

NOT MEASUREMENT SENSITIVE

MIL-STD-193L

27 August 1991

SUPERSEDING

MIL-STD-193K

1 December 1986

MILITARY STANDARD

PAINTING PROCEDURES AND MARKING FOR VEHICLES,
CONSTRUCTION EQUIPMENT,
MATERIAL HANDLING EQUIPMENT, AND SPARE PARTS

AMSC N/A

AREA MFFP

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-STD-193L

FOREWORD

1. This Military Standard is approved 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: Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BUE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. The purpose of this standard is to establish minimum requirements for painting and marking military vehicles, equipment and associated spare parts.

MIL-STD-193L

CONTENTS

<u>PARAGRAPH</u>		<u>PAGE</u>
	<u>FOREWORD</u>	ii
1.	<u>SCOPE</u>	1
1.1	Scope	1
1.2	Selection of finishes	1
1.3	Purpose	1
2.	<u>APPLICABLE DOCUMENTS</u>	2
2.1	Government documents	2
2.1.1	Specifications, standards, and handbooks	2
2.1.2	Other Government documents, drawings, and publications	5
2.2	Non-Government publications	6
2.3	Order of precedence	7
3.	<u>DEFINITIONS</u>	8
3.1	Camouflage pattern	8
3.2	Chemical agent resistant coating (CARC)	8
3.3	Galvanic couple	8
4.	<u>GENERAL REQUIREMENTS</u>	9
4.1	Surfaces to be painted	9
4.2	Surfaces not to be painted	9
4.3	Materials	9
4.4	Substitution for specified finishes, processes, or materials	9
4.5	Phenolic environment	9
5.	<u>DETAILED REQUIREMENTS</u>	10
5.1	Preparation and application	10
5.2	Condition of surface	10
5.3	Surfaces after painting	10
5.4	Paint finishes	10
5.5	Metallic finishes	10
5.6	Miscellaneous treatments	10
5.7	Galvanic couples	10
5.8	Tests	10
5.8.1	Paint adhesion	10

CONTENTS

MIL-STD-193L

<u>PARAGRAPH</u>		<u>PAGE</u>
5.8.1.1	Scribe tape test procedure	11
5.8.2	Paint film thickness	11
5.8.3	Corrosion resistance	11
5.9	Colors	12
5.10	Markings	12
6.	<u>NOTES</u>	13
6.1	Intended use	13
6.2	Issue of DoDISS	13
6.3	Subject term (key word) listing	13
6.4	Changes from previous issue	13
<u>TABLE</u>		
I	Special finish requirements	14
II	Chemical agent resistant coating (CARC) systems	17
III	Dry film thickness	19
IV	Metallic coatings	20
V	Miscellaneous treatments	21
VI	Galvanic couples	22
VII	Colors for vehicles, construction and material handling equipment and markings	23
VIII	Chemical agent resistant coating (CARC) colors and national stock numbers (NSN)	40
IX	Sample list of CARC drawings	42
APPENDIX	CARC PAINT APPLICATIONS FOR SPARE PARTS USED ON TANK-AUTOMOTIVE VEHICLE SYSTEMS ..	41

MIL-STD-193L

1. SCOPE

1.1 Scope. This standard establishes minimum requirements for materials to be used and procedures to be followed in surface preparation, surface treatment, plating and painting of vehicles, construction and material handling equipment, and markings so as to provide protection from the adverse effect of chemical and environmental conditions.

1.2 Selection of finishes. Unless otherwise specified, the selection of the cleaning method, surface treatment, metal coating, paint system or other finish shall be as specified by the procuring activity. The finishing system shall be selected from those specified herein and shall be referenced on drawings, contracts, and item specifications.

1.3 Purpose. This document serves three purposes: first, to guide designers and production engineers in the selection of suitable and compatible materials, procedures, and finishes; second, to permit the specification of a preferred finish plus all other acceptable alternate finishes on drawings, contracts and end item specifications; and third, finishes specified in this standard shall not be deleted in future revisions without first providing a substitute finish in its place. Thus, there will be no need to update specific finish notes on drawings every time one of the specifications is canceled or superseded.

MIL-STD-193L

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this standard to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

A-A-884	- Tape, Pressure-Sensitive Adhesive, Box Closure.
A-A-1830	- Tape, Pressure-Sensitive Adhesive, Box Closure.
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-S-365	- Silver Plating, Electrodeposited; General Requirements for.
TT-C-490	- Cleaning Methods for Ferrous Surfaces and Pretreatment for Organic Coatings.
TT-E-485	- Enamel, Semi-Gloss, Rust-Inhibiting.
TT-E-489	- Enamel, Alkyd, Gloss Low VOC Content.
TT-E-496	- Enamel, Heat-resisting (400 Deg.F, Black).
TT-E-522	- Enamel, Phenolic, Outside.
TT-E-527	- Enamel, Alkyd, Lusterless, Low VOC Content.
TT-E-529	- Enamel, Alkyd, Semigloss, Low VOC Content.
TT-L-32	- Lacquer, Cellulose Nitrate, Gloss, for Aircraft Use.
TT-P-28	- Paint, Aluminum, Heat Resisting (1200°F).
TT-P-645	- Primer, Paint, Zinc-Molybdate, Alkyd Type.
TT-P-664	- Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant.
TT-P-1757	- Primer Coating, Zinc Chromate, Low-Moisture-Sensitivity.
VV-L-800	- Lubricating Oil, General Purpose, Preservative (Water-Displacing, Low Temperature).

MIL-STD-193L

DEPARTMENT OF DEFENSE

MIL-V-173	- Varnish, Moisture and Fungus Resistant (for Treatment of Communications, Electronics, and Associated Equipment).
MIL-F-495	- Finish, Chemical, Black, for Copper Alloys.
MIL-L-3150	- Lubricating Oil, Preservative, Medium.
MIL-M-3171	- Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on.
MIL-W-5044	- Walkway Compound, Nonslip, and Walkway Matting, Nonslip.
MIL-C-5541	- Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
MIL-C-8514	- Coating Compound, Metal Pretreatment, Resin-Acid.
MIL-A-8625	- Anodic Coatings, for Aluminum and Aluminum Alloys.
MIL-C-8837	- Coating, Cadmium (Vacuum Deposited).
MIL-C-10578	- Corrosion Removing and Metal Conditioning Compound (Phosphoric Acid Base).
MIL-T-10727	- Tin Plating: Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals.
MIL-L-11195	- Lacquer, Lusterless, Hot Spray.
MIL-P-11414	- Primer Coating; Lacquer, Rust Inhibiting.
MIL-C-11796	- Corrosion Preventive Compound, Petrolatum Hot Application.
MIL-V-12276	- Varnish, Phenolic, Baking.
MIL-T-12879	- Treatments, Chemical, Prepaint and Corrosion Inhibitive, for Zinc Surfaces.
MIL-L-13762	- Lead Alloy Coating, Hop Dip (for Iron and Steel Parts).
MIL-L-13808	- Lead Plating, Electrodeposited.
MIL-C-13924	- Coating, Oxide, Black, for Ferrous Metals.
MIL-P-14105	- Paint, Heat-Resisting (for Steel Surfaces).
MIL-C-14538	- Chromium Plating, Black (Electrodeposited).
MIL-C-14550	- Copper Plating (Electrodeposited).
MIL-P-14553	- Primer Coating; Dipping, Automotive.
MIL-P-14631	- Plate, Automobile, Individual, General Specification for.
DOD-P-15328	- Primer (Wash), Pretreatment (Formula No. 117 for Metals) (Metric).
MIL-C-16173	- Corrosion Preventive Compound, Solvent Cutback, Cold-Application.
DOD-P-16232	- Phosphate Coating, Heavy, Manganese or Zinc Base (for Ferrous Metals).
MIL-P-18317	- Plating, Black Nickel (Electrodeposited) on Brass, Bronze or Steel.

MIL-STD-193L

MIL-P-20689	- Plastic, Plastisol (for Coating Metallic Objects).
MIL-C-22750	- Coating, Epoxy, VOC-Compliant.
MIL-D-23003	- Deck Covering Compound, Nonslip, Rollable.
MIL-C-23217	- Coating, Aluminum, Vacuum Deposited.
MIL-P-23377	- Primer Coatings: Epoxy, Chemical and Solvent Resistant.
MIL-P-23408	- Plating: Tin-Cadmium (Electrodeposited).
MIL-D-24483	- Deck Covering, Spray-on, Nonslip.
DOD-E-24607	- Enamel, Interior, Nonflaming (Dry), Chlorinated Alkyd Resin, Semigloss (Metric).
MIL-C-26074	- Coatings, Electroless Nickel, Requirements for.
MIL-P-26915	- Primer Coating, Zinc Dust Pigmented, for Steel Surfaces.
MIL-M-45202	- Magnesium Alloys, Anodic Treatment of.
MIL-G-45204	- Gold Plating, Electrode Deposited.
MIL-L-46010	- Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting.
MIL-P-46105	- Primer Coating, Weld-Through, and Zinc-Rich.
MIL-L-46147	- Lubricant, Solid Film; Air Cured (Corrosion-Inhibiting).
MIL-R-46164	- Rustproofing for Military Vehicles and Trailers.
MIL-C-46168	- Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-L-52043	- Lacquer, Semi-Gloss, Cellulose Nitrate.
MIL-E-52835	- Enamel, Modified Alkyd, Camouflage, Lusterless.
MIL-P-53022	- Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free.
MIL-P-53030	- Primer Coating, Epoxy, Water Reducible, Lead and Chromate Free.
MIL-C-53039	- Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant.
MIL-C-53072	- Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection.
MIL-P-53084	- Primer, Cathodic Electrodeposition, Chemical Agent Resistant.
MIL-C-62218	- Corrosion Preventive Compounds, Cold-Application (for New and Fielded Motor Vehicles).
MIL-C-81562	- Coatings, Cadmium, Tin-Cadmium and Zinc (Mechanically Deposited).
MIL-P-81728	- Plating, Tin-Lead (Electrodeposited).
MIL-C-81751	- Coating, Metallic-Ceramic.
MIL-A-81801	- Anodic Coatings for Zinc and Zinc Alloys.

MIL-STD-193L

STANDARDS

FEDERAL

FED-STD-595 - Colors Used in Government Procurement.

DEPARTMENT OF DEFENSE

MIL-STD-186 - Protective Finishing for Army Missile Weapon Systems.
 MIL-STD-194 - Systems for Painting and Finishing Fire-Control Material.
 MIL-STD-865 - Selective (Brush Plating), Electro-deposition.
 MIL-STD-1223 - Non-Tactical Wheeled Vehicle Treatment, Painting, Identification Marking and Data Plate Standards.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Navy Publications and Printing Service Office, Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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. Unless otherwise specified, the issues are those cited in the solicitation.

DEPARTMENT OF TRANSPORTATION (DOT)

48 CFR 177.823 - Code of Federal Regulations.

(Application for copies should be addressed to the Department of Transportation, Washington, DC 20590).

ARMY REGULATIONS (AR)

AR 55-355 - Military Traffic Management Regulation.
 AR 381-143 - Logistics Policies and Procedures for U.S. Army.
 AR 385-30 - Safety Color Code Markings and Signs (Restricted).
 AR 385-63 - Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat.
 AR 708-1 - Logistics Support Policies for U.S. Army Forces Operating in the Mediterranean Littoral and/or Cumberland Army Depot, PA.
 AR 840-10 - Flags, Guidons, Streamers, Tabards and Automobile and Aircraft Plates.

FIELD MANUALS (FM)

MIL-STD-193L

- | | |
|----------|--|
| FM 5-36 | - Engineers - Route Reconnaissance and Classification. |
| FM 55-30 | - Transportation, Army Motor Transport Units and Operations. |

TECHNICAL BULLETINS (TB)

- | | |
|-------------|--|
| TB 34-9-249 | - Standardization of International Materiel, Marking of Military Vehicles. |
| TB 43-0209 | - Maintenance, Color, Marking and Camouflage, Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment. |
| TB 742-93-1 | - Inspection of Supplies and Equipment, Inspection and Test of Air and Other Gas Compressors. |

TECHNICAL MANUALS (TM)

- | | |
|---------------------|---|
| TM 55-1500-204-25/1 | - Transportation, General, Aircraft Maintenance Manual. |
|---------------------|---|

(Copies of other Government documents, 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.)

2.2 Non-Government publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-----------|--|
| ASTM A153 | - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware. |
| ASTM A380 | - Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems. |
| ASTM A792 | - Standard Specification for Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process, General Requirements. |
| ASTM B117 | - Standard Test Method of Salt Spray (Fog) Testing. |
| ASTM B633 | - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel. |
| ASTM D610 | - Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces. |

MIL-STD-193L

ASTM D3359

- Standard Test Methods for Measuring Adhesion by Tape Test.

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents may also be available in or through libraries or other informational services.)

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

MIL-STD-193L

3. DEFINITIONS

3.1 Camouflage pattern. A camouflage pattern is a system of contrasting color bands and patches applied over a base color. When applied to a vehicle, the bands and patches are keyed to the distinguishable identifying surface features so as to visually disrupt the silhouette. The visualized combination of pattern and colors blend with the background reflections and shadows to render undetectable the distinguishable features of the vehicle.

3.2 Chemical Agent Resistant Coating (CARC). CARC enhances the decontamination process for combat and support equipment that is subjected to surface contamination by chemical attack on the battlefield. Chemical agents deposited on the surface of CARC paints remain on the surface and can be removed with decontaminant procedures without destroying the coating.

3.3 Galvanic couple. A galvanic couple is a cell in which chemical change is the source of electrical energy. The cell consists of two dissimilar conductors in contact with each other and with an electrolyte, e.g. water, or of two similar conductors in contact with each other and with dissimilar electrolytes.

MIL-STD-193L

4. GENERAL REQUIREMENTS

4.1 Surfaces to be painted. Unless otherwise specified in individual engineering drawings, all vehicular parts and assemblies shall be cleaned, treated, primed, and topcoated as specified in this standard. Spare parts shall be prepared and painted the same as the original part.

4.2 Surfaces not to be painted. Painting shall not be required on certain types of surfaces, such as: fabrics, plastics, rubber, glass, dataplates, and metal parts not requiring corrosion protection or where paint interferes with function and surfaces intended for electrical contact or heat transmission. CARC shall not be used on surfaces which attain a temperature exceeding 400 degrees Fahrenheit (°F). Unless otherwise specified, surfaces exceeding 400°F shall be painted with heat resistant paint per table I.

4.3 Materials. Materials specified in this document shall conform to the requirements of their respective specifications.

4.4 Substitution for specified finishes, processes or materials. If, due to special conditions of service or design, the contractor considers that finishes, processes or materials other than those specified herein are necessary or more suitable, such finishes, processes or materials shall be used only upon receipt of prior written approval from the contracting officer. Unless otherwise specified, the contractor shall demonstrate the suitability of the proposed substitute by submission of samples, test specimens, test data or other evidence as required by the acquiring activity.

4.5 Phenolic environment. Unpainted zinc-base alloy parts and unpainted parts plated with either cadmium or zinc shall not be used in totally unventilated assemblies when such use may subject the parts to vapors emanating from phenolic insulating varnishes, phenolic encapsulating compounds, uncured phenolic materials or air-drying alkyd paints.

MIL-STD-193L

5. DETAILED REQUIREMENTS

5.1 Preparation and application. The preparation of surfaces and application of CARC shall be in accordance with MIL-C-53072 using materials as specified in table II of this standard. Paint finish applications not specified in MIL-C-53072 or this standard shall be applied as instructed by the coating manufacturer.

5.2 Condition of surface. All surfaces shall be examined just prior to painting to ensure that they are properly cleaned, pretreated, dry and free of oil, grease, wax, scale, rust or contamination of any kind. Immediately prior to painting, the surface shall be subjected to a water break test and evaluated in accordance with MIL-C-53072.

5.3 Surfaces after painting. After application of the final film of paint, the surface shall have a smooth, continuous, adherent film which is free of visual surface imperfections affecting performance or appearance, such as: incomplete coverage, runs, sags or blisters.

5.4 Paint finishes. Basic paint finishes shall meet the requirements specified in table II for steel, aluminum, magnesium, and other non-ferrous metals, wood and reinforced plastics. Finishes for special applications (exceptions to standard finishes) shall meet the requirements specified in table I. Each paint finish, unless otherwise specified, shall consist of cleaning, pretreatment, primer and topcoat, with coating thickness as specified in table III. If circumstances make it desirable, primer or intermediate coats may be applied to unassembled components of an assembly and the topcoat applied after assembly. When finish requirements are to be specified in drawings, contracts or in item specifications, the finish note shall be specified in such a way to permit the contractors the option of utilizing any one of the approved coating materials.

5.5 Metallic finishes. Metallic coatings and platings for application to assemblies, or parts thereof, shall be in accordance with table IV as applicable.

5.6 Miscellaneous treatments. Finishes (or processes) other than paints or platings for application to assemblies or parts shall be in accordance with table V. Specific finishes shall be selected with respect to the base metal to be protected.

5.7 Galvanic couples. Permissible dissimilar metal couples are shown in table VI by the graphs in the right column. Members of groups connected by lines shall form permissible couples where corrosion, as a result of galvanic action, is most likely to occur.

5.8 Tests.

5.8.1 Paint Adhesion. Paint adhesion shall be verified with a scribe tape test after the top coat is cured. The location for the scribe tape test shall be in an obscure location and be

MIL-STD-193L

acceptable to the cognizant Government quality assurance representative. The test locations shall be routinely varied among the following:

- a. Directly adjacent to a weld.
- b. On or directly adjacent to a machine cut or sheared edge.
- c. Any mechanically formed surface where lubricants are used.
- d. Paint touch-up areas.

5.8.1.1 Scribe tape test procedure. The following test procedure shall be followed for the scribe tape test (all dimensions are approximate):

- a. Scribe four 1-inch lines completely through the paint finish, 1/16 to 3/32-inch apart.
- b. Scribe another four 1-inch lines, 1/16 to 3/32-inch apart, and 90 degrees to the first set of lines. The resulting pattern shall be nine 1/16 to 3/32-inch squares.
- c. Press a length of A-A-884, A-A-1830 or any commercially available tape with a minimum adhesion rating of 45 ounces per inch of width firmly over the scribed pattern rubbing out all air pockets.
- d. Wait 10 seconds minimum. Grasp a free end of the tape and at a rapid speed strip it from the painted surface by pulling the tape back upon itself at 180 degrees. The removal of two or more squares of topcoat, topcoat primer or topcoat primer-pretreatment coating shall be cause for rejection. Removal of overspray does not constitute test failure.
- e. Upon completion of the adhesion test, the scribe marks shall be feathered into the adjacent area and touched-up per MIL-C-53072.

5.8.2 Paint film thickness. Test methods to measure paint film thickness shall be per MIL-C-53072. Dry film thickness of primers and topcoats shall be within limits specified in table III. The test gage shall be capable of being calibrated to known standards. Sufficient measurements shall be made to ensure that sufficient film has been applied irrespective of part configuration. Wet films shall be checked with a wet film gage. Total dry film thickness on flat, accessible areas shall not exceed 5 mils and 75 percent (%) of the surface area of each test unit shall meet the requirements of table III.

5.8.3 Corrosion resistance. The corrosion resistance for all but electrodeposited cathodic primers shall be verified in accordance with the salt spray test method of ASTM B117 (5% salt). The test shall be run for 336 hours on parts or the standard test panels specified in ASTM B117 cross scribed to the base metal. Evaluation shall be in accordance with ASTM D610 (No. 8) with no blisters greater than 1.0 mm diameter. Rust creeping from the scribe line shall not exceed one-eighth inch. Cathodic electrodeposited primers shall be subjected to a 1000 hour salt spray test in accordance with ASTM B117 (5% salt). Test panels shall be cross scribed to the base metal. Test panels shall show no more than a trace of rusting (ASTM D610, No. 8) and no blister larger than one millimeter in diameter. The cross scribe area shall not exceed 1/8 inch

MIL-STD-193L

score rust creeping on either side of the scribe line. The test panels shall also be tested for cross hatch adhesion and shall satisfy classification 3B of ASTM D3359.

5.9 Colors. Unless otherwise specified, colors for painting interior and exterior surfaces of vehicles, construction and material handling equipment and colors for markings shall be in accordance with table VII (Parts 1 and 2, respectively), except for Chemical Agent Resistant Coating (CARC) colors, which shall be in accordance with table VIII. All color numbers refer to the colors specified in FED-STD-595. Camouflage paints purchased from manufacturers listed in Qualified Products Lists, for respective specifications, shall provide the proper colors and the necessary visual and infrared spectral reflectance. Camouflage pattern painting specified in the contract shall be in addition to the requirements specified herein and shall conform to the pattern stipulated. The basic Army camouflage three color pattern colors are: green 383, 34094; brown 383, 30051; and black 37030. CARC color for desert application is tan 686, 33446.

5.10 Markings. Unless otherwise specified, markings shall be in accordance with table VII. Equipment painted with CARC shall have, in close proximity to the data plate, the word CARC stenciled on it in contrasting colors with lusterless black or green 383. The letters shall not exceed one inch. An optional identification data (ID) plate or decal may be used for the marking.

MIL-STD-193L

6. NOTES

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

6.1 Intended use. The intent of this document is to standardize the requirements, materials and procedures to be followed for the uniform application or tailoring of: acceptable corrosion protection means, paint colors and markings for a wide variety of military vehicles, construction and material handling equipment, and associated spare parts.

6.2 Issue of DoDISS. When this standard is used in acquisition, the applicable issue of the DoDISS must be cited in the solicitation (see 2.1.1 and 2.2).

6.3 Subject term (key word) listing.

Camouflage pattern
CARC
Chemical agent resistant coating (CARC)
Colors
Corrosion resistance
Galvanic couples
Metallic coatings
Paint adhesion
Paint film thickness
Paint finishes
Phenolic environment
Scribe tape test

6.4 Changes from previous issue. Vertical lines or asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MIL-STD-193L

TABLE I. Special finish requirements.

Components or requirements	Finish processes
Ammunition containers, racks, feedtrays (surfaces in direct contact with ammunition). NOTE: Surfaces not in direct contact with ammunition shall be finished as specified in table II.	<u>Ferrous</u> 1. Clean per applicable method of TT-C-490. 2. Treatment optional per type I of TT-C-490. 3. Apply clear epoxy coating per MIL-C-22750.
	<u>Aluminum</u> 1. Clean and treat per MIL-C-5541 or anodize per MIL-A-8625. 2. Do not prime or paint.
	<u>Plastic</u> Do not prime or paint.
Battery boxes and associated parts.	Finish per table II or: 1. Clean per applicable method of TT-C-490. 2. Treatment optional per type I of TT-C-490. 3. Apply plastisol per type II of MIL-P-20689 (1/32 to 1/8-inch thick).
Brake drums.	Primer source and application procedure to be approved by the U.S. Army Tank-automotive and Armaments Command (TACOM).
Corrosion-resistant steels.	Passivate per ASTM A380 or QQ-P-35 when not to be painted.
Dissimilar metals.	1. Contact surfaces of dissimilar metals shall be plated or treated and primed. 2. Fasteners shall be coated with unreduced epoxy primer MIL-P-53022 or MIL-P-53030 prior to assembly. 3. Compatibility of coupled metals shall be in accordance with table VI.
Electrical varnish - moisture- and fungus-resistant.	Coat with MIL-V-173.
Enamel (non-CARC system).	1. Clean and pretreat per table II. 2. Prime per TT-E-485, TT-P-645, TT-P-664, TT-P-1757, MIL-P-14553, MIL-P-23377 or MIL-P-53030. <u>1/</u> 3. Topcoat: gloss per TT-E-489; semigloss per TT-E-485, TT-E-529 or DOD-E-24607; lusterless per TT-E-527; camouflage per MIL-C-46168, MIL-E-52835 or MIL-C-53039.

MIL-STD-193L

TABLE I. Special finish requirements - Continued.

Components or requirements	Finish processes
Exhaust system.	Corrosion-resistant exhaust components, when not exposed to outside view, may be left unpainted. When exposed to view, use heat resisting paint per MIL-P-14105.
Fire-control components.	Finish in accordance with MIL-STD-194.
Fuel tanks (ferrous, aluminum and terne-coated).	<ol style="list-style-type: none"> Exterior surfaces unless otherwise specified shall be cleaned, treated, primed and painted as specified in table II. Interior surfaces of carbon steel tanks shall be cleaned, treated and coated with Buna-N type elastomeric coating. Coating source and application procedure to be approved by TACOM. Interior surfaces of aluminum tanks: <ol style="list-style-type: none"> Clean and condition per MIL-C-10578. Rinse with warm water. Dry with forced dry air. Interior surfaces of terne-coated or corrosion resisting steel tanks do not require finish.
Heat-resisting paint.	<u>Ferrous surfaces</u> Coat per MIL-P-14105. <u>Aluminum surfaces</u> 5. Coat per TT-P-28 or MIL-P-14105.
Lacquer (non-CARC system).	<ol style="list-style-type: none"> Clean and pretreat per table II. Prime per TT-P-664, TT-P-1757, MIL-P-11414 or MIL-P-53030. <u>1/</u> Topcoat: gloss per TT-L-32; semigloss per MIL-L-52043 or lusterless per MIL-L-11195.
Missile support vehicles.	Finish in accordance with MIL-STD-186.
Non-slip coating.	<ol style="list-style-type: none"> Finish per table II, except for topcoat which is optional. Apply non-slip coating types II, III, or IV of MIL-W-5044, or MIL-D-23003 or MIL-D-24483. Apply CARC topcoat per table II.
Rustproofing.	Coat with corrosion preventive compound per MIL-C-62218 in accordance with MIL-R-46164.
Solid film lubricant.	For general applications, use MIL-L-46010, Type I (Heat Cure) or MIL-L-46147 (Air Cure). For severe applications, use MIL-L-46010, Type II (Heat Cure).

MIL-STD-193L

TABLE I. Special finish requirements - Continued.

Components or requirements	Finish processes
Springs.	Finish as specified by procuring activity: <ol style="list-style-type: none"> 1. Clean per applicable method of TT-C-490 and enamel per TT-E-496. 2. Mechanically deposit zinc per type II of MIL-C-81562 (preferred), or cadmium, or electroplate per type II of QQ-P-416 or ASTM B633 type II. When electroplated, bake within one hour after plating. 3. No finish required for springs operating in grease or oil. 4. Paint leaf springs as specified in table II or apply corrosion preventive compound, grade 4 of MIL-C-16173, color green 383. 5. Closely coiled springs, where plating or painting of internal surfaces is not feasible, shall be coated with corrosion preventive compound per class 2 of MIL-C-11796 or grade 2 of MIL-C-16173.
Weld through primer.	Contact areas of ferrous sheet metal (0.125 inch thick and under) shall be primed as follows before welding: <ol style="list-style-type: none"> 1. Clean per applicable method of TT-C-490. 2. Prime each contact surface per MIL-P-46105 or MIL-S-53018 or coating source and application approved by TACOM

1/ TT-P-1757 shall be used on non-ferrous surfaces, except on magnesium use CARC paint per table I.

MIL-STD-193L

TABLE II Chemical agent resistant coating (CARC) systems.

Surface	Type (exposure)	Requirements <u>1/</u> , <u>2/</u> & <u>3/</u>	Material Specifications
Iron & Steel	Polyurethane (exterior & interior)	Clean Pretreat Prime Topcoat	TT-C-490, method optional TT-C-490, Type I or III <u>7/</u> <u>8/</u> MIL-P-53022, MIL-P-53030 or MIL-P-53084 <u>4/</u> MIL-C-46168 or MIL-C-53039
	Epoxy (interior)	Clean Pretreat Prime Topcoat	TT-C-490, method optional TT-C-490, Type I or III <u>8/</u> MIL-P-53022, MIL-P-53030 or MIL-P-53084 MIL-C-22750
Aluminum alloys	Polyurethane (exterior & interior)	Clean & treat or Anodize Prime Topcoat	MIL-C-5541 MIL-A-8625 MIL-P-53022, MIL-P-53030 or MIL-P-53084 MIL-C-46168 or MIL-C-53039
	Epoxy (interior)	Clean & treat Prime Topcoat	MIL-C-5541 MIL-P-53022, MIL-P-53030, or MIL-P-53084 MIL-C-22750
Magnesium	Polyurethane (exterior)	Clean & treat Prime Topcoat	MIL-M-45202, type I or MIL-M-3171, type III MIL-P-53022 or MIL-P-53030 MIL-C-46168 or MIL-C-53039
	Epoxy (interior)	Clean & treat Prime Topcoat	MIL-M-45202, type I or MIL-M-3171, type III MIL-P-53022 or MIL-P-53030 MIL-C-22750
Cadmium, copper, lead, terne-coat, tin, & zinc	Polyurethane (exterior or interior)	Treat Prime Topcoat	TT-C-490, type III <u>5/</u> MIL-P-53022 or MIL-P-53030 MIL-C-46168 or MIL-C-53039
	Epoxy (interior)	Treat Prime Topcoat	TT-C-490, type III <u>5/</u> MIL-P-53022 or MIL-P-53030 MIL-P-22750
Wood	Polyurethane (exterior or interior)	Topcoat <u>6/</u>	MIL-C-46168 or MIL-C-53039 <u>6/</u>

MIL-STD-193L

TABLE II Chemical agent resistant coating (CARC) systems - Continued.

Surface	Type (exposure)	Requirements <u>1/</u> , <u>2/</u> & <u>3/</u>	Material Specifications
Fiberglass-reinforced plastic	Polyurethane (exterior or interior)	Treat Prime Topcoat	DOD-P-15328 MIL-P-53030 or MIL-P-53022 MIL-C-46168 or MIL-C-53039
	Epoxy (interior)	Prime Topcoat	DOD-P-15328, MIL-P-53022 or MIL-P-53030 MIL-C-22750

- 1/ See table I for special requirements on specific materials or components.
- 2/ Coating system selected shall show adequate compatibility and adhesion between primer and topcoat.
- 3/ Do not use on surfaces which attain a temperature in excess of 400°F. Use high temperature coating per MIL-P-14105 on steel surfaces that exceed 400°F.
- 4/ The zinc rich primer shall be capable of passing the salt spray corrosion resistance requirements specified in MIL-P-53084 (ME). Test panels shall receive the same surface cleaning and pretreatment as the actual production.
- 5/ Chemical treatment per MIL-T-12879 is preferred for zinc surfaces.
- 6/ Coating thickness shall be 1.8 - 2.2 mils dry film and no primer shall be used.
- 7/ For stainless steel, clean and passivate per QQ-P-35 or ASTM A380.
- 8/ Phosphate coated parts (TT-C-490 Type I) which are unpainted or have unpainted areas and require added corrosion protection shall be coated with preservative oil VV-L-800 or MIL-L-3150.

MIL-STD-193L

TABLE III. Dry film thickness.

Specification	Thickness in mils
TT-E-485	1.0 - 1.5
TT-E-489	0.8 - 1.2
TT-C-490, Type III	0.3 - 0.5
TT-E-496	0.8 - 1.2
TT-E-522	1.0 - 1.5
TT-E-527	0.8 - 1.2
TT-E-529	0.8 - 1.2
TT-L-32	0.8 - 1.2
TT-P-28	0.8 - 1.2
TT-P-664	1.0 - 1.5
TT-P-1757	0.4 - 0.6 <u>2/</u>
MIL-C-8514	0.3 - 0.5
MIL-L-11195	0.8 - 1.2
MIL-P-11414	0.6 - 0.8
MIL-V-12276	0.8 - 1.2
MIL-P-14105	1.5 - 2.5
MIL-P-14553	0.4 - 0.6
DOD-P-15328	0.3 - 0.5
MIL-C-22750	1.3 - 1.7
DOD-E-24607	0.8 - 1.2
MIL-P-26915	2.0 - 3.0
MIL-P-46093	0.4 - 0.6
MIL-P-46105	2.0 - 3.0
MIL-C-46168	1.8 - 3.2 <u>3/</u> <u>4/</u>
MIL-L-52043	0.8 - 1.2
MIL-E-52835	1.8 - 3.2 <u>4/</u>
MIL-P-53018	4.0 - 8.0 (wet)
MIL-P-53022	1.0 - 1.5 <u>1/</u>
MIL-P-53030	1.0 - 1.5 <u>1/</u>
MIL-C-53039	1.8 - 3.2 <u>1/</u> <u>3/</u> <u>4/</u>
MIL-P-53084	0.8 - 1.5

1/ A maximum thickness of 1.5 mils is recommended; higher maximum film thicknesses are acceptable provided the contractor can prove that paint film adhesion is not jeopardized.

2/ On ferrous metal surfaces, film thickness shall be 0.6 - 0.8 mil.

3/ On wood, film thickness shall be 1.8 - 2.2 mils.

4/ Per each coat of paint. (Excessive paint thickness will compromise adhesion and CARC requirements.)

MIL-STD-193L

TABLE IV. Metallic coatings.

Materials	Description	Applicable specifications
Aluminum	Hot dipped Vacuum deposited	ASTM A792 MIL-C-23217
Cadmium	Electroplated Mechanically deposited Vacuum deposited Brush plating	QQ-P-416, type II MIL-C-81562, type II MIL-C-8837 MIL-STD-865
Chromium	Hard (industrial) Black Brush plating	QQ-C-320, class 2 MIL-P-14538 MIL-STD-865
Copper	Electrodeposit Brush plating	MIL-C-14550 MIL-STD-865
Gold	Electrodeposit Brush plating	MIL-G-45204 MIL-STD-865
Lead	Electroplated Hot-dipped	MIL-L-13808 MIL-L-13762
Metallic-ceramic	Coating	MIL-C-81751
Nickel	Electroplated Electroless Black Brush plating	QQ-N-290, class 2 MIL-C-26074, class 2 MIL-P-18317 MIL-STD-865
Silver	Electrodeposit Brush plating	QQ-S-365 MIL-STD-865
Tin	Electroplated Hot-dipped Brush plating	MIL-T-10727, type I MIL-T-10727, type II MIL-STD-865
Tin-cadmium	Electrodeposit	MIL-P-23408
Tin-Lead	Electroplated	MIL-P-81728
Zinc	Electroplated Hot-dipped Mechanically deposited	ASTM B633 ASTM A153 plus MIL-T-12879 MIL-C-81562, type II

MIL-STD-193L

TABLE V. Miscellaneous treatments.

Description	Applicable specifications
Anodic coating for aluminum	MIL-A-8625, type I or II
Anodic hard coating for aluminum	MIL-A-8625, type III
Anodic coating for magnesium	MIL-M-45202
Anodic coating for zinc	MIL-A-81801
Black oxide finish for copper	MIL-F-495
Black oxide coating for iron and steel	MIL-C-13924
Chemical conversion coating for aluminum	MIL-C-5541
Chemical treatment for zinc surfaces	MIL-T-12879
Manganese phosphate coating	DOD-P-16232, type M
Passivation treatment for corrosion-resisting steel	ASTM A380 or QQ-P-35
Zinc phosphate coating (heavy)	DOD-P-16232, type Z
Zinc phosphate coating (light)	TT-C-490, type I

MIL-STD-193L

TABLE VI Galvanic couples.

Group No.	Metallurgical Category	E.M.F. (Volt)	Permissible Couples <u>1/</u>
1	Gold, solid and plated; gold-platinum alloys; wrought platinum	+0.05	○
2	Rhodium, graphite	+0.05	● ↓ ○
3	Silver, solid or plated; high silver alloys	0	● ↓ ● ↓ ○
4	Nickel, solid or plated; monel metal; high nickel-copper alloys; titanium	-0.15	● ↓ ● ↓ ○
5	Copper, solid or plated; low brasses or bronzes; silver solder; German silver; high copper-nickel alloys; nickel-chromium alloys; austenitic stainless steels	-0.20	● ↓ ● ↓ ● ↓ ○
6	Commercial yellow brasses and bronzes	-0.25	● ↓ ● ↓ ● ↓ ○
7	High brasses and bronzes; Naval brass; Muntz metal	-0.30	● ↓ ● ↓ ● ↓ ○
8	18% chromium type corrosion-resistant steels	-0.35	● ↓ ● ↓ ● ↓ ○
9	Chromium, plated; tin, plated; 12% chromium type corrosion-resistant steels	-0.45	● ↓ ● ↓ ● ↓ ○
10	Tin-plate; terneplate; tin-lead solders	-0.50	● ↓ ● ↓ ● ↓ ○
11	Lead, solid or plated; high lead alloys	-0.55	● ↓ ● ↓ ● ↓ ○
12	Aluminum; wrought alloys of the Duralumin type	-0.60	● ↓ ● ↓ ● ↓ ○
13	Iron, wrought, gray, or malleable; plain carbon and low alloy steels; Armco iron	-0.70	● ↓ ● ↓ ● ↓ ○
14	Aluminum; wrought alloys other than Duralumin type; aluminum, cast alloys of the silicon type	-0.75	● ↓ ● ↓ ● ↓ ○
15	Aluminum, cast alloys other than silicon type; cadmium, plated and chromated	-0.80	● ↓ ● ↓ ● ↓ ○
16	Hot-dip zinc plate; galvanized steel	-1.05	● ↓ ○
17	Zinc, wrought; zinc-base die-casting alloys; zinc, plated	-1.10	● ↓ ●
18	Magnesium and magnesium-base alloys, cast or wrought	-1.60	●

1/ Members of groups connected by lines are considered as permissible couples. Permissible couples represent a low galvanic effect. However, this should not be construed as being devoid of galvanic action. ○ indicates the most cathodic member of the series, ● an anodic member, and the arrows the anodic direction.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings.

Equipment and Marking	Colors	Placement
<u>Part 1 - Colors for equipment:</u>		
1. Vehicles and construction equipment unless otherwise indicated below.	<p>Lusterless camouflage pattern in accordance with appropriate technical publications.</p> <p>Lusterless green 383.</p> <p>Nonslip compound: White, MIL-D-23003 and lusterless green 383.</p>	<p>Exterior surfaces.</p> <p>Interior surfaces.</p> <p>Walking areas (catwalks, walkways, platforms, cabs, fenders, frames, guards foot-operated controls, mounting steps, ladders, tops of bumpers, slope and deck plates, turret floors, crew).</p>
2. Fire-fighting vehicles, auxiliary vehicles assigned exclusively for firefighting or protection against fires, and airfield crash rescue vehicles.	Gloss red 11136 or gloss yellow 13538 when in nontactical use. In hot climates, shall be gloss white 17875.	Exterior and interior surfaces.
3. Repair and utility vehicles, including attachments used for highway construction or maintenance.	Gloss yellow 13538. This does not apply to construction equipment assigned to tactical units.	Exterior and interior surfaces.
4. a. Material handling equipment, including aircraft towing and fuel and oil dispensing vehicles used in nontactical areas.	Gloss yellow 13538, with the exception that the mast, the overhead guard, and the top surface of the cowl shall be painted lusterless black 37038.	Exterior and interior surfaces.
b. Material handling equipment, including fuel and oil dispensing equipment used in tactical areas.	<p>Lusterless camouflage pattern in accordance with appropriate technical publications.</p> <p>Lusterless green 383.</p>	<p>Exterior surfaces.</p> <p>Interior surfaces.</p>

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 1 – (Continued)</u>		
5. Garbage and refuse collection trucks in nontactical use.	Gloss white 17875, gloss black 17083.	Exterior and interior surfaces. Top of hood, handles and control levers, and stepping areas of running board. Stepping areas may be covered with black conformable nonslip walkway matting, MIL-W-5044, type IV.
6. Commercial design vehicles in administrative use. (Bodies on vehicles need not be painted if constructed of aluminum, stainless steel or other corrosive resistant material and when this is in accordance with accepted commercial practice.)	Refer to MIL-STD-1223	Refer to MIL-STD-1223
7. Vehicles and equipment used in connection with approved research and development test projects.	Any color deemed appropriate by the head of the responsible activity.	Exterior and interior surfaces.
8. Calibration vehicles in CONUS and major oversea commands.	Forest green or gloss white 17875. Semigloss green 24533. Lusterless gray 36118.	Exterior surfaces. Walls, ceiling, doors, fittings and mounted equipment. Floors.
9. Refrigerator vans in nontactical use in hot climates.	Gloss white 17875 or forest green.	Applicable exterior surfaces on authorization by the theater commander.
10. Water tank vehicles in nontactical use in hot climates.	Same as item 9.	Same as item 9.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 1 – (Continued)</u>		
11. Van-type vehicles in nontactical use in hot climates assigned to centers or schools for the purpose of training personnel in the operation of equipment installed therein.	Same as item 9.	Same as item 9.
12. Van-type vehicles and shelters in nontactical use in hot climates in which installed equipment would be adversely affected or where personnel would not be able to accomplish assigned technical functions due to excessive heat from solar radiation.	Same as item 9.	Same as item 9.
13. Buses in nontactical use in hot climates.	Same as item 9.	Same as item 9.
14. a. Tracked combat vehicles and special purpose armored hull-type vehicles. Exception: See 14b.	Lusterless camouflage pattern in accordance with appropriate technical publications. Gloss white 17875. White nonslip deck covering compound, MIL-D-23003 or black, conformable nonslip walkway matting, MIL-W-5044, type IV (see NOTE 1). Lusterless green 383.	Exterior surfaces. Interior surfaces. Over primed, painted surface of crew compartment or turret floor. Surfaces, such as doors and hatches, which become exterior surfaces during operational use.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 1 – (Continued)</u>		
b. M113 personnel carrier family of vehicles.	Lusterless camouflage pattern in accordance with appropriate technical publications.	Exterior surfaces.
	Semigloss green 24533. Lusterless forest green, then coated with olive drab nonslip walkway matting, MIL-W-5044, type IV (see NOTE 1).	Interior surfaces, unless otherwise directed.
	Lusterless green 383.	Surfaces, such as doors and hatches, which become exterior surfaces during operational use.
c. Vehicles and construction equipment in nontactical use, in Army units not subject to the Army camouflage policy and not identified in items 2, 3, 4a, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, and 20.	Lusterless green 383.	Exterior surfaces.
	Lusterless green 383.	Interior surfaces, unless otherwise directed.
d. Vehicles, construction equipment and materials handling equipment in tactical use from new production, from depot overhaul, and coming from depot stock.	Lusterless camouflage pattern in accordance with appropriate technical publications.	Exterior surfaces, unless otherwise directed.
	Lusterless green 383.	Interior surfaces, unless otherwise directed.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 1 – (Continued)</u>		
15. Interior surfaces of van-type bodies, equipped with interior lighting, in which personnel are required to perform certain detail operations.	Semigloss green 24533. Where greater brightness is required shall be painted semigloss white 27875. Semigloss green 24533. Lusterless gray 36118. Semigloss green 24410. Semigloss gray 26492.	Ceilings. Walls, doors and fittings. Floors. Equipment cabinets of guided missile system vans. Panels.
16. Commercial design vehicles assigned to Armed Forces Police units.	Gloss black 17038.	Exterior and interior surfaces.
17. Commercial design vehicles used for military police traffic accident prevention.	Gloss white 17875, when deemed necessary by responsible commander.	Exterior and interior surfaces.
18. Vehicles used for intelligence, criminal investigation, and similar purposes, requiring concealment of the true identity of the activity involved.	Painted and marked as deemed appropriate by the responsible commander. Proper identification of such vehicles shall be marked in an inconspicuous location as prescribed in applicable technical publications and AR 381-143.	Exterior and interior surfaces.
19. Ground support equipment in Army units subject to Army camouflage policy.	Lusterless camouflage patterns in accordance with appropriate technical publications.	Exterior surfaces.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 1 – (Continued)</u>		
20. Ambulances in tactical use.	Lusterless camouflage pattern in accordance with appropriate technical publications.	Exterior surface and cab interior.
	Lusterless green 383.	Interior of cab and interior surfaces and doors which become exterior surfaces during operational use.
	Black.	Interior of cab when vehicle is commercial design procured with standard color options.
	Semigloss green 24533 or gloss white 17875.	Interior of body.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - Colors for markings:</u> <u>General.</u> Markings shall be adhesive backed markers or paint conforming to color requirements.		
1. National symbol (five-pointed star) a. Tactical and combat vehicles and related equipment, including support and special purpose vehicles in CONUS and overseas. Does not apply to vehicles and equipment assigned to TOE Medical Units. b. Mounted equipment.	Star will be of a size to fit into a three-inch diameter circle, in lusterless black 37038. Lusterless black 37038. Lusterless black 37038.	Star shall be applied at time of manufacture or by depots only when materiel is specifically designated for issue to U.S. Army units. One each, centered on front and rear, on any suitable vertical or near vertical surface such as bumpers and tailgates, where it will not be obscured by canvas items, gasoline cans, pioneer tools or other objects. Normally, stars shall not be applied to ambulances or other medical dedicated vehicles or to ground support equipment at Army airfields in CONUS. Only where there is no more suitable surface on vehicle.
2. Unit identification (abbreviations representing the complete identification of the unit to which the vehicle or equipment is assigned). Specific abbreviations to be used and methods of application are prescribed in TB 742-93-1 (see NOTE 2).	Lusterless black 37038.	a. Markings shall be uniform Gothic style letters. The numeral to be the largest size practical to use in available space but not to exceed four inches in height.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		<p>b. Normally, markings shall appear on both front and rear of each item of equipment, usually on the bumpers when so equipped. Where a more suitable surface is available, such surface shall be used provided that the location is not in conflict with the location of other prescribed markings. Where a suitable surface is not available on the front or rear of an item of equipment, markings shall be applied in an appropriate location on the sides of the item.</p> <p>c. Markings shall be applied to vehicles and equipment by the organization to which materiel is assigned. Markings shall be maintained on vehicles and equipment at all times but will be removed when the item is permanently transferred from the operating unit.</p>

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		d. When directed by the responsible commander for security purposes, the first two categories of markings (a and b of NOTE 2) shall be thoroughly removed from all vehicles and equipment being shipped with units from CONUS to overseas commands. To insure effective removal, the original figures shall be physically erased rather than painted over.
<p>3. Agency identification, i.e., U.S. Army and registration number.</p> <p>a. Agency identification and registration number to be carried by vehicles and by construction equipment camouflaged in accordance with Part 1, items 1, 4b, & 6.</p>	<p>Exterior: none required.</p> <p>Interior: lusterless black 37038 or other color as appropriate.</p>	<p>Exterior: none permitted.</p> <p>Interior: any appropriate location which is accessible from outside of a locked vehicle.</p>

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
b. Army identification, i.e., "U.S. ARMY" shall be carried by those vehicles, construction equipment and material handling equipment in nontactical use, in Army units not subject to the Army camouflage policy, and equipment as identified in Part 1, items 2, 3, 4a, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14c, 14d, 16 and 17.	Lusterless black 37038.	Marking shall be in uniform Gothic style letters. The letters to be of a size practical to use in available space, but not to exceed four inches in height. Normally, agency identification shall appear on both sides of each item of equipment.
c. Registration number assigned in accordance with AR-708-1 shall be carried by those vehicles, construction equipment and material handling equipment which carry identification markings, i.e., U.S. Army, in accordance with criteria set forth in item 3b above.	Lusterless black 37038.	Exterior: both sides and rear in uniform Gothic letters, no larger than four inches high.
4. General officer identification for vehicles.		
a. Plate.	Gloss enamel with rhodium plated stars, in accordance with AR 840-10 and MIL-P-14631.	Right end of the front bumper. If it causes interference with lights or functional components of the vehicle, mount in front center. Plate shall be removed or covered when general officer is not riding in vehicle.
b. Flag.	See AR 840-10.	

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
5. Weight classification for bridge crossing. (For weight classification numbers, see FM 5-36.)	Black numerals on a yellow circular background nine inches in diameter. When towing another vehicle, the weight classification number of the combination shall be shown with the letter "C" in red above the number.	On the front of applicable self-propelled vehicles. For design of plate and its mounting, see TB 43-0209.
a. All vehicles with a gross weight over 3 tons; all trailers with a rated payload of 1-1/2 tons and over.	On vehicles painted in gloss colors use gloss yellow 13538, gloss black 17038 or gloss red 11136. On vehicles painted in semigloss or lusterless colors use lusterless yellow 33538, gloss black 17038 or gloss red 11136. On vehicles painted lusterless colors in accordance with camouflage policy, weight classification numbers (three inches high) shall be painted in lusterless black directly onto camouflage pattern. For camouflage purposes, marking shall be lusterless black 37038 on a lusterless green 383 background.	
b. Combination vehicles.	Black numerals on a yellow circular background six inches in diameter. Color numbers same as above.	

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
6. Safety		
a. Stripes (vehicles and equipment in nontactical use which because of size, construction or function present a possible hazard).	Alternate gloss yellow 13655 and gloss black 17038 stripes in accordance with AR 385-30.	Normally, stripes shall be applied only to the rear. They may also be applied to the front and certain side surfaces when conditions so warrant.
b. "FLAMMABLE" and "NO SMOKING WITHIN 50 FEET" - vehicles used for bulk transportation of gasoline, fuel oil or other flammable liquids by Army units subject to the Army camouflage policy.	Lusterless black 37038. The word "FLAMMABLE" in six-inch letters and the words "NO SMOKING WITHIN 50 FEET" in three-inch letters.	On both sides and rear of body. "NO SMOKING WITHIN 50 FEET" shall be placed on a line below the word "FLAMMABLE."
"FLAMMABLE" and "NO SMOKING WITHIN 50 FEET" - vehicles used for bulk transportation of gasoline, fuel oil or other flammable liquids by Army units which are not subject to the Army camouflage policy or in nontactical use.	When the vehicle is commonly used on public highways in CONUS, Title 48, Sec. 177.823, code of Federal Regulations, Department of Transportation (DOT), requires six inch block letters in gloss red 11105 or 11136 for the word "FLAMMABLE" and three-inch block letters for the words "NO SMOKING WITHIN 50 FEET", also in gloss red 11105 or 11136. A back-ground extending one inch beyond lettering all around will be gloss white 17875. If available, reflective markings shall be used.	On both sides and rear of body. "NO SMOKING WITHIN 50 FEET" shall be placed on a line below the word "FLAMMABLE." Vehicles used infrequently on public highways shall employ removable or reversible signs which shall be securely fastened while in use. These safety markings shall be applied upon receipt by the using service.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
c. "GALS CAP" Fuel and oil dispensing vehicles and equipment used for servicing aircraft.		On side of tank near each manhole cover. In addition, types of fuel or oil by military designation shall be marked nearby.
d. Placards (vehicles carrying explosive or other dangerous articles).		
(1) Over public highways.		Placards shall be used in accordance with applicable DOT regulations and AR 55-355.
(2) Training areas.		Placards shall be used in accordance with applicable DOT regulations and AR 385-63.
e. Reflective markings (vehicles and ground support equipment used on airfield flight lines).		As specified in TM-55-1500-204-25/1.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
f. Flags (all vehicles not painted in accordance with Part 1, items 2 & 10 and Part 2, item 6e).		<p>Vehicles shall bear a distinctive flag whenever operating on landing areas, runways, taxiways or peripheral roads at airfields. The flag shall be square, at least three feet on each side, and shall be divided into nine equal squares forming a checkerboard pattern with the center and corner squares in international orange and the remaining four squares in white.</p> <p>A red flag shall be mounted on vehicles to indicate danger when considered necessary to caution personnel of a hazardous condition in the area.</p>
g DA Label 76 (A Good Driver) (to promote good driving).		<p>Display in all motor vehicles to be readily visible to the driver. Requisition through normal publication channels.</p>
7. Red Cross insignia.	Lusterless red 31136 on lusterless white 37875.	<p>On tactical type ambulance, cross shall be approximately 36 to 48 inches square and shall be placed on roof, both sides, rear, and front, if practicable. On other medical dedicated TOE vehicles, a three-inch square cross shall be placed on front and rear in lieu of the national symbol.</p>

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
8. Military police and security guard tactical type vehicles:		
a. "MILITARY POLICE"	Gloss black 17038 and lusterless white 37875 (black letters on white background).	As specified in applicable DA technical publications. On 1/4-ton military design trucks, a horizontal strip with lettering shall be placed under the windshield and on a disc covering the spare wheel.
b. "SECURITY POLICE" (at class II installations and activities).	Same as 8a above, except the words "SECURITY POLICE" shall be used in lieu of "MILITARY POLICE".	Same as 8a above.
9. Rifle and pistol team vehicles (decals of approved design).		On both sides of vehicle.
10. Calibration service vehicles.		In accordance with applicable DA technical publications.
11. Convoy markings. As prescribed by FM 55-30.	Serial letter of number shall be black on reflective signboard background.	

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
12. Tactical markings (may consist of stripes, geometrical figures, other simple designs, or naming of individual vehicle). They shall be used to provide a more visible means of identifying the vehicles of tactical units by personnel of those units during tactical operations. They will be of a suitable size to facilitate identification from ground or from a reasonable distance. They shall be designed to be as nearly unintelligible as possible to enemy observation. Under no circumstances shall they in any way represent the numerical designation or distinctive insignia of any unit. Under actual combat conditions, no written record shall be made or published on the system of tactical markings used.	Any appropriate color.	As prescribed by commanders of major Army commands. Any changes shall be approved by those commanders.
13. Priority signs shall be authorized by the area commander and are valid only within the area under his jurisdiction. (Signs shall not be displayed when vehicle is actually being used for a priority mission and shall be removed when no longer required for that mission.)		On front and rear of vehicle. Signs shall be fabricated and mounted on vehicles in accordance with TB 43-0209. Vehicles under the jurisdiction of NATO shall comply with TB 34-9-249.

MIL-STD-193L

TABLE VII. Colors for vehicles, construction, and material handling equipment and markings
- Continued.

Equipment and Marking	Colors	Placement
<u>Part 2 - (Continued)</u>		
14. Air recognition panels.	Red fluorescent on one side and yellow fluorescent on the reverse side.	Marking as directed by the appropriate major commander as to the arrangements and conditions under which it shall be used. Panel shall be draped on a vehicle in a standard unchanging pattern different from displays prescribed for other recognition purposes, such as front lines, targets, etc. The panel size shall be 6 feet x 2 feet 3 inches, and each panel shall have a tie cord of adequate length in each corner.
15. Commercial design vehicle markings. (Unless otherwise specified, vehicles assigned to TOE or TD units, or to other organizations and activities for nonadministrative use.)		Similar to markings used on military design vehicles.

NOTES: 1. Internal surface of doors, hatches and the edges of the hatch openings which become exposed to outside view during operational use shall be the same color as the exterior surface of the vehicle.

2. These markings are divided into four elements arranged from left to right, as follows:
- Major command, organization or activity. The major headquarters having jurisdiction over the vehicle or equipment, normally not lower than a division, brigade, group or major subordinate command.
 - Intermediate organization or activity. The next lower headquarters having jurisdiction over the vehicle or equipment, normally the headquarters above the unit to which the vehicle or equipment is assigned. This includes regiments, separate battalions, installations, and separate companies or detachments not assigned to an intermediate headquarters.
 - Unit or activity. The lowest unit or activity to which the vehicle is assigned, normally, a company type unit. This space shall be used to identify the type of separate company or detachment already identified above.

MIL-STD-193L

- d. Vehicle or equipment number. The sequence number of the vehicle or equipment in the normal order of march within the unit to which it assigned.

TABLE VIII. Chemical agent resistant coating (CARC) colors and national stock numbers (NSN).

Colors	ONE QUART KIT (NSN)	ONE GALLON KIT (NSN)	FIVE GALLON KIT (NSN)
*1. Green 383, 34094	8010-01-160-6741	8010-01-162-5578	8010-01-160-6742
*2. Brown 383, 30051	8010-01-160-6744	8010-01-160-6745	8010-01-160-6746
3. Dark Green, 34082	8010-01-141-2412	8010-01-130-3343	8010-01-131-0611
4. Field Drab, 33105	8010-01-141-2414	8010-01-130-3345	8010-01-148-3662
5. Earth Yellow, 33245	8010-01-141-2415	8010-01-130-3346	8010-01-131-0612
6. Sand, 33303	8010-01-141-2416	8010-01-130-3347	8010-01-131-6259
*7. Black 37030	8010-01-141-2419	8010-01-131-6254	8010-01-131-6261
**8. Tan 686, 33446	8010-01-260-0910	8010-01-260-0909	8010-01-260-0908
9. Aircraft Green, 34031	8010-01-141-2420	8010-01-131-6255	8010-01-131-6262
10. Olive Drab, 34088	8010-01-146-2650	8010-01-055-2319	8010-01-144-9875
11. Aircraft Gray, 36300	8010-01-144-9882	8010-01-127-8908	8010-01-144-9876
12. Aircraft White, 37875	8010-01-144-9883	8010-01-144-9872	8010-01-144-9877
13. Aircraft Red, 31136	8010-01-144-9884	8010-01-144-9873	8010-01-144-9878
14. Aircraft Black, 37038	8010-01-144-9885	8010-01-146-2646	8010-01-144-9879
15. Int. Aircraft Black (With Glass Beads), 37031	8010-01-144-9886	8010-01-146-2647	8010-01-146-4376
16. Insignia Blue, 35044	8010-01-144-9887	8010-01-146-2648	8010-01-144-9880
17. Int. Aircraft Gray, 36231	8010-01-170-7583	8010-01-146-2649	8010-01-170-0132
18. Aircraft Yellow, 33538	8010-01-235-5078	8010-01-235-8059	8010-01-235-5079

* Basic three-color CARC camouflage coatings

** CARC for desert applications

MIL-STD-193L

APPENDIX

CARC PAINT APPLICATIONS FOR SPARE PARTS USED ON TANK-AUTOMOTIVE VEHICLE SYSTEMS

10. GENERAL

10.1 Scope. This appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

10.2 Application. The mandatory provisions of this appendix are applicable to the CARC finish treatment of spare parts used on tank-automotive vehicle systems.

20. APPLICABLE DOCUMENTS

20.1 Government drawings.

ARMY

12369000	- Chemical Agent Resistant Coatings (CARC) Paint Systems Index.
----------	---

(Copies of the Army drawings are available from the Contracting Officer, U.S. Army Tank-automotive and Armaments Command, Warren, Michigan 48397-5000.)

30. REQUIREMENTS

30.1 Index drawing. The Index Drawing 12369000 is a listing of available CARC drawings which are used to develop the specific and complete surface treatment and finish notes in the spare part drawing. The CARC drawings contain the requirements for cleaning, pretreating, priming and topcoating various base metals and paint topcoat color for the spare part. Table IX is a sample list of available CARC drawings. For a complete and up-to-date listing, see Index Drawing 12369000. Copies of the CARC drawings listed in the Index Drawing may be obtained from the contracting officer (see 20.1).

MIL-STD-193L

APPENDIX

TABLE IX. Sample list of CARC drawings.

Drawing no.	Color of topcoat	Title of drawing: “Paint System For”
12369001	Green 383	Aluminum Exterior Surfaces, Green 383
12369002	White	Aluminum Interior Surfaces, White
12369003	Green 383	Steel Exterior Surfaces, Green 383
12369004	White	Steel Interior Surfaces, White
12369005	Light Green	Steel Interior Surfaces, Light Green
12369006	Green 383	Steel High Temp Application (Over 400 Degrees Fahrenheit)
12369007	Light Green	Aluminum Interior Surfaces, Light Green
12369008	Green 383	Galvanized Exterior Surfaces, Green 383
12369009	Light Green	Galvanized Interior Surfaces, Light Green
12369010	White	Galvanized Interior Surfaces, White
12369011	Green 383	Magnesium Exterior Surfaces, Green 383
12369012	Light Green	Magnesium Interior Surfaces, Light Green
12369013	White	Magnesium Interior Surfaces, White
12369014	Green 383	Plastic Exterior Surfaces, Green 383
12369015	Light Green	Plastic Interior Surfaces, Light Green
12369016	White	Plastic Interior Surfaces, White
12369017	Green 383	Wood Exterior Surfaces, Green 383
12369018	Light Green	Wood Interior Surfaces, Light Green
12369019	White	Wood Interior Surfaces, White
12369020	Gray	Pretreated Interior Surfaces, Gray
12369021	Green 383	Pretreated Exterior Surfaces, Green 383
12369022	Light Green	Pretreated Interior Surfaces, Light Green
12369023	White	Pretreated Interior Surfaces, White

30.2 CARC finish note. The CARC finish note in the spare part drawing shall reference one of the CARC drawings listed in table IX or in the Index Drawing 12369000. The following are examples of how the CARC finish notes shall be specified in the drawing:

- a. Example A - When no exception to the CARC drawing is required, “Finish per Drawing 12369001.”
- b. Example B - When an exception to the CARC drawing is required, “Finish per Drawing 12369001, except color number shall be safety yellow 33538.”

MIL-STD-193L

Custodian:

Army - AT

Navy - MC

Review Activity:

Army - AR

User Activity:

Navy - YD

Preparing Activity:

Army - AT

(Project MFFP-0469)