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MILITARY SPECIFICATION

PAINTING AND MARKING: FREIGHT AND MAINTENANCE CARS,

RAILWAY MOTIVE POWER AND WORK EQUIPMENT

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

1. SCOPE

1.1 Scope. This specifications covers the painting and marking of freight and maintenance railway cars, motive power, and work equipment.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), 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

O-C-303	- Chromium Trioxide, Technical.
TT-C-494	- Coating Compound, Bituminous, Solvent Type, Acid Resistant.
TT-C-520	- Coating Compound, Bituminous, Solvent Type.
TT-E-489	- Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces).
TT-E-529	- Enamel, Alkyd, Semi-Gloss.
TT-P-28	- Paint, Aluminum, Heat Resisting.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research and Development Center, ATTN: STRBE-DS, Fort Belvoir, VA 22060-5606 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 2220

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- TT-P-32 - Paint, Blackboard coating.
- TT-P-38 - Paint, Aluminum, Ready-Mix.
- TT-P-320 - Pigment, Aluminum, Powder and Paste, For Paint.
- TT-T-291 - Thinner-Paint, Volatile Spirits
Petroleum Spirits.
- TT-V-51 - Varnish: Asphalt.
- TT-V-109 - Varnish, Interior, Alkyd-resin.
- TT-V-119 - Varnish, Spar, Phenolic-Resin.
- TT-W-572 - Wood Preservative. Water Repellent.
- VV-P-236 - Varnish, Interior, Alkyd-resin.

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- DOD-E-698 - Enamel, Alkyd, Deck, Black (Formula No. 24) (Metric).
- MIL-M-3171 - Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on.
- MIL-C-4556 - Coating Kit, Epoxy, for Interior of Steel Fuel Tanks.
- MIL-C-5541 - Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
- MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys.
- MIL-E-15145 - Enamel, Zinc Dust Pigmented, Fresh Water Tank Protective, Formula No. 102.
- DOD-P-15328 - Primer (Wash), Pretreatment, (Formula No. 117 for Metals) (Metric).
- DOD-E-18214 - Enamel, Interior, Deck, Dark Green, Formula No. 19 (Metric).
- MIL-T-22085 - Tape, Adhesive, Preservation and Sealing.
- MIL-D-23003 - Deck Covering Compound, Nonslip, Rollable.
- DOD-P-23236 - Paint Coating Systems, Steel Ship Tank, Fuel and Saltwater Ballast (Metric).
- MIL-C-46168 - Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
- MIL-P-52977 - Primer Coating Alkyd Anticorrosive Lead Chromate Free.
- MIL-S-53018 - Sealer Weld-through. For Overlapping Surfaces.
- MIL-P-53022 - Primer, Epoxy Coating, Corrosion Inhibiting Lead and Chromate Free.
- MIL-C-83286 - Coating Urethane, Aliphatic Isocyanate.

STANDARDS

FEDERAL

- FED-STD-141 - Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing.
- FED-STD-595 - Colors.

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

DEPARTMENT OF TRANSPORTATION (DOT)

Federal Railroad Administration (FRA).
Code of Federal Regulation.

(Application for copies should be addressed to the U.S. Department of Transportation, Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

D520 - Zinc Dust (Metallic Zinc Powder).
D1186 - Standard Method for Measurement of Dry Film Thickness of
Nonmagnetic Coatings of Paint, Varnish, Lacquer, and
Related Products Applied on a Magnetic Base.

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

ASSOCIATION OF AMERICAN RAILROADS (AAR)

Manual of Standards and Recommended Practices

(Application for copies should be addressed to the Association of American Railroads, 59 East Van Buren Street, Chicago, IL 60605.)

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

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

3. REQUIREMENTS

3.1 Description. Painting and marking of railway freight and maintenance cars, motive power, and work equipment shall be as specified herein and in the AAR Manual of Standards and Recommended Practices, as applicable. Compliance with applicable FRA regulations shall also be observed.

3.2 Materials. Materials shall be as specified herein. Color of paint shall be as shown in the applicable table. Where color is indicated by a 5-digit number, the color shall match the color designated by the number FED-STD-595.

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3.3 Surface preparation.

3.3.1 Wood surfaces. Wood surfaces to be painted shall be smooth, dry, and thoroughly cleaned of all dirt, grease, and other foreign substances. The wood shall then be treated by dipping to complete submergence for not less than 3 minutes in a sealer preservative in accordance with TT-W-572 except that items too large for dipping shall be saturated by brushing or spraying. Sufficient time shall be allowed for drying before assembly. Any new cuts, raw ends, or bored holes, caused by assembling the wood members shall be thoroughly swabbed with preservative. Wood items employing glue in fabrication shall be given one coat of spar varnish in accordance with TT-V-119.

3.3.2 Ferrous metal surfaces. Ferrous metal surfaces shall be cleaned to bare metal by sandblasting, commercial grade grit blasting, mechanical or chemical means. Where cleaning by chemical means is performed, the chemical residues shall be neutralized with water by thorough washing. Oily, greasy deposits shall be removed from bare and coated metal surfaces by washing with mineral spirits in accordance with TT-T-291. Surfaces to be painted shall be coated with a primer pretreatment coating in accordance with MIL-P-15328 within 24 hours prior to the application of the specified primer (see 3.4). The dry film thickness shall be 0.3 to 0.5 mils for wash primer.

3.3.3 Zinc-coated (galvanized) surfaces requiring finish painting. Zinc-coated (galvanized) surfaces requiring finish painting shall be treated as specified in 3.3.2 except that sandblast or acid pickling shall not be used.

3.3.4 Aluminum surfaces to be painted. Bare aluminum surfaces shall be treated by immersion, or, if too large, by spraying, brushing, or swabbing with a 10 percent solution of chromic acid conforming to O-C-303 for 3 to 5 minutes at 140° F (60° C) followed by thorough rinsing with clean, warm water and subsequent drying, coat with pretreatment MIL-P-15328. Aluminum surfaces already anodized in accordance with MIL-A-8625, or chemically treated in accordance with MIL-C-5541, are suitable for priming and top coating without use of wash primer. The dry film thickness of wash prime shall be 0.3 to 0.5 mils, (when used).

3.3.5 Aluminum surfaces not to be painted. Aluminum surfaces anodized in accordance with MIL-A-8625 or chemically treated in accordance with MIL-C-5541 will require no further treatment. Untreated aluminum surfaces not requiring painting shall be treated with a 5 percent solution of chromic acid for 3 to 5 minutes at 140° F (60° C). The item shall be treated by immersion, or, if too large, by spraying, brushing, or swabbing. After treatment, the surface shall be thoroughly rinsed with clean, warm water. Threaded areas shall be coated before assembly with an anti-seize mixture of 50 percent zinc dust pigment conforming to ASTM-D520 and 50 percent petrolatum conforming to VV-P-236. Bolts inserted in aluminum components shall be zinc or cadmium plated.

3.3.6 Magnesium-alloy surfaces. Magnesium alloy surfaces requiring finish painting shall be cleaned and treated in accordance with MIL-M-3171, type III. Treated surfaces which become scratched in handling shall be touched up in accordance with MIL-M-3171, type I, except that no magnesium sulfate shall be used in the formulation.

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3.3.7 Tank car interior surface. Interior surfaces of tank cars to be coated with special lining shall be cleaned to "white" metal (see 6.3), by grit or shot blasting. When slight after-rusting occurs, it shall be removed by light blasting as above. Unless otherwise specified by the manufacturer of the lining to be applied, the interior of the tank shall not be washed with a solvent or given any pretreatment coating after cleaning. Paint or special lining to be applied applicable to the type of lading to be carried shall be as specified and shall be applied in accordance with the manufacturer's requirements as soon as possible after cleaning.

3.4 Priming.

3.4.1 Wood surfaces. Wood surfaces requiring finish painting shall be primed with primer, MIL-P-52977. Wood which is not to be painted shall be coated with varnish conforming to TT-V-119. Apply primer at 3 to 4 mils wet film thickness.

3.4.2 Ferrous surfaces. Ferrous surfaces requiring finish painting shall be primed with one coat of rust-inhibiting enamel conforming to MIL-P-52977 unless otherwise specified herein. The film thickness shall be 1.3 to 1.7 mils (dry film).

3.4.3 Zinc-coated (galvanized) surfaces. Zinc-coated (galvanized) surfaces requiring finish painting shall be coated with MIL-P-15328 prior to top coating. The film thickness shall be 0.3 to 0.5 mils dry film thickness.

3.4.4 Aluminum surfaces. Aluminum surfaces treated as in 3.3.4 requiring finish painting shall be primed with one coat of primer conforming to MIL-P-52977 except that surfaces not accessible for inspection and maintenance after assembly shall be given two coats of the same primer. The dry film thickness shall be 1.3 to 1.7 mils.

3.4.5 Contact (faying) surfaces and joints. Contact metal surfaces shall have weld-through sealer, MIL-S-53018 applied before assembly; except that surfaces to be welded (other than spot weld) shall not receive the sealer. See MIL-S-53018 for details.

3.4.6 Inaccessible surfaces. All surfaces to be painted which will be inaccessible after assembly shall have the specified primer applied before assembly. Inaccessible ferrous surfaces shall be painted with one coat of MIL-P-52977 primer before assembly. The dry film thickness shall be 1.3 to 1.7 mils. For surfaces to be arc-welded: do not apply paint (primer) within 1 to 1-1/2 inch of weld area. Respray, if possible, weld areas after welding.

3.5 Film properties.

3.5.1 Drying. The paint film shall be considered dry for recoating or final inspection when no loosening, detachment, wrinkling, or other distortion occurs as a result of the pressure test (see 4.3.1).

3.5.2 Adhesion. The paint shall adhere without evidence of any of the following conditions of exposure of bare metal, wood, or underlying coating:

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- a. Any spot exceeding 1/8-inch (3 mm) average diameter.
- b. More than one spot 1/8-inch (3 mm) or less average diameter and exceeding 1/16-inch (2 mm) average diameter.
- c. More than five spots 1/16-inch (2 mm) or smaller average diameter.

3.5.3 Gloss. Gloss of finish coats shall not vary more than 10 percent from that specified in the individual coating specifications referenced, except where irregular, rough, or highly porous surfaces are demonstrated to obscure or prevent accurate gloss measurement.

3.5.4 Film thickness. The finished film thickness of the type coating being applied, shall be not less than the minimum thickness requirements added by the number of coats, designated in table I, II and III.

3.6 Finish paint. Finish coats of paint shall be applied in accordance with acceptable painting practices and the tables and figures specified herein. Brake equipment shall be painted as specified for exterior metal sides and ends. Surfaces not specified shall be painted in accordance with requirements for similar items. If there are no similar items, such surfaces shall be painted to match adjacent surfaces.

3.6.1 Surfaces not to be painted. Contractor shall conform to AAR requirements for non-painted surfaces. Paint shall not be applied to surfaces of tanks, bulkheads, or any surface that will be subjected to hydrostatic tests until all tests have been completed. The working parts of machinery, screw threads, bearings, oil holes, and other surfaces where paint would impair the operation or efficiency of the item shall not be painted. All rubber, plastics, glass surfaces, corrosion-resistant steel, nickel-copper alloys, brass, aluminum, zinc, and other surfaces normally not painted shall not be painted. Metal identification and brake badge plates shall not be painted. Components and areas which are not to be painted shall be masked off or protected during the painting operations to prevent paint spatter.

3.6.2 Installed equipment. Unpainted equipment constructed of corrosion-resistant materials shall not be painted after installation. Painted equipment shall not be repainted if the finish applied by the manufacturer provides adequate protection and approximates the applicable color requirements of this specification.

3.7 Lettering and marking.

3.7.1 Freight and maintenance cars. One coat of white enamel on green, blue, or black topcoats or black enamel on aluminum, red, or gray topcoats, conforming to TT-E-489, or equivalent, shall be used for stencilling all letters, numbers, and insignias. Paint shall be of a consistency to thoroughly cover the background and provide a sharp contrast that will remain legible for a minimum period of 96 months. Insignia, when required, shall appear on both sides of the car, and shall be applied at a minimum dry coat thickness of 1.25 mils. Letters and numbers shall conform to figure 1. Where necessary, due to the presence of louvers, vents, doors, and bands which may become loose and obliterate or obscure markings, the size, arrangement, and location of markings may be revised to suit the construction of the equipment. Stencillings for both interchange and intra plant cars shall conform to provisions of the AAR Manual of Standards

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and Recommended Practices, Rule 80 of AAR Interchange Rules (Consolidated Stencil), and FRA requirements as applicable. Caboose stencillings shall conform to figure 2.

3.7.1.1 Reporting marks. Railcars operated by the Department of Defense, Military Traffic Management Command (MTMC) in the railroad interchange service pool and cars procured by the army on behalf of MTMC and any military service for use in dedicated interchange service by that service shall show the assigned car number the following reporting marks:

Department of Defense	DODX
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Intraplant railcars acceptable by the railroads in interchange movements between military installations or activities shall each have the assigned car number and the following reporting marks:

Department of the Army	USAX
Department of the Navy	USN
Department of the Air Force	DAFX

All other intraplant service cars, except Army and Air Force cabooses, shall have the assigned car number and the following reporting marks shown:

Department of the Army	USA
Department of the Navy	USN
Department of the Air Force	DAF

Army and Air Force cabooses shall only show the assigned car number.

3.7.2 Motive power and work equipment. One coat of white enamel conforming to TT-E-489 or equivalent, shall be used for all letters, numbers, and insignia, except where equipment is painted gray or yellow, letters and stencilling shall be black. Paint shall be of a consistency to thoroughly cover the background and provide a sharp contrast that will remain legible for a minimum period of 96 months. If louvers, screens, doors, or windows interfere with the legibility of the lettering, the lettering shall be appropriately relocated. When a lacquer-type system is used, lettering and marking shall be accomplished with lacquers of durability and color equivalent to that of the specified enamel system. Letters and numbers shall conform to figure 1. Stencilling shall conform as closely as possible with figures 3, 4, or 5 as applicable.

3.7.2.1 Air brake system. Parts of the air brake system, which require periodic testing or cleaning in accordance with the Code of Federal Regulations as prepared by the FRA shall be legibly stencilled in a conspicuous place indicating the date the part was tested or cleaned and the initials of the location at which the work was accomplished. In lieu of stenciling, the information may be placed on a card and displayed under a transparent cover in the cab of each locomotive or work equipment.

3.7.2.2 Safety markings. Two coats of yellow enamel conforming to TT-E-489, color No. 13538 or 13655 shall be used for all safety markings. Grab rails, main hooks, and blocks shall be painted solid yellow except for Navy locomotives which are painted yellow and shall have their vertical handholds painted black

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for proper contrast. Bumpers and other surfaces shown on the applicable figures shall be painted with 4-inch diagonal strips alternating colors of yellow gloss No. 13538 or 13655 and black No. 17038. The strips shall be inclined at 45 degrees to the left and right of vertical to simulate an inverted V-pattern. Sufficient space shall be allowed on bumpers for application of markings when specified. Peripheral stripes shall run the full width of all steps and running boards.

3.7.2.3 Internal combustion locomotives. Diesel and gasoline locomotives shall be marked in accordance with figure 3 or 4 as applicable.

3.7.2.4 Work equipment. Work equipment such as cranes, derricks, pile drivers, tampers, track gang maintenance cars, moving equipment, push/pull cars, etc., shall be marked in accordance with figure 5 as applicable and as possible.

3.8 Workmanship. All painted surfaces shall be evenly covered, with no runs, drips, or excess buildup. Areas containing checks, blisters, or other discontinuities shall be cleaned to bare metal and repainted. Masking or other suitable means shall be utilized to obtain clearly defined color lines and protect surfaces that are not to be painted.

3.9 Alternate schedules. Proposed alternate surface coating schedules may be submitted to the contracting officer for approval. The alternate schedules shall produce a coating system with durability, color, and gloss equivalent to that of the paint system specified herein. Alternate enamel systems shall provide a minimum dry-film thickness of 5 mils (0.13 mm). If alternate schedules are used, surfaces shall be prepared as specified in 3.5. Alternate schedules shall specify the entire surface coating procedure. This shall include the paints, enamels, lacquers, or other types of coating compounds to be used, the order of their application, operations to be performed before and after each coat, and the drying time for each coat.

3.10 Lacquer system. Exterior surface as specified in tables II and III, except the trucks and components, may be finished with a lacquer-type system provided the surfaces are prepared as specified in 3.5 and primed with a rust-inhibiting lacquer primer of 1.3 mils (0.033 mm) minimum dry coat thickness, sanded as required and finish painted with semi-gloss lacquer of 2.5 to 3 mils (0.06 to 0.08 mm) dry coat thickness. The color, gloss, and durability of the lacquer system shall be equivalent to that of the enamel system specified for exterior surfaces.

4. QUALITY ASSURANCE PROVISIONS

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

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4.1.1 Material inspection. The contractor is responsible for insuring that materials used are manufactured, examined, and tested in accordance with referenced specifications and standards.

4.2 Examination. At various stages of cleaning, treating, and painting, each item of equipment shall be examined for the following defects. Presence of one or more defects shall be cause for rejection.

101. Material not as specified.
102. Wood preservation not as specified.
103. Surface preparation not as specified.
104. Pretreatment and priming not as specified.
105. Finish painting not as specified.
106. Painting system not as specified.
107. Application not as specified.
108. Film thickness not as specified.
109. Surfaces and corners not completely covered.
110. Presence of dust, runs, sags, blisters, or bare or abraded spots.
111. Gloss not as specified.
112. Colors not as specified.
113. Time schedule of operations not as specified.
114. Paint on surfaces not to be painted.
115. Marking not as specified.
116. Workmanship not as specified.

4.3 Tests.

4.3.1 Pressure test. Allow paint film to dry in accordance with the manufacturer's instructions. At five or more locations selected at random, on any flat or curved surface, of each item of equipment bear down with the thumb and turn it through an angle of 90 degrees in the plane of the film. Nonconformance to 3.5.1 shall constitute failure of this test.

4.3.2 Paint adhesion. The paint adhesion test shall be performed on each painted item after a maximum of 24 hours drying. Tape 3/4-inch (19 mm) wide conforming to MIL-T-22085 shall be used. The following method shall be followed:

- a. Press a 2-inch (51 mm) length or a somewhat longer piece of tape firmly onto a flat or cylindrical surface of the item, rubbing out all air bubbles under the tape. Allow approximately 10 seconds for the test area to return to room temperature.
- b. Grasp a free end of the tape and, at a rapid speed, strip it from the specimen by pulling the tape back upon itself at 180 degrees in such a manner that the tape is folded back-to-back during the procedure.
- c. Observe for bare spots where paint is removed. Disregard flecks of paint on tape if the paint is not completely removed from the metal or pretreatment coating.
- d. Test a sufficient number of points in each area to give a representative value for the entire area and for each coating applied. Nonconformance to 3.5.2 shall constitute failure of this test.

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4.3.3 Gloss. The gloss shall be measured in accordance with FED-STD-141, method 6101. Nonconformance to 3.5.3 shall constitute failure of this test.

4.3.4 Film thickness. Dry-film thickness shall be measured by an instrument conforming to ASTM D1186. Dry-film thickness less or more than specified in 3.3, 3.4 and table 5 shall constitute failure of this test.

5. PACKAGING

(This section not applicable to this specification.)

6. NOTES

6.1 Intended use. This specification is intended for use as a reference in applicable specifications for painting of railway maintenance and freight cars, motive power and work equipment.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Date of issue of DoDISS applicable and exceptions thereto (see 2.1.1.).
- c. Color of paint required for exterior surfaces, safety markings and cab interiors of locomotives (see table II).
- d. Color of paint for exterior surfaces of cranes, other work equipment (see Table III).
- e. Color of paint for exterior and interior of freight and maintenance cars if different from table I.
- f. Type of coating or special lining to be applied to inside of tank cars.

6.3 White metal blast. A white metal blast surface is defined as a surface where all traces of rust, scale, old paint or other foreign matter are removed, producing a uniform light gray finish.

Custodians:

Army - ME
Navy - YD
Air Force - 99

Preparing activity

Army - ME

Project 2220-0137

Review activity:

Air Force - 84

User activities:

Navy - MC

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TABLE I. Finish painting of freight and maintenance cars.

Area	Extent	Coats	Paint
1. BOX CAR a. Interior surface:	(1) Interior exposed surfaces of doors and door frames.	2	<p>Army Olive green enamel <u>1</u>/ TT-E-489, Class A, color 14064 or gray, color 16492, or paint, aluminium TT-P-38.</p> <p>Navy Medium gray enamel <u>2</u>/ TT-E-489, class A, color 16187.</p> <p>Marine Corp Green enamel <u>3</u>/ TT-E-489, class A, color 14052.</p> <p>Air Force Strata blue enamel <u>4</u>/ TT-E-489, class A, color 516.</p> <p>DFT: 0.8 to 1.2 mils each coat.</p>
	(2) Metallic roofs underside. (a) Galvanized surfaces. (b) Ferrous surfaces.	1	<p>none.</p> <p>White Enamel TT-E-529, Sem. Gloss. DFT: 0.8 to 1.2 mil.</p>
	(3) All metal surfaces behind the sides and end car interiors.	1	<p>Coating compound bituminous: TT-C-520 DFT: 1/16 to 1/8-inch.</p>
	(4) Wood flooring.		None.

"DFT" means dry film thickness as used throughout table I, II, and III.

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
b. Exterior surfaces.	(5) Steel flooring.	1	Urethane top coat, equivalent to MIL-C-46168 in performance. Color: Gray 36492 applied over epoxy primer MIL-P-53022, or equal. DFT (top coat) 1.5 to 1.8 mils. Do not use the regular primer, MIL-P-52977 here.
	(1) All exposed surfaces including sides and ends doors, door frames, ladders, running boards, brake steps.	2	Army Olive Green enamel <u>1</u> / TT-E-489, color 14064 or Gray, color 16492 Navy Aluminum enamel <u>2</u> / TT-P-38 Marine Corps Green enamel, TT-E-489, Class A, Color 14052 Air Force Strata blue enamel <u>4</u> / TT-E-489, Color 15045, DFT: 0.8 to 1.2 mils each coat.
	(a) Trucks and components <u>5</u> /.	1	Enamel, black, TT-E-489, DFT: 0.5 mils maximum.
	(2) Metallic roofs (exterior). (a) Galvanized surfaces.	2	Enamel, gray, TT-E-489, Color 16492, or paint, aluminum, TT-P-38, DFT: 1.2 to 1.8 mils each coat.
	(b) Steel roofs.	2	Enamel, gray, TT-E-489, Color 16492, or paint, aluminum, TT-P-38, DFT: 1.2 to 1.8 mils each coat.
	(3) Underframes.	2	Enamel, black, TT-E-489, DFT: 1.2 to 1.8 mils.

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
2. CABOOSE CAR a. Interior Surfaces	(1) All exposed metal surfaces of ceiling, sides, ends, desks, seat frames, bunk frames and interior or surfaces of lockers and closets.	2	Light green enamel, TT-E-529, Class A, Color 24533, (for all services) DFT: 0.8 to 1.2 mils each coat.
	(2) All exposed wood surfaces	2	Light green enamel, TT-E-529, Class A, Color 24533 (for all services) with film thickness 3 to 4 mils each coat.
	(3) Exposed surfaces of wood flooring		Dark green deck paint, MIL-E-18214, wet film thickness: 3 to 4 mils each coat.
	(4) All metal surfaces behind ceiling, flooring, side and end lining of car interiors.	1	Coating Compound, bituminous. TTC-520 DFT: 1/16 to 1/8 inch.
	(1) Metallic roofs: (a) Galvanized surfaces.	2	Paint, aluminum, TT-P-38 or enamel, black, TT-E-489, or gray, Color 16492, DFT: 1.2 to 1.8 mils each coat.
	(b) Steel roofs	2	Paint, aluminum, TT-P-38 or enamel, black, TT-E-489, or gray, Color 16492, DFT: 1.2 to 1.8 mils each coat.
	(2) Underframes.	2	Paint, aluminum, TT-P-38 or enamel, black, TT-E-489. DFT: 1.2 to 1.8 mils each coat.
	b. Exterior Surfaces		

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
3. FLAT CAR a. Exposed surfaces.	(3) Handholds and still steps.	2	Yellow enamel, TT-E-489, DFT: 0.8 to 1.2 mils each coat, class A, Color 13538.
	(4) All remaining exposed surfaces including sides, end ladders, platforms and steps.	2	Army Olive green enamel <u>1</u> / TT-E-489, class A, color 14064 or gray, color 16492 Navy red enamel <u>2</u> /. TT-E-489 TT-E-489, Class A, Color 11105. DFT: 0.8 to 1.2 mils each coat.
	(5) Truck and components <u>5</u> /	1	Enamel, black, TT-E-489, DFT: 0.5 mils maximum.
	(1) of wood flooring		None.
	(2) Steel flooring	1	Nonskid composition over entire surface. MIL-D-23003. Applied at 5-8 mils over epoxy primer MIL-P-53022; or urethane top coat MIL-C-46168, or equal color olive green. DFT: 1.2 to 1.8 mils each coat; applied over same MIL-P-53022 epoxy primer.
		2	
b. Exterior Surfaces	(1) Exposed surfaces of sides and ends.	2	Army Olive green enamel <u>1</u> / TT-E-489, class A, color 14064. DFT: 1.2 to 1.8 mils each coat.
		2	Navy TT-P-38, class A, type II.

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
4. GONDOLA CAR		2	Marine Corps Green enamel <u>3/</u> TT-E-489, class A, color 14052. DFT: 1.2 to 1.8 mils each coat.
		2	Air Force Strata blue enamel <u>4/</u> TT-E-489, Class A Color 15045, DFT: 0.8 to 1.2 mils each coat.
	(2) Underframes	2	Enamel, black, TT-E-489, DFT: 1.2 to 1.8 mils each coat.
	(3) Truck and components <u>5/</u>	1	Enamel, black, TT-E-489, DFT: 0.5 mils maximum.
	a. Interior surfaces: (1) Exposed surfaces of wood flooring.		None.
	(2) Steel flooring	1	Nonskid composition MIL-D-23003 over entire surfaces (5-8 mils) over epoxy primer MIL-P-53022.
	(3) Exposed ferrous surfaces.		None.
	b. Exterior Surfaces	2	Army Black enamel <u>1/</u> , TT-E-489, class A, color 17038 Navy Aluminum enamel <u>2/</u> TT-P-38, Type II, Class A. Marine Corps Green enamel <u>3/</u> , TT-E-489, Class A, Color 14052 or

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
			Air Force Strata blue enamel <u>4</u> / TT-E-489, Class A, Color 14045, DFT: 0.8 to 1.2 mils each coat.
	(2) Underframes	2	Enamel, black, TT-E-489, DFT: 1.2 to 1.8 mils each coat.
5. HOPPER CAR	(Apply to center sills and underside of longitudinal of hoods before fabrication)	2	Enamel, black, TT-E-489, DFT: 1.2 to 1.8 mils each coat.
a. Interior Surfaces			
b. Exterior Surfaces	(1) Underframes	2	Enamel, black, TT-E-489, DFT: 1.2 to 1.8 mils each coat.
	(2) Remaining exposed surfaces including sides, ends, <u>5</u> /		Army Black enamel <u>1</u> / TT-E-489, class A, color 17038.
			Navy Aluminum enamel <u>2</u> / TT-P-38.
			Air Force Strata blue enamel <u>4</u> / TT-E-489, Class A, color 15045 DFT: 0.8 to 1.2 mils each coat.
	(3) Trucks and components <u>5</u> /	1	Black enamel, TTE-489, Class A, color 17038, DFT: 0.5 mils maximum.
MAINTENANCE CAR	(1) Wood surfaces including flooring.	2	Black enamel, TT-E-489 DFT: 0.8 to 1.2 mils each coat.
a. Interior surfaces:			

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
b. Exterior Surfaces	(2) Metal surfaces.	2	Black enamel, TT-E-489 DFT: 0.8 to 1.2 mils each coat.
	(3) Interior of battery box and blocking.	1	Asphalt varnish (acid resistant), TT-V-51, DFT: 2.3 to 2.8 mils.
	(4) Interior of all lockers:		
	(a) Steel.	1	Black enamel, TT-E-489 DFT: 0.8 to 1.2 mils.
	(b) Wood.	1	Black enamel, TT-E-489 DFT: 0.8 to 1.2 mils
	(1) Safety railing.	2	Yellow enamel, TT-E-489, Class A, Color 13538, DFT: 0.8 to 1.2 mils each coat.
	(2) Exposed surfaces of attached component parts, and components.	1	Black enamel, TT-E-489 DFT: 0.8 to 1.2 mils
	(3) Underframes	1	Enamel, black, TT-E-489, DFT: 0.8 to 1.2 mils.
7. REFRIGERATOR CAR	(4) Trucks and components <u>5/</u>	1	Enamel, black, TT-E-489, Class A, color 17038, DFT: 0.5 mils maximum.
	(1) All exposed wooden surfaces except floors	1	Spar varnish TT-V-109
	a. Interior Surfaces		
	(2) Wood flooring	1	Spar varnish TT-V-109
	(3) Metal surfaces behind interior linings	-	None.
	b. Exterior Surfaces		
	(1) Metallic roofs:	2	Aluminum enamel, TT-P-38, or gray, TT-E-489, Class A, color 16492, DFT: 0.8 to 1.2 mils each coat.
	(a) Galvanized roof panels		

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
	(b) Steel roof panels	2	Aluminum enamel, TT-P-38, DFT, 0.8 to 1.2 mils each coat or gray, TT-E-489, color 16492.
	(c) Hatch covers	2	Aluminum enamel, TT-P-38, DFT: 0.8 to 1.2 mils. each coat.
	(2) Underframes,	2	Enamel, black, TT-E-489, DFT: 1.2 to 1.8 mils each coat.
	(3) Trucks, and components <u>5/</u>		Enamel, black, TT-E-489, DFT: 0.5 mils maximum.
	(4) Remaining exposed including ladders, running boards, brake steps	2	<p>Army Olive green enamel TT-E-489, Class A, Color 14064</p> <p>Navy Aluminum enamel <u>2/</u>, TT-P-38.</p> <p>Marine Corps Green Enamel <u>3/</u> TT-E-489, Class A color 14052.</p> <p>Air Force Strata Blue enamel <u>4/</u> all TT-E-489, Class A, color 15045, DFT: 0.8 to 1.2 mils each coat.</p>
8. TANK CAR			
a. Interior surfaces of tanks lading as follows	(1) Water	2	Zinc dust paint <u>6/</u> . MIL-E-15145. DFT: 1.2 to 1.6 mils each coat (see footnote <u>7/</u> for application).

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TABLE I. Finish painting of freight and maintenance cars. (continued)

Area	Extent	Coats	Paint
b. Exterior of tank cars (excluding shell):	(2) Petroleum products	see spec.	MIL-C-4556, QPL-4556, Classes 2, and 3 (see footnotes <u>1/</u> and <u>4/</u> or MIL-P-23236, QPL-23236, Classes 1, 3, and 4 (see footnotes <u>1/</u> and <u>2/</u>
	(3) Chemical products and other lading.		See Footnote <u>7/</u> .
	(1) Inaccessible metal surfaces forming the cavity of metal-jacketed tanks between tank shell and jacket <u>8/</u>		None
	(2) Underframes	2	Enamel, black, TT-E-489, DFT: 1.2 to 1.8 mils each coat.
	(3) Trucks and components	1	Enamel, black, TT-E-489, DFT: 0.5 mils maximum.
c. Exterior shell surfaces tank cars	(4) Remaining exposed surfaces (all metals).	2	Black enamel <u>1/</u> , TT-E-489, Color 17038. or Paint, aluminum, TT-P-38, Type II, Class, or gray, TT-E-489, Color 16492. DFT: 0.8 to 1.2 mils each coat.
	(1) Aluminum shell and steel shell	2	Aluminum, TT-P-38, Gray, TT-E-489, Color 16492, DFT: 0.8 to 1.2 each coat.

1/ Applicable to Army equipment only.2/ Applicable to Navy equipment only.3/ Applicable to Marine Corps equipment only.4/ Applicable to Air Force equipment only.5/ Paint applied to truck and components shall be so applied that the detection of cracks or other flaw is not prevented. Wheels, axles, and parts contained in journal box shall not be painted.

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- 6/ Zinc dust paint shall be applied after all hydrostatic tests have been completed. Apply as follows: Clean to bare metal and apply 1 coat of paint conforming to MIL-E-15145. Circulate unheated air through tank for 12 hours, and apply second coat. Again circulate unheated air through tank for 12 hours. Tanks shall be flushed twice with fresh water before being placed in service. Mixed zinc dust paint shall not be stored since a gas pressure builds up in closed containers.
- 7/ Paint shall conform to the requirements of the end item specification for the particular tank car.
- 8/ Paint shall be applied to the interior of the jacket and to the exterior of the shell prior to fabrication.

TABLE II: Finish painting of locomotives.1/, 6/

Area	Extent	Coats	Paint
Exterior surfaces. A. Paint	(a) All exposed surfaces such as: hood, cab, sides, and roof. <u>2/</u>	1	<p>Army</p> <p>Urethane top coat, Black, Color 27038 meeting MIL-C-83286, or equivalent in performance; applied an epoxy primer meeting MIL-P-53022, or equivalent in performance and composition. DFT: 1.5 to 1.7 mils. (Top coat)</p> <p>or</p> <p>Above system in:</p> <p>Medium Gray color 16187.</p> <p>or</p> <p>Navy yellow, color 23538.</p> <p>or</p> <p>Marine Corps Green</p> <p>or</p> <p>Strata blue color 15045 as specified (see 6.2).</p>
	(b) Underframe.	2	Black, TT-E-529, color 27038. DFT: 1.3 to 1.5 mil.
	(c) Trucks, and <u>3/</u>	1	Black, TT-E-529, color 27038 DFT: 0.5 mil.

- 5/ Paint applied to truck and components shall be so applied that the detection of cracks or other flaw is not prevented. Wheels, axles, and parts contained in journal box shall not be painted.

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TABLE II: Finish painting of locomotives.^{1/}, ^{6/} (continued)

Area	Extent	Coats	Paint
B. Safety Markings ^{5/}	(a) Bed plate.	1	Urethane system as in "A" above color 27038 and yellow 13538 or 13655.
	(b) Grab rails.	1	Urethane System as in "A" above yellow 13538 or 13655 (see 3.7.2.2).
Exhaust, System to stack	Exterior surfaces of exhaust system.	1	Heat resistant paint. TT-P-28, aluminum DFT .9 to 1.2 mils.
Engine block and Interior of hoods.	All exposed surfaces.	1	Medium gray, TT-E-489, color 16187 DFT: 1.3 to 1.5 mils
Interior of cab.	(a) Exposed metal of floor, toolboxes, handbrakes, wheels,	2	Black deck paint. MIL-E-698. DFT: 1.0 to 1.5 per coat.
	(b) All other metal surfaces.	2	Medium gray, TT-E-489, color 16187, or Medium green, TT-E-489, color 14110. DFT: 1.0 to 1.5 mils per coat.
Stack.	All exposed exterior faces. ^{4/}	1	Heat resistant paint. Black for Army use.
Battery box.	Interior surfaces and blocking.	2	Asphalt varnish, TT-C-494.

^{1/} See 3.4 for priming.^{2/} Smoothing cement shall be applied to rough spots and sanded smooth before application of primer.^{3/} Paint applied to trucks and components shall be thinned sufficiently so that detection of cracks or other flaws is not prevented. Wheels, axles, and parts contained in journal box shall not be painted.^{4/} Primer shall not be applied.^{5/} Safety markings not required for overseas service.^{6/} Rubber tired car spotters with hirail equipment shall be painted as nearly identical to locomotives as possible.

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TABLE III. Finish painting of locomotive cranes, wrecking cranes and other work equipment. ^{1/}, ^{5/}

Area	Extent	Coats	Paint
Exterior surfaces	(a) All exposed surfaces such as cab ^{2/} , crane booms, frame-work or derricks, pile-drivers and other work equipment.	1	Army Urethane top coat, black color 27038 meeting MIL-C-83286, or equivalent in performance; applied over an epoxy primer meeting MIL-P-53022, or equivalent in performance and composition DFT: 1.5 to 1.7 mils (Topcoat) or above system in: medium gray color 16187 or Navy, yellow, color 23538. or Marine Corps Green or Strata blue color 15045 as specified (see 6.2).
A. Paint.	(b) Underframe.	2	Black, TT-E-529, color 27038. DFT: 1.3 to 1.5 mils
			Black, TT-E-529, color 27038, 0.5 mils maximum.
			Black deck paint, MIL-E-698. DFT: 1.3 to 1.5 mils
			Medium green, TT-E-489, color 14110. DFT: 1.3 to 1.5 mils.
B. Cab.	(c) Truck and components. ^{3/}	1	Urethane system as in "A" above color 27038 and yellow 13538 or 13655.
			Urethane system as in "A" above yellow 13538 or 13655.
C. Safety ^{4/}	(a) Exposed metal surfaces of floor, toolboxes, hand-brakes and shafts.	2	
	(b) All other surfaces.	2	
	(a) Front and rear ends of car body and rear edge rotating bed.	1	
	(b) Block and grab rails.	1	

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- 1/ See 3.4 for priming.
- 2/ Smoothing cement shall be applied to rough spots and sanded smooth before application of primer.
- 3/ Paint applied to trucks and components shall be thinned sufficiently so that detection of cracks or other flaws is not prevented. Wheels, axles, and parts contained in journal box shall not be painted.
- 4/ Safety markings not required for overseas service.
- 5/ Other work equipment shall include tampers, track gang maintenance cars, mowing equipment, push/pull cars, etc.

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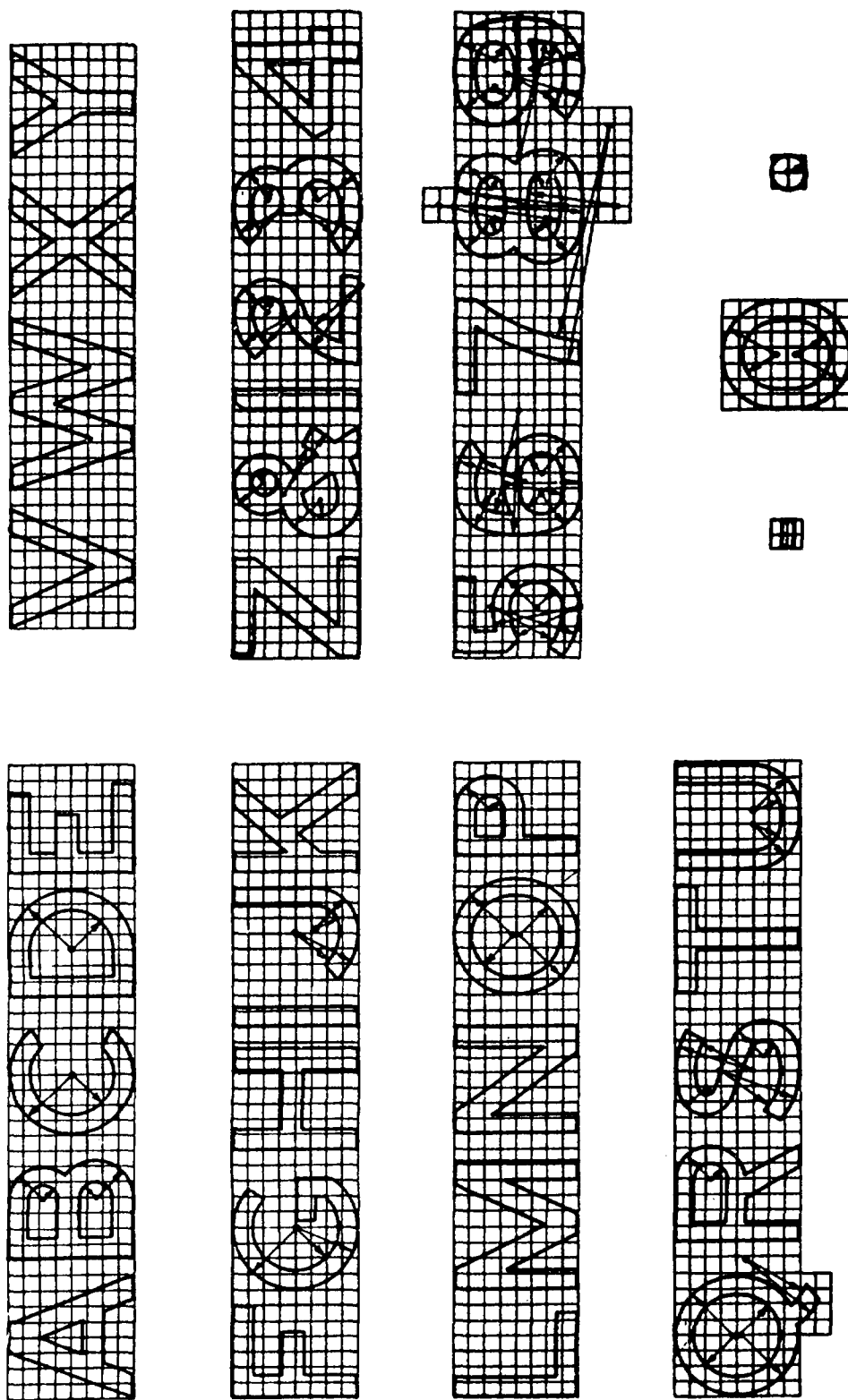
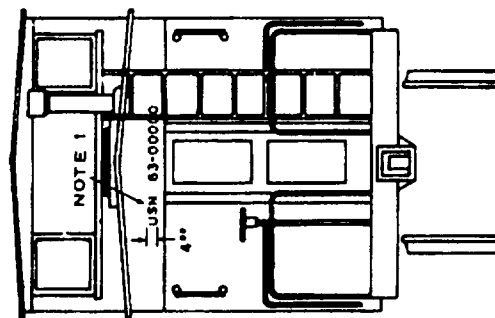
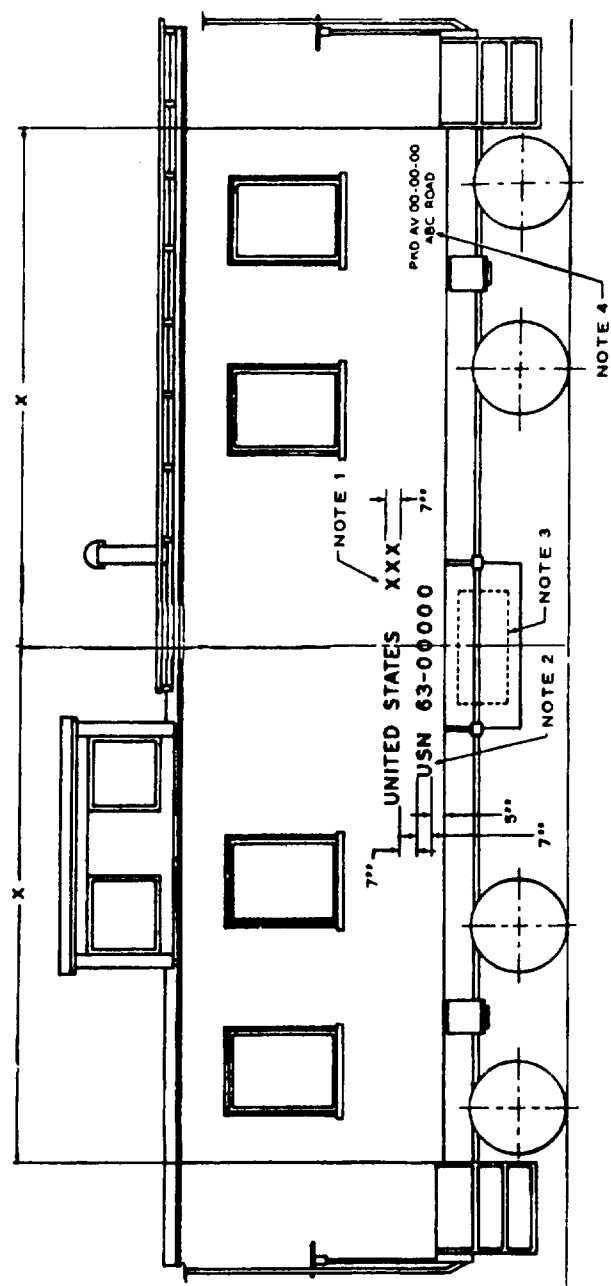


FIGURE 1. LETTERS AND NUMBERS

x897

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**NOTES:**

1. FOLLOWING "UNITED STATES", ON SAME LINE AND USING SAME SIZE LETTERS, INSERT NAME OF COGNIZANT SERVICE "ARMY", "NAVY", OR "AIR FORCE".
2. REPORTING MARKS AND NUMBERS SHALL BE USED ON NAVY EQUIPMENT ONLY. NUMBERS ONLY SHALL BE USED ON ARMY AND AIR FORCE EQUIPMENT.
3. AIR BRAKE CLEANING MARKS SHALL BE ACCORDANCE WITH AAR INTERCHANGE RULE NO. 2, FOR ALL CARS USED IN INTERCHANGE.
4. STENCILING TO CONFORM TO INSTRUCTIONS SHOWN IN INTERCHANGE RULE NO. 80.

FIGURE 2. CABOOSE (DOMESTIC SERVICE)**X907A**

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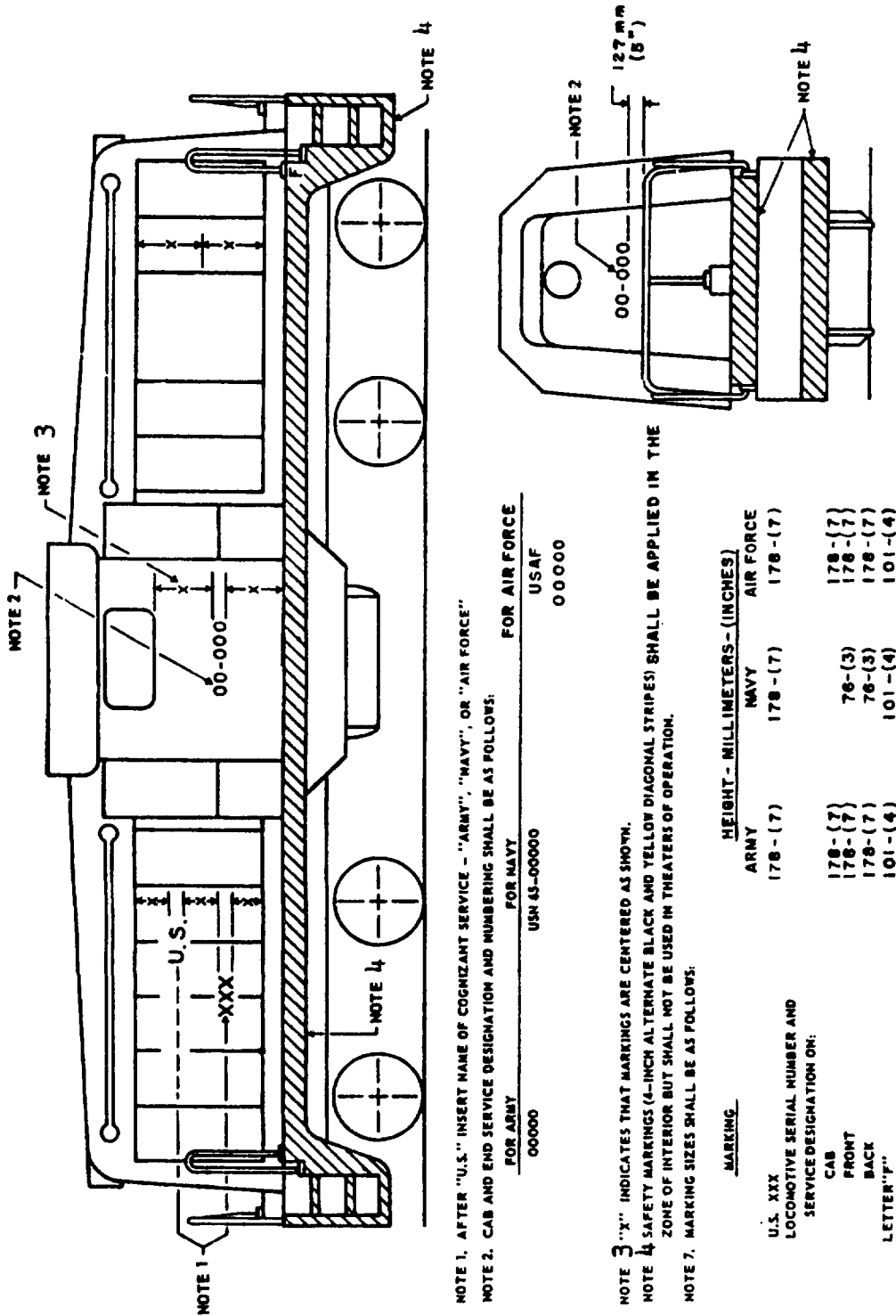


FIGURE 3. Markings for diesel-electric locomotive with cab located in center for domestic service.

X-882 B

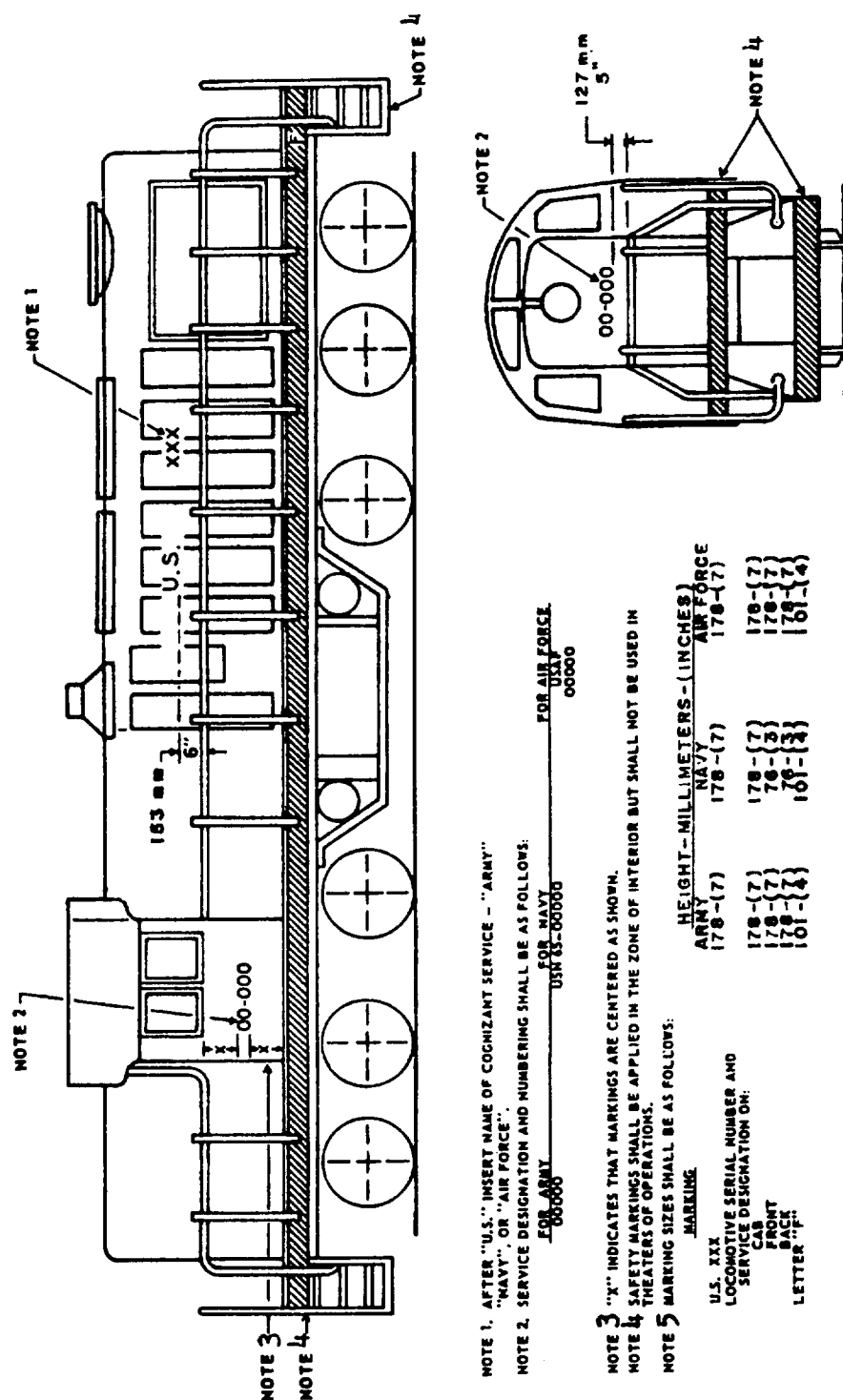
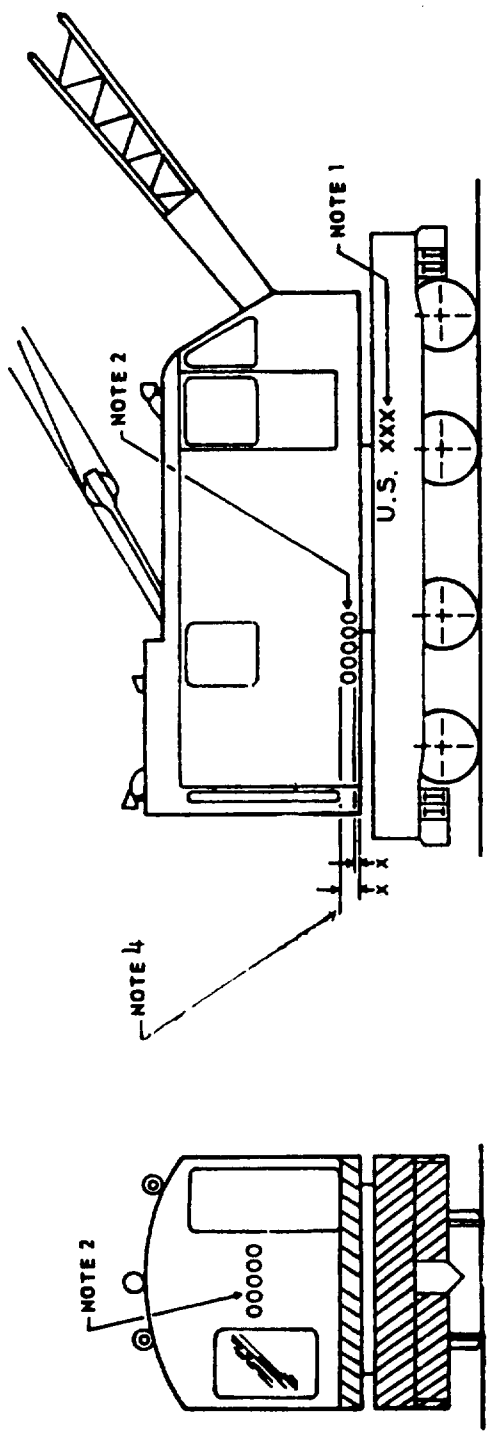


FIGURE 4. Markings for diesel-electric locomotive with cab located to rear of center for domestic service.

X-883 B



NOTE 1. AFTER "U.S." INSERT NAME OF COGNIZANT SERVICE - "ARMY", "NAVY", OR "AIR FORCE".

NOTE 2. SERVICE DESIGNATION AND NUMBERING SHALL BE AS FOLLOWS:

	FOR ARMY	FOR NAVY	FOR AIR FORCE
	00000	USN 65-00000	USAF 00000

NOTE 3. SERVICE DESIGNATION, AND NUMBERING SHALL BE RELOCATED TO ACCOMMODATE FOR DOOR, WINDOWS AND OTHER

OPENINGS THAT INTERFERE WITH LEGIBILITY OF MARKINGS.

NOTE 4. "X" INDICATES THAT MARKINGS ARE CENTERED AS SHOWN.

NOTE 5. MARKING SIZES SHALL BE AS FOLLOWS:

U.S. XXX SERIAL NUMBER ON: SIDE REAR	MARKING			HEIGHT-MILLIMETERS - (INCHES)	
	ARMY	NAVY	AIR FORCE		
	178-(7)	178-(7)	178-(7)		
	178-(7)	76-(3)	178-(7)		
	178-(7)	76-(3)	178-(7)		

NOTE 7. SAFETY MARKINGS SHALL BE APPLIED IN THE ZONE OF INTERIOR, BUT SHALL NOT BE USED IN THEATERS OF OPERATIONS.

FIGURE 5. Markings for diesel locomotive cranes, derricks, and pile drivers for domestic service.

X-885C

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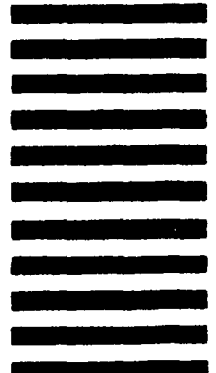
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3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
b. ADDRESS (Street, City,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