall be closed with cadmium plated self-tapping screws, code 304, installed with wet zinc chromate primer, code 504. The interior surfaces of open tubes shall be given the treatment specified for exteriors wherever practicable.

4.13.4 Steel, aluminum, and magnesium alloy tubing (large). Interior surfaces of sealed steel, aluminum, and magnesium alloy tubing which, due to size, weight, or geometry, are impractical to protect with corrosion preventive compound code 702, shall be protected by an application of volatile crystalline corrosion inhibitor. The crystalline inhibitor VCI material shall be applied at a rate of 2 grams per cubic foot of volume to be protected, code 711. The VCI material shall be applied to the enclosure through access holes in a manner that shall insure uniform distribution over the area to be protected. (A tube with an inside diameter of 5 inches and a length of 7.5 feet has a volume of approximately 1 cubic foot.) Access holes shall be sealed as specified in 4.13.3. Interior surfaces of large open tubes shall be given the treatment specified for exteriors wherever practicable. Interior surfaces of large open steel tubes may be protected by application of wash primer code 401 and paint per code 402.

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4.14 Rivets and threaded fasteners. Rivets and threaded fasteners in general shall be assembled with zinc chromate primer, code 504. If the fasteners are dissimilar to and can result in a direct contact with magnesium, a washer of 5056 aluminum alloy, with a minimum over lap of 1/8-inch, shall be used in addition to assembling with wet zinc chromate primer, code 504.

4.15 Star washers. Star washers may be used for electrical contacts provided they are protected after assembly, code 497.

4.16 Cadmium plating. Cadmium plating must be avoided when an alternative process can be used. Cadmium plating shall be restricted to essential applications only. Use zinc plating, tin plating, or aluminum coating instead.

4.17 Cables, chains, close-wound springs. Control cables, chains, and close-wound springs shall be protected by coating with a corrosion preventive compound, code 701. Springs made of music wire or steel heat treated to 200,000 pounds per square inch (psi) (or higher ultimate tensile strength) shall not be plated, but shall be treated in accordance with code 701.

4.18 Plastics. In the selection of nonmetallic materials, every effort shall be made to select fungus-inert materials. Materials considered fungi-inert shall be those listed in MIL-STD-1250 or MIL-STD-454. In the event that fungus-inert materials are not available, the materials selected shall be treated with moisture-and fungus-resistant varnish, code 497.

4.19 Elastomers. Elastomers, such as natural rubber, that are subject to ozone attack shall be treated with an anti-ozonant in accordance with code 712, but shall not be painted.

4.20 Wire covering. Vinyl wire insulation, shielding, and sleeving shall not be used. Tetrafluorethylene, chloro-sulfonated polyethylene, and other materials compatible with their environment shall be used.

4.21 Lubrication. Dry-film lubricants containing graphite shall not be used. For an acceptable dry-film lubricant, see codes 708 and 709. Oils and greases used in conjunction with dry-film lubricants negate the effect of dry-film lubricant.

4.22 Identification marking. Epoxy type printing inks shall be used for identification purposes, code 806. Aniline base inks contain corrosive acids shall not be used. See code 805 for an alternate printing ink and marking method.

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4.23 Drainage. Attention shall be directed towards the elimination of crevices, pockets, hollows, walls, etc., that permit water to collect. Provisions such as drain holes shall be provided to allow suitable drainage of the design. Where possible, finishing of parts shall be done prior to fabrication. Where this is not possible, the finishing and fabrication of items shall be handled in such a way that processing solutions shall not become trapped within any of the assemblies such as lock seams, lap joints, spot welds, rivets, bolts, or other places where processing solutions will remain on the parts.

4.24 Standard Parts - Government Standard Parts (bolts, nuts, screws, washers, et cetera). Standard parts (MS, AN, NAS, DS, etc.) that are procured with the protective finish already applied as specified by the procurement document relating to the manufacture of the part, shall be inspected prior to assembly to determine if the part conforms to the finish requirement of the procurement document. In the event that the part does not meet the finish requirement of the procurement document, it shall be refinished and reinspected. Lots of Government Standard Parts shall be subjected to sampling in accordance with a plan acceptable to the Government Inspection Agency, but conforming to MIL-STD-105, and samples shall be subjected to salt spray test of FED-STD-151, Method 811.1.

5. DETAIL REQUIREMENTS

5.1 Cleaning requirements.

5.1.1 General.

5.1.1.1 Corrosion and heat resisting metals. Corrosion and heat resisting metals and alloys shall be cleaned by suitable chemical or mechanical processes, or combinations thereof; except materials that are sensitive to deleterious constituents such as hydrogen, oxygen, nitrogen, and chemical reactions such as hydrogen embrittlement, oxidation, or hardening. These materials shall be cleaned by mechanical processes only.

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and on moving parts that cannot tolerate the dimensional build-up of more corrosion-resistant finishes. When black oxide is applied to exterior surfaces, it shall be overcoated with clear lacquer or varnish, with paint or dry-film lubricant. When used on interior surfaces it shall be treated at least with a supplementary oil or wax coating.

5.4.3 Hard anodic coatings for aluminum and its alloys. Where hard anodic coatings are specified, they shall conform to type III of MIL-A-8625.

5.4.4 Metallo-ceramic and ceramic coatings. Metallo-ceramic and ceramic coatings shall not be used prior to approval by the procuring activity. Necessary process and quality control requirements shall be established, and technical data developed which shall be submitted to the procuring activity substantiating that the proposed coatings are entirely satisfactory for the intended use.

5.5 Organic coatings. Codes for organic coatings are enumerated in table IV.

5.5.1 General priming and painting of surfaces. Interior and exterior surfaces of the weapon system shall be painted with the materials specified herein. The painting sequence for all metals shall be preparatory treatment (i.e., anodized, chemical conversion coating, plating, or wash primer), primer, and top coats. These requirements may have been specified previously in the surface treatment paragraphs on the metal surfaces. The use of wash primer on high hardness Rc 40 steels is prohibited. High hardness Rockwell C 40 steels should be cleaned, primed, and top coated. Exterior surfaces of tactical equipment shall have a camouflage finish that meets the color, gloss, chemical agent resistance, and spectral reflectance characteristics of MIL-C-46168. Code 448 provides a callout for the green 383 color with these properties. The green 383 color can be molded-in, provided the surfaces meet the color, gloss, chemical agent resistance, and spectral reflectance requirements of MIL-C-46168.

Supersedes page 19 of Notice 3, dated 25 Jun 82

MIL-STD-186D(MI)**5.5.2 Equipment and facilities.**

5.5.2.1 General. The equipment and facilities used in applying surface finishes shall be suitable and adequate for the purpose and shall be subject to approval of the procuring activity. All safety precautions contained in Standard NFPA Nos. 30, 33, and 34 shall be observed. Painting shall be conducted in properly ventilated spray rooms or areas. Paint spray rooms shall be ventilated by means of a forced draft, effecting at least three complete changes of air every hour. Doors and windows shall be kept closed to exclude dirt and dust. The air shall be introduced into the room in such manner as not to cause turbulence or excessive air currents which would have the effect of causing orange peel in the paint film. Sufficient ventilation shall, however, be maintained to keep dried overspray from settling on surfaces which have already been painted and are still tacky. Where practicable, water-washed exhaust systems or grilled flooring over flowing water should be used. Humidity and temperature indicators shall be installed in a proper operation. Controls shall be employed for humidity and temperature or for temperature alone if a satisfactory ratio of temperature and humidity can be maintained, as defined herein. To insure that dirt and dust are kept to a minimum, all air entering spray booths or rooms shall be filtered; spray areas are to be kept clean; lint-bearing rags shall not be allowed in such areas; a positive air pressure shall be maintained in the spray booth or room. Lighting conditions shall be in accordance with the 1968 Illuminating Engineering Society Handbook. Lights in the floor, as well as coatings of high light reflectance, shall be used where required to increase lighting efficiency. The paint spray room floors shall be cleaned as frequently as required to insure good housekeeping.

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5.5.4.3 Air and weather conditions. Coatings shall not be applied under unfavorable atmospheric conditions, such as high humidity strong drafts, or low temperatures. In the event the following conditions cannot be met, painting operations shall be suspended until acceptable conditions are re-established. Data for thinning materials for spray application at other than standard room temperature and humidity conditions shall be as specified in the applicable process specifications, or shall be determined experimentally by the applicator. The application of lacquers under other than normal conditions shall be performed in accordance with MIL-F-18264.

5.5.4.3.1 Enamel. For enamel topcoats, polyuethane paint, epoxy primer, wash primer, and epoxy topcoats, air temperatures shall not be less than 15.5 degrees C (60 degrees F) nor greater than 37.7 degrees C (100 degrees F) and the relative humidity shall not be greater than 90 percent.

5.5.4.3.2 Lacquer. Air temperatures shall not be less than 15.5 degrees C (60 degrees F) nor greater than 32.2 degrees C (90 degrees F) and the relative humidity shall not be greater than 85 percent except in the case where lacquer is used with blush-retardant thinner, then 90 percent is permissible, per paragraph 5.5.4.3.

5.5.4.4 Time of application of paint-type materials.

5.5.4.4.1 First coat. Surfaces shall receive a coat of wash primer, or where other preparatory treatment has been provided previously, the first primer coat shall be applied within a 2-hour maximum period after final cleaning.

5.5.4.4.2 System. Surface coatings shall be applied as follows: Preparatory coating plus primer plus first enamel or lacquer coat shall be applied on the exterior surfaces within 24 hours. Where production operations are suspended for short periods; e.g., over week-ends, holiday, etc., this time may be extended as necessary, but not to exceed 72 hours, provided the adhesion is unaffected thereby, as determined by the wet tape scratch adhesion inspection test described in 6.3.4. OUTDOOR STORAGE OF PRIMED PARTS BEFORE SUBSEQUENT FINISHING OPERATIONS IS PROHIBITED.

5.5.4.4.3 Dry time (wash primer). The wash primer coat shall be allowed to dry a minimum of 60 minutes (although it may dry to handle within a few minutes), but not more than 4 hours prior to application of the paint system. The primer may impair the adhesion of the paint system if prematurely applied. The wash primer shall be capable of resisting removal with the fingernail prior to application of the top coats.

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5.5.4.4.4 Drying time (primer). When specification TT-P-1757 zinc chromate primer; MIL-P-52192 epoxy primer, or MIL-P-23377 epoxy polyamide primer is used, the minimum and maximum drying times shall be those prescribed by the specifications MIL-P-6808, MIL-P-46856, or MIL-C-22751 respectively. The minimum drying time for lacquer-type primer, under ideal atmospheric conditions shall be at least one hour. Under other conditions, the drying time of the lacquer-type primer shall be extended as necessary to avoid lifting, embrittlement, and adhesion difficulties induced by the high solvency thinners in the topcoats. The precautions outlined in specification MIL-P-6808 to avoid degradation of the primer prior to topcoating, as a result of outdoor exposure, especially in sunlight, shall be scrupulously observed.

5.5.4.4.5 Lacquer topcoating. Lacquer topcoating shall be accomplished in accordance with the requirements of MIL-P-18264.

5.5.4.5 Spraying over bar metal. Wash primer shall be applied in accordance with MIL-C-8507. Zinc chromate primer shall be applied over the wash primer in accordance with MIL-P-6808. Epoxy primer shall be applied in accordance with MIL-P-46856. Epoxy-polyamide primer shall be applied in accordance with MIL-C-22751.

5.5.4.6 Thickness of finish (dry thickness). The film thickness of each single dried coat of paint-type material shall be controlled within the following limits: 0.0003 to 0.0007 inch for wash primer, 0.0003 to 0.0006 inch for one coat of zinc chromate primer, 0.0008 to 0.0012 inch for one coat of epoxy primer MIL-P-52192, 0.0006 to 0.0009 inch for one coat of epoxy primer MIL-P-23377, 0.0005 to 0.0008 inch for one coat of lacquer topcoat, and 0.0008 to 0.0012 inch for one coat of enamel topcoat, epoxy topcoat, and polyurethane topcoat, or as specified in the applicable finishing specification. The thickness of two coats of zinc chromate primer shall not exceed 0.0007 inch on surfaces which are to be topcoated. Because of the greatly reduced corrosion-inhibiting effectiveness and coverage in dried film thickness of less than 0.0003 inch, solitary zinc chromate primer films below this thickness should be avoided. The general finish shall be maintained below the maximum thickness specified to avoid cracking, flaking, and checking of the paint finish. Where sanding surfaces is used, which is permitted only on limited areas and subject to the restrictions contained in 5.5.4.11, the thickness of the finish may be increased in these areas by 0.0006 inch. Where insignia and markings are added by painting, the total thickness of finish on these areas may be increased by approximately 0.001 inch. Where decalcomanias are used, the additional thickness is controlled by the decalcomania specification.

5.5.4.7 Application of enamel. A thin coat or "tack" of enamel shall be applied with a light pass of the gun and, while it is still tacky followed with one full wet coat. No mist coat shall be used after application of the wet enamel coat.

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streaks, blisters, seeds, excessive silking, or other irregularities or surface. Dry scuff sanding by hand, using No. 400 or No. 320 sandpaper should be employed, as necessary, to remove specks of roughness that might carry through to the topcoats, but extreme care should be exercised to avoid removing the primer down to the pretreatment coating. Great caution is necessary to avoid gouging the surface of rivets and other protuberances and edges of faying surfaces with the sandpaper, and thus remove the primer to bare metal, which results in subsequent susceptibility to corrosion. Should this be, normal touch-up with primer should be accomplished. Areas where primer presents a distinctly rough appearance not removable by sanding should be stripped and new primer applied to the area involved. If bubbling of the wash primer and subsequent coatings are encountered on magnesium, it may be taken as evidence of inadequate surface treatment of the magnesium. Such bubbled coatings should be removed immediately and the surface given a manually applied chemical surface treatment, followed by wash primer.

5.5.4.14.5 Final dry of the finish. The parts, after painting, shall be permitted to dry in a dust-free atmosphere for a sufficient time prior to moving to insure that the paint is adequately dry and to avoid damage of the finish. Painted parts shall also be protected from condensing moisture and rain during the first 24 hours after painting. This time may vary somewhat depending on the temperature and type of paint used.

5.5.4.15 Application of camouflage polyurethane paint. It is essential that MIL-C-46168 green 383 paint be applied at a minimum dry film thickness of 1.80 mils to achieve color uniformity and optimum camouflage characteristics. Because of the higher degree of transparency of this paint in both the visual and infrared regions of the spectrum, an application of 0.8-1.0 mils dry, which is the normal application for an olive drab paint, would allow both the visual and infrared light to partially penetrate the surface and reflect the substrate or base coating. This would cause both nonuniformity in visual color and poor camouflage properties. Due to the extreme flatness of the paint, the color will vary to a degree, depending upon the texture and type of substrate, plus the orientation of the film and the direction by which the light hits the film. Acceptance of an end item shall not be based specifically on color. It shall be based on whether the paint was approved by the U.S. Army Belvoir Research and Development Center, ATTN: STRBE-VO, Fort Belvoir, VA 22060, and whether application techniques are correct. As specified above, the paint must be applied at least 1.8 mils dry film thickness. A dust coat should be applied first before the second application for solvent flash-off. A single application of 1.8 mils minimum is permissible, provided the paint film is free of imperfections such as runs, sags, or orange peel.

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Since this paint is extremely flat it will tend to mar and scratch to a slight degree when handled. As long as the marring and scratching is a small percentage of the paint film and it does not break through to the substrate, the piece of equipment shall not be rejected. This slight marring and scratching will not affect the camouflage properties when observed by photographic means. Before any painting is performed, proper cleaning, pretreatment, and painting shall be adhered to to assure that optimum adhesion is achieved.

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 as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in this standard 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, electroplating, and application of other types of finishes and coatings, 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 specification shall be regarded as defective.

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TABLE I - CLEANING METHOD

<u>Code No.</u>	<u>Method</u>
101	Cleaning, mechanical or abrasive, per TT-C-490, Method I.
102	Solvent cleaning per TT-C-490, Method II.
103	Hot Alkaline cleaning per TT-C-490, Method III.
104	Emulsion cleaning per TT-C-490, Method IV.
105	Phosphoric acid corrosion removing and metal conditioning treatment, MIL-M-10578, for ferrous and non-ferrous metals, slight etch, type shall be delineated on the drawing immediately following the code 105.
106	Alkaline cleaner for ferrous and non-ferrous alloys, boiling vat or steam cleaning, per P-C-436, nonetch to aluminum.
107	Immersion cleaning, per MIL-C-14460, Type I (for steel).
108	Electrolytic cleaning, per MIL-C-14460, Type II (for steel).
109	Sand lightly with number 400 grit paper.
110	Abrade lightly with aluminum wool; immerse for 3 minutes minimum in a solution of equal parts of nitric acid (specific gravity 1.42) and water. Follow with a water rinse and dry.
111	Magnesium cleaning, MIL-M-3171.
112	Prepare surfaces for bonding using procedures of MIL-13918. Preference of cleaning method where multiple methods are given for a particular surface shall be designated on the drawing immediately following the code number.
113	Vapor blast clean per MIL-C-47267.

NOTE: The above methods listed shall be specified only when applicable and when the detail finishing specification does not contain a cleaning requirement.

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MIL-STD-186D(MI)**TABLE II - SURFACE TREATMENTS**

<u>CODE NO.</u>	<u>TREATMENT</u>
201	Anodize, aluminum, chromic acid, type I, class 1, per MIL-A-8625.
202	Anodize, aluminum, sulfuric acid, type II, class 1, per MIL-A-8625.
203	Anodize, aluminum, sulfuric acid, type II, class 2, per MIL-A-8625. Applicable colors shall be designated on the drawing immediately following the code number by delineating the color and chip code number (i.e., black, 27038; red, 31336) per FED-STD-595.
204	Anodize, hard coat, type III, class 2, per MIL-A-8625, Color Black 37038 per FED-STD-595. Color requirements other than black shall be designated on the drawing immediately following the code number.
205	Use Code 203.
206	Use Code 203.
207	Anodize, hard coat, type III, class 1, per MIL-A-8625.
208	Chromate conversion coat per MIL-C-5541, class 1A.
209	Anodic coating, magnesium, per MIL-M-45202. Type, class, and grade shall be delineated on the drawing immediately following the code number (i.e., code 209, type I, class A, grade 2, etc.).
210	Phosphate coating per TT-C-490, type I (zinc).
211	Phosphate coating per TT-C-490, type II.
212	Use Code 401.
213	Black oxide for copper alloys per MIL-F-495.
214	Black oxide for ferrous metals including stainless steels, per MIL-C-13924. Class shall be delineated on the drawing immediately following the code 214 (i.e., code 214, class 2).
215	Zincate treatment, ASTM B253, preplate for aluminum.

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TABLE II - Continued

<u>Code No.</u>	<u>Treatment</u>
216	<u>Passivate</u> by immersion for 30 minutes in a hot (120 to 130°F) aqueous solution containing 20 percent by volume nitric acid (Sp. Gr. 1.42) and 2 percent by weight of sodium dichromate, rinsed in clean hot water and then thoroughly dried (for 200/300/400 series and precipitation hardening corrosion-resistant steels).
217	<u>Vacuum Pressure or Vacuum Soak Treatment.</u> The clean, dry, well seasoned wood, freed of bark, shall be surfaced to the correct cross-sectional dimensions and then treated by vacuum and pressure, or vacuum and soak. The treating material shall conform to Composition C of TT-W-572. Retention on treatment shall not be less than 0.3 pounds per cubic foot. The temperature of the preservative during the treating process is to be at the discretion of the contractor, so long as the requirements of TT-W-571 as to penetration and the above retention requirement are met.
218	<u>Immersion treatment.</u> Dress the wood part to correct cross-sectional dimensions. Immerse in composition C of specification TT-W-572 for not less than 4 hours. Allow the treated wood to air-dry or kiln-dry before it is painted.
219	<u>Surface treatment.</u> Dress the wood part to correct cross-sectional dimensions. Apply one liberal coat of M-GARD W550 ¹ or equivalent (zinc naphthenate) reduced with water down to 3 percent zinc metal. Where practical, apply the solution by immersion for not less than 3 minutes. Otherwise, brushing or low pressure spraying (no atomization) is acceptable. Allow the treated wood to air-dry or kiln-dry before it is painted.
220	Fungus resistant paranitrophenol treatment for cork product per MIL-T-12664.
221	Treatment, mildew-resistant, for rope per MIL-T-16070. Designate type on drawing immediately following code number.
222	Treatment, mildew-resistant, noncopper process for cotton duck, webbing, and sewed items, per MIL-T-45035. Class to be designated on drawing immediately following code number.

¹Mooney Chemicals Inc, 2301 Scranton Rd, Cleveland, OH 44113-9988

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TABLE II. Continued

<u>Code No.</u>	<u>Treatment</u>
223	Treatment, insect-resistant for paper per MIL-T-21330.
224	Anodic coating for zinc and zinc alloys per MIL-A-81801. Specify class on drawing immediately following code number.
225	Apply chromate treatment for brass per MIS-28744. Class to be designated on the drawing immediately following the code number.
226	Heavy phosphate coating per MIL-P-16332, type M, class 1 (Supplementary preservative treatment to be delineated on the drawing immediately following the code).
227	Heavy phosphate coating per MIL-P-16232, type M, class 2 (Supplementary treatment with lubricating oil MIL-L-3150).
228	Heavy phosphite coating per MIL-P-16232, type M, class 3 (No supplementary treatment).
229	Heavy phosphate coating per MIL-P-16232, type M, class 4 (Chemically converted; may be dyed to color as specified).
230	Heavy phosphate coating per MIL-P-16232, type Z, class 1 (Supplementary preservative treatment to be delineated on the drawing immediately following the code).
231	Heavy phosphate coating per MIL-P-16232, type Z, class 2 (Supplementary treatment with preservative conforming to MIL-C-16173, grade 1 or MIL-L-3150.
232	Heavy phosphate coating per MIL-P-16232, type Z, class 3 (No supplementary treatment).
233	Heavy phosphate coating per MIL-P-16232, type Z, class 4 (Chemically converted: may be dyed to color as specified).
234	Water-Repellant Preservative (WRP) Treatment. Apply one liberal coat of WRP Solution to the wood surfaces. The solution shall contain copper naphthenate, boiled linseed oil or exterior-grade varnish, parafin wax, and solvent. Where practical, apply the solution by immersion for not less than 3 minutes. Otherwise, brushing or low pressure spraying is acceptable. Allow the treated wood to air dry or kiln dry before it is painted.

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MIL-STD-186D(MI)**Code No.**

- 414 Use Code 448.
- 415 Apply lusterless enamel TT-E-527, one coat (0.8-1.2 mils), color olive drab 34087 per FED-STD-595. Color other than olive drab shall be delineated on the drawing immediately following the code 415.
- 416-419 Reserved for future use.
- 420 Apply lusterless enamel TT-E-527, two coats (1.6-2.4 mils), color olive drab 34087 per FED-STD-595. Color other than olive drab shall be delineated on the drawing immediately following the code 420.
- 421-424 Reserved for future use.
- 425 Apply semigloss enamel TT-E-529, one coat (0.8-1.2 mils), color olive drab 24087 per FED-STD-595. Color other than olive drab shall be delineated on the drawing immediately following the code 425.
- 426-436 Reserve for future use.
- 437 Apply semigloss enamel TT-E-529, two coats (1.6-2.4 mils), color olive drab 24087 per FED-STD-595. Color other than olive drab shall be delineated on the drawing immediately following the code 437.
- 438 Apply polyurethane aliphatic, weather resistant camouflage coating per MIL-C-83286, one coat (1.0 to 1.2 mils), color and code number per FED-STD-595 shall be delineated on the drawing immediately following the enamel code 438.
- 439 Apply polyurethane, aliphatic, weather resistant camouflage coating per MIL-C-83286, two coats (1.6 to 2.4 mils). Color and code number per FED-STD-595 shall be delineated on the drawing immediately following the enamel code 439.
- 440 Apply polyurethane, aliphatic weather resistant, semigloss coating per MIL-C-83286, one coat, 1.0 to 1.2 mils. Color and code number per FED-STD-595 shall be delineated on the drawing immediately following the enamel code 440.

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MIL-STD-186D(MI)**Code No.**

- 441 Apply polyurethane, aliphatic, weather resistant semigloss coating per MIL-C-83286, two coats, 1.6 to 2.4 mils. Color and code number per FED-STD-595 shall be delineated on the drawing immediately following the enamel code 441.
- 442 Apply polyurethane, aliphatic weather resistant gloss coating per MIL-C-83286, one coat (1.0 to 1.2 mils) color and code number per FED-STD-595 shall be delineated on the drawing immediately following the enamel code 442.
- 443 Apply polyurethane, aliphatic weather resistant gloss coating per MIL-C-83286, two coats (1.6 to 2.4 mils). Color and code number per FED-STD-595 shall be delineated on the drawing immediately following the enamel code 443.
- 444 Use Code 445
- 445 Use Code 448
- 446 Use Code 447
- 447 Use Code 448
- 448 Apply polyurethane, aliphatic, chemical agent resistant, coating per MIL-C-46168, two coats, 1.8-2.4 mils, color green 383. Color other than green 383 shall be delineated on the drawing immediately following the code.
- 449 Use Code 448
- 450-460 Reserved for future use.
- 461 Use Code 448

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