

MIL-L-52043C(MR)
17 July 1972
SUPERSEDING
MIL-L-52043B(MR)
26 August 1966

MILITARY SPECIFICATION

LACQUER, SEMI-GLOSS, CELLULOSE NITRATE

1. SCOPE

1.1 Scope. This specification covers cellulose nitrate semi-gloss lacquers which can be applied at either elevated or room temperatures. It provides for two compositions, one of which is suitable for use under AIR POLLUTION REGULATIONS (see 6.6).

1.2 Classification. Lacquer covered by this specification shall be of the following composition as specified:

Composition G - General use.

Composition L - Limited use (see 6.6).

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

- TT-C-490 - Cleaning Methods and Pretreatment of Ferrous Surfaces for Organic Coatings.
- TT-P-143 - Paint, Varnish, Lacquer and Related Materials; Packaging, Packing and Marking Of.
- TT-S-735 - Standard Test Fluids; Hydrocarbon.
- PPP-T-60 - Tape; Pressure Sensitive, Adhesive, Waterproof (for Packaging and Sealing).

FSC 8010

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STANDARDS

Federal

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

Fed. Std. No. 595 - Colors.

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

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials

ASTM D. 476 - Specifications for Titanium Dioxide Pigments

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

3. REQUIREMENTS

3.1 Qualification. The lacquer furnished under this specification shall be a product which is qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3.1 and 6.4). Any change in the formulation of a qualified product will necessitate its requalification. The material supplied under contract shall be identical, within manufacturing tolerances, to the product receiving qualification.

3.2 Composition.

3.2.1 Vehicle.

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3.2.1.1 Nonvolatile vehicle. The nonvolatile vehicle shall conform to the requirements specified in Table I, when analyzed in accordance with 4.4.

TABLE I. Composition of nonvolatile vehicle

Material	Minimum	Maximum
Cellulose nitrate, percent by dry weight	30	--
Resins, phthalic alkyd type, percent by weight ^{1/}	55	--
Plasticizers, percent by weight	10	15
Rosin and phenol, percent by weight ^{2/}	--	0

^{1/}The resins shall be phthalic alkyds of the non-drying or semi-drying type containing a minimum of 30 percent phthalic anhydride.

^{2/}The test for rosin and phenol shall be negative.

3.2.1.2 Volatile vehicle. The volatile portion of the lacquer shall conform to the requirements of Table II, when analyzed in accordance with 4.4. The volatile portion shall contain no benzol, methanol, chlorinated solvents or any other solvent of a highly toxic nature.

TABLE II. Quantitative requirements of volatile portion

Material	Composition G		Composition L	
	Percent by weight		Percent by weight	
	Minimum	Maximum	Minimum	Maximum
Esters and ketones percent by weight ^{1/}	37.5	---	37.5	---
Alcohols, percent by weight ^{2/}	15	22.5	15	22.5
Aromatic hydrocarbons, percent by weight ^{3/}	---	40	---	20
Aliphatic hydrocarbons	---	---	---	20

^{1/}Minimum boiling point; 111°C.

^{2/}At least 50 percent of the alcohol content shall have a minimum boiling point of 116°C.

^{3/}Minimum boiling point; 135°C.

3.2.1.2.1 Composition L. The volatile content of composition L shall also conform to the following requirements by volume when tested as in 4.4.4.

(a) Solvents having an olefinic or cyclo-olefinic type of unsaturation: 5 percent maximum.

(b) A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethyl benzene: 8 percent maximum.

(c) A combination of ethyl benzene, ketones having branched hydrocarbon structures or toluene: 20 percent maximum.

(d) Total of a + b + c: 20 percent maximum.

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3.2.2 Pigments. Any combination of the pigments listed in Table III for any specific color shall make up the basic hiding pigmentation for that color. Hiding pigments shall be chemically pure and free from extenders. The titanium dioxide shall be rutile chalk resisting type conforming to types III or IV of ASTM D 476. Small amounts of other shading pigments may be used when necessary to match the color chips provided these additional pigments have good color permanence. Extender pigments shall be siliceous matter and barytes and shall not exceed the amount specified in Table IV. The amount of barytes shall not exceed 20 percent of the extender content by weight. Calcium sulfate or carbonate shall not be employed alone or as a component part of any pigment.

TABLE III. Pigmentation

Color	Color No. Fed. Std. No. 595	Pigmentation
Red	21158	Quinacridone red, molybdate orange, titanium dioxide, carbon black
Orange	22246	Chrome orange, molybdate orange
Yellow	23538	Medium chrome yellow, yellow iron oxide, titanium dioxide
Olive drab	24087	Red or yellow iron oxide, carbon or lamp black, titanium dioxide, chrome yellow
Light green	24533	Titanium dioxide, copper phthalocyanine blue or green, chrome yellow, yellow iron oxide
Blue	25109	Iron blue, titanium dioxide, carbon or lamp black
Slate gray	26132	Titanium dioxide, carbon or lamp black, yellow iron oxide
Blue gray	26231	Titanium dioxide, carbon or lamp black, yellow iron oxide
Accent gray	26251	Titanium dioxide, carbon or lamp black, yellow iron oxide
Sand gray	26306	Titanium dioxide, carbon or lamp black, yellow iron oxide, red iron oxide
Black	27038	Black iron oxide, carbon or lamp black
White	27875	Titanium dioxide

3.3 Quantitative requirements.

3.3.1 Specific quantitative requirements. Each color shall conform to its specific requirements in Table IV when tested as in 4.4.

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TABLE IV. Specific quantitative requirements

Color corresponding to Table III	Solids, % by wt of lacquer			Pigment, % by wt of total pigment		Pigment volume, % of total solids volume Max.	Contrast ratio Min.
	Total solids	Pigment solids		Prime pigment ^{1/}	Extender pigment		
	Min.	Min.	Max.	Min.	Max.		
Red	40	13	17	35 (TiO ₂)	37	22	0.98
Orange	45	17	22	--	22	18	0.87
Yellow	44	17	22	45 (PbCrO ₄)	40	22	0.91
Olive drab	40	11	15	46 (Fe ₂ O ₃ and/or PbCrO ₄)	42	18	0.98
Light green	44	17	22	50 (TiO ₂)	42	24	0.98
Blue	40	13	17	45 (TiO ₂)	44	20	0.98
Slate gray	44	17	22	48 (TiO ₂)	42	27	0.98
Blue gray	44	17	22	52 (TiO ₂)	42	27	0.98
Accent gray	44	17	22	52 (TiO ₂)	42	27	0.98
Sand gray	44	17	22	52 (TiO ₂)	42	24	0.98
Black	40	13	17	55 (Fe ₃ O ₄)	42	18	0.98
White	44	17	22	64 (TiO ₂)	33	24	0.86

^{1/}On analysis compute prime pigment as indicated in parentheses.

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3.3.2 General quantitative requirements. The lacquer tested as in 4.4 shall comply with Table V.

TABLE V. General quantitative requirements

Characteristics	Minimum	Maximum
Vehicle solids, percent by weight of lacquer	22	--
Phthalic anhydride, percent by weight of vehicle solids	16.5	--
Rosin and rosin derivatives	--	0
Phenolic resin	--	0
Viscosity, No. 4 Ford cup, seconds		
Package	90	130
Reduced	15	25
Fineness of grind	6	--
Specular gloss, 60 Degree ^{1/}	15	25
Directional reflectance, white only, percent	83	--
Drying time, air drying		
Set to touch, minutes	4	8
Dry through, minutes	--	10
Full hardness, hours	--	48
Water, percent by weight of lacquer	--	1.0
Coarse particles and skins, percent by weight	--	1.0

^{1/} For slate gray and accent gray - minimum 10, maximum 17.

3.4 Qualitative performance.

3.4.1 Color. The lacquer shall be furnished in the Fed. Std. No. 595 color number specified in the contract or purchase order (see 6.2). When tested as in 4.4.9 it shall acceptably match standard color chip in Fed. Std. No. 595.

3.4.2 Condition in container. The lacquer tested as in 4.4.10 shall be free from grit, seeds, skins, or livering in a freshly opened full container, and shall show no more pigment settling or caking than can be easily and completely reincorporated to a smooth homogeneous state.

3.4.3 Storage stability.

3.4.3.1 Partially full container. The lacquer shall show no skinning when tested as in 4.4.11.1. After aging as in 4.4.11.1 the lacquer shall show no livering, curdling, hard caking, or tough gummy sediment. The lacquer shall mix readily to a smooth homogeneous state, and any skin formed shall be continuous and easily removed.

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3.4.3.2 Full container. The lacquer, tested as in 4.4.11.2, shall show no skinning, livering, curdling, hard caking, or tough gummy sediment. It shall remix readily to a smooth homogeneous state. It shall have a maximum No. 4 Ford cup viscosity of 150 seconds and shall meet all other requirements of the specification.

3.4.4 Dilution stability. The lacquer shall show no evidence of precipitation, separation or curdling when tested according to 4.4.12; slight pigment settlement shall be permitted.

3.4.5 Heat stability. Lacquer heated and tested as in 4.4.13 shall meet the requirements of 3.4.8 through 3.4.16 and the gloss requirements of Table V.

3.4.6 Suspension properties. The lacquer shall show no more than slight settling, no caking, and shall completely redisperse to a smooth homogeneous state when tested as in 4.4.14.

3.4.7 Spraying properties.

3.4.7.1 Hot spray. The packaged lacquer, when tested as in 4.4.15.1 shall spray satisfactorily in all respects and shall show no running, sagging, streaking or blushing. The dried film shall show no dusting, mottling, or color separation, and shall present a smooth semi-gloss finish free from seeds.

3.4.7.2 Cold spray. Lacquer tested as in 4.4.15.2 shall spray satisfactorily in all respects and shall show no running, sagging, streaking, or blushing. The dried film shall show no dusting, mottling, or color separation, and shall present a smooth semi-gloss finish free from seeds.

3.4.8 Flexibility. A film of lacquer tested as in 4.4.16 shall withstand bending without cracking or flaking.

3.4.9 Knife test. A film of lacquer tested as in 4.4.17 shall adhere tightly and not flake, crack, or powder from the metal. The cut shall show beveled edges.

3.4.10 Adhesion. A film of lacquer tested as in 4.4.18 shall show no removal of the lacquer by the adhesive tape beyond one-sixteenth inch on either side of the score line.

3.4.11 Water resistance. A film of lacquer tested as in 4.4.19 shall show no wrinkling or blistering immediately after removal of the panel from the water. The lacquer shall be no more than slightly affected when examined 2 hours after removal. After 24 hours air drying the portion of the panel which was immersed shall be almost indistinguishable with regard to hardness, color and gloss from a panel prepared at the same time but not immersed.

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3.4.12 Hydrocarbon resistance. A film of lacquer tested as in 4.4.20 shall show no wrinkling or blistering immediately after removal of the panel from the fluid. The lacquer shall be no more than slightly affected when examined 2 hours after removal. After 24 hours air drying the portion of the panel which was immersed shall be almost indistinguishable with regard to hardness, color and gloss from a panel prepared at the same time but not immersed.

3.4.13 Lacquer resistance. A film of lacquer tested as in 4.4.21 shall withstand recoating with white lacquer after drying or aging for the stated time intervals. There shall be no blistering, wrinkling, bleeding, film irregularities or other evidence of lifting.

3.4.14 Salt spray resistance. A film of lacquer tested as in 4.4.22 and examined immediately after removal from the test shall show no rust creepage or undercutting beyond one-eighth inch from the score mark. At all other points of the panel there shall be no more than a trace of rusting (Photo 9-1, Method 6451 of Fed. Test Method Std. No. 141) and no more than 5 scattered blisters not more than 1 mm. in diameter. On removal of the lacquer the surface of the steel shall show no more than a trace of rusting, pitting, or corrosion.

3.4.15 Accelerated weathering. A film of lacquer tested as in 4.4.23 shall show no more than a slight chalking (No. 8 Method 6411 of Fed. Test Method Std. No. 141) and a color change equivalent to a lightness-difference estimate not exceeding 4 units.

3.4.16 Weather resistance. A film of lacquer exposed as in 4.4.24 shall show no checking, cracking, or appreciable film deterioration. There shall be no more than light chalking (No. 6 Method 6411 of Fed. Test Method Std. No. 141) of olive drab and no more than moderate chalking (No. 4 Method 6411 of Fed. Test Method Std. No. 141) of the other colors. After removal of any chalking that has occurred, the original color shall be substantially restored and the washed area shall show no more than slight fading or darkening. On removal of the lacquer the surface of the steel shall show no more than a trace of rusting, pitting, or corrosion. Rust creepage shall not extend beyond one-eighth inch from the score mark.

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4. QUALITY ASSURANCE PROVISIONS

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

4.2 Sampling, inspection and testing. Unless otherwise specified, sampling, inspection and testing shall be in accordance with method 1031 of Fed. Test Method Std. No. 141.

4.3 Classification of tests. Testing under this specification shall be for the purpose of:

- (a) Qualification.
- (b) Acceptance of individual lots.

4.3.1 Qualification testing shall consist of tests for all requirements specified in section 3 (see 6.4).

4.3.2 Acceptance tests shall normally consist of tests for all requirements specified in section 3 with the exception of storage stability in full container (3.4.3.2), weather resistance (3.4.16) and lacquer resistance after outdoor exposure (4.4.21.3).

4.4 Test methods.

4.4.1 Test conditions. The routine and referee testing conditions shall be in accordance with section 7, Fed. Test Method Std. No. 141 except as otherwise specified herein.

4.4.2 The following tests shall be conducted in accordance with applicable methods of Fed. Test Method Std. No. 141 or as required in this specification.

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TABLE VI. Index

Tests	Test Method		
	Applicable method in Fed. Test Method Std. No. 141	Paragraph of this specification giving further references	Paragraph of this specification giving requirements
Isolation of vehicle (supercentrifuge)	4032	--	--
Nitrocellulose	5205	--	Table I
Phthalic anhydride	7024	--	Tables I & V
Plasticizer	7371	--	Table I
Rosin in isolated vehicle	5031	--	Tables I & V
Phenolic resin	5141	--	Tables I & V
Solvents, quantitative	7360	4.4.4	Table II
Benzol	7360	--	3.2.1.2
Methanol	5133	--	3.2.1.2
Chlorinated solvents	5132	--	3.2.1.2
Total solids	4044	--	Table IV
Pigments solids	4022	--	Table IV
Pigment analysis	4021	--	Table IV
Fe ₂ O ₃ or Fe ₃ O ₄ , iron oxide	7141	4.4.3.1	Table IV
TiO ₂ , titanium dioxide	7082	4.4.3.1	Table IV
PbCrO ₄ , lead chromate	7131	4.4.3.1	Table IV
Extender pigment, total	5271	4.4.3.2	Table IV
Extender pigment, analysis	7281	4.4.3.3	3.2.2
Pigment volume	4312	4.4.3.4	Table IV
Hiding power (contrast ratio)	4122	4.4.5	Table IV
Vehicle solids	4044	--	Table V
Viscosity	4282	4.4.6	Table V
Fineness of grind	4411	--	Table V
Specular gloss, 60°	6101	4.4.7	Table V
Directional reflectance	6121	--	Table V
Drying time	4061	--	Table V
Set to touch	--	4.4.8.1	Table V
Dry through	--	4.4.8.2	Table V
Full hardness	--	4.4.8.3	Table V
Water	4082	--	Table V
Coarse particles and skins	4092	--	Table V
Color	4250	4.4.9	3.4.1
Condition in container	3011	4.4.10	3.4.2
Storage stability	--	--	--
Partially full container	3021	4.4.11.1	3.4.3.1
Full container	3022	4.4.11.2	3.4.3.2
Dilution stability	--	4.4.12	3.4.4

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TABLE VI. Index (continued)

Tests	Test Method		
	Applicable method in Fed. Test Method Std. No. 141	Paragraph of this specification giving further references	Paragraph of this specification giving requirements
Heat stability	--	4.4.13	3.4.5
Suspension properties	--	4.4.14	3.4.6
Spraying properties	4331	--	--
Hot spray	4331	4.4.15.1	3.4.7.1
Cold spray	4331	4.4.15.2	3.4.7.2
Flexibility	6221	4.4.16	3.4.8
Knife test	6304	4.4.17	3.4.9
Adhesion	--	4.4.18	3.4.10
Water resistance	6011	4.4.19	3.4.11
Hydrocarbon resistance	6011	4.4.20	3.4.12
Lacquer resistance	--	4.4.21	3.4.13
Salt spray resistance	2011, 6061	4.4.22	3.4.14
Accelerated weathering	6121, 6152	4.4.23	3.4.15
Weather resistance	6160	4.4.24	3.4.16

4.4.3 Analysis of pigment. Extract the pigment as in method 4021 of Fed. Test Method Std. No. 141.

4.4.3.1 Prime pigment content. Determine the prime pigment content in the extracted pigment by the applicable method listed in Table VI and check for compliance with the requirements of Table IV.

4.4.3.2 Total extender pigment content. Determine matter insoluble in acid in the extracted pigment by method 5271 of Fed. Test Method Std. No. 141.

4.4.3.3 Extender pigments. Determine barium sulfate and siliceous material and calcium (sulphate or carbonate) by the applicable portions of method 7281 of Fed. Test Method Std. No. 141.

4.4.3.4 Pigment volume. Extract the pigment by washing with lacquer thinner conforming to that in Table VII and proceed as in method 4312 of Fed. Test Method Std. No. 141.

4.4.4 Solvent analysis (composition L). Determine solvent as in method 7360 of Fed. Test Method Std. No. 141. Samples that fail to meet the requirements of 3.2.1.2.1 shall be subject to further examination using a six foot silicone nitrile column (20 percent XF-1150 on 60 to 80 mesh Chromosorb W).

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4.4.5 Hiding power (contrast ratio). Determine the contrast ratio as in Method 4122 of Fed. Test Method Std. No. 141. For orange (22246) and white (27875) use a film applicator that will deposit a 3 inch wide film with a dry film thickness of 0.0015 inch maximum and for all other colors a dry film thickness of 0.0010 inch maximum. After air drying, determine the reflectance and verify the film thickness in the area in which the reflectance was measured. Calculate the contrast ratio and check for compliance with the requirements of Table IV.

4.4.6 Viscosity (reduced). Reduce 5 parts by volume of the packaged lacquer with 3 parts by volume of thinner conforming to Table VII. Check for compliance with Table V.

TABLE VII. Thinner

Ingredient	Composition G		Composition L	
	Percent by weight	Approx. Percent by volume	Percent by weight	Approx. Percent by volume
Methyl isobutyl ketone	31	31	--	--
Methyl isobutyl carbinol	8	8	--	--
Isopropyl alcohol (99 percent)	11	11	--	--
Toluene	25	23	15	17
Low flash naphtha (dry point below 100°C.)	25	27	--	--
Normal butyl acetate	--	--	35	32
Normal butyl alcohol	--	--	15	15
Heptane	--	--	31	36

4.4.7 60° specular gloss. Draw down the packaged material on glass using a 0.0020 inch (0.0040 inch gap clearance) film applicator. Measure the gloss as specified in method 6101 of Fed. Test Method Std. No. 141 and check for compliance with Table V.

4.4.8 Drying time. Determine drying time as in method 4061 of Fed. Test Method Std. No. 141 using referee conditions.

4.4.8.1 Set to touch. Draw down the packaged material using a 0.002 inch (0.004 inch gap clearance) film applicator. Determine the set to touch time for compliance with Table V.

4.4.8.2 Dry through. Draw down the package material using a 0.002 inch (0.004 inch gap clearance) film applicator. Determine the dry through time for compliance with Table V.

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4.4.8.3 Full hardness. Condition the packaged lacquer as in 4.4.13. Phosphoric acid etch a 4 by 12 inch steel panel as specified in procedure 8, method 2011 of Fed. Test Method Std. No. 141. Coat the panel immediately with the conditioned lacquer using a 0.002 inch (0.004 inch gap clearance) film applicator. Determine full hardness for compliance with Table V. The film shall be considered to have reached full hardness when it is very difficult to remove with a knife blade.

4.4.9 Color. Match the specified color chip of Fed. Std. No. 595 with the pigmented coating on the white carrara glass panel prepared for the hiding power test (4.4.5) as in method 4250 of Fed. Test Method Std. No. 141. Observe for compliance with 3.4.1.

4.4.10 Condition in container. Determine package condition on acceptance testing as in method 3011 of Fed. Test Method Std. No. 141. On qualification testing determine pigment settling or caking as follows: Proceed as in method 3011 of Fed. Test Method Std. No. 141, but do not stir. Reseal and then agitate the can for 3 minutes on a paint shaker^{1/}. On reexamination of the contents, the disclosure of any gel bodies or undispersed pigment indicates unsatisfactory settling properties. Observe for compliance with 3.4.2.

4.4.11 Storage stability.

4.4.11.1 Partially full container. Determine 48 hours skinning as in method 3021 of Fed. Test Method Std. No. 141 and observe for compliance with 3.4.3.1. Reseal and age for 7 days at 60°C. and observe for compliance with 3.4.3.1.

4.4.11.2 Full container. Allow a full standard quart can of the packaged lacquer to stand undisturbed for six months and then examine the contents as in method 3022 of Fed. Test Method Std. No. 141. Evaluate pigment settling or caking as in 4.4.10, but agitate the can for 5 minutes on the paint shaker prior to reexamination. Determine viscosity and make other applicable tests for compliance with 3.4.3.2.

^{1/}An apparatus of this type, powered by 1/4 hp motor operates at a rate of 1350 shakes per minute, and is manufactured by Red Devil Tools, Irvington, N.J.

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4.4.12 Dilution stability. Reduce one volume of lacquer with one volume of thinner of the following composition:

	<u>Composition G</u>	<u>Composition L</u>
Normal butyl acetate, percent by volume	15	24
Normal butyl alcohol, percent by volume	15	15
Toluene, percent by volume	70	17
Heptane, percent by volume	--	44

Observe after reduction and after standing 24 hours for evidence of incompatibility with reference to 3.4.4.

4.4.13 Heat stability. Place seven ounces of the packaged lacquer in an 8-ounce glass jar, close tightly, and immerse half-way in a water bath at $77 \pm 2^\circ\text{C}$. ($170 \pm 3^\circ\text{F}$.) for 24 hours. At the end of this time allow the lacquer to return to room temperature. Then check for change in gloss and use in tests as specified in 4.4.16 through 4.4.24. Observe for compliance with 3.4.5.

4.4.14 Suspension properties. Reduce 5 parts by volume of lacquer with 3 parts by volume of thinner conforming to Table VII. Place 6 ounces of the reduced lacquer in an 8-ounce glass jar. Allow the capped jar to remain undisturbed for 24 hours and then place the uncapped jar on a paint shaker as in 4.4.10 and agitate the contents for 20 seconds. Reexamine the material for any evidence of nonhomogeneity or undispersed pigment. Observe for compliance with 3.4.6.

4.4.15 Spraying properties.

4.4.15.1 Hot spray. Spray the packaged lacquer heated in an Underwriters Laboratory approved hot spray unit, under the conditions specified below and observe for compliance with 3.4.7.1 and method 4331 of Fed. Test Method Std. No. 141.

Atomization air temperature
Atomization air pressure
Cold lacquer feed tank pressure
Fluid and air adjustment valves
on spray gun
Air cap and fluid tip

Lacquer temperature at spray gun
Distance of spray gun from work
Lacquer flow rate at nozzle
Thermostatic setting on lacquer
heating unit

Room temperature (70° to 90°F .)
50 pounds, maximum
10 to 15 pounds

Wide Open
DeVilbiss or equivalent. Type
FX tip and No. 704 air cap.
 $160^\circ \pm 5^\circ\text{F}$.
6 to 8 inches
10 to 20 fluid ounces per min.

 175°F ., maximum

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4.4.15.2 Cold spray. Reduce 5 parts by volume of lacquer with 3 parts by volume of thinner conforming to Table VII. Spray on a steel panel to give a dry film thickness of 0.0008 to 0.0011 inch and observe for spraying properties as in method 4331 of Fed. Test Method Std. No. 141 and for compliance with 3.4.7.2. For referee test use automatic application per method 2131 of Fed. Test Method Std. No. 141.

4.4.16 Flexibility. Determine flexibility in accordance with method 6221 of Fed. Test Method Std. No. 141. After conditioning the lacquer as specified in 4.4.13, apply a 2 inch wide film of lacquer with a film applicator that will give a dry film thickness of 0.0009 to 0.0011 inch on a smooth finish steel panel prepared as in method 2011 of Fed. Test Method Std. No. 141 using the aliphatic naphtha ethylene glycol monoethyl ether mixture. The panel shall be prepared from new cold rolled carbon steel rust-free 0.010 ± 0.001 inch thick with a Rockwell 15-T maximum hardness of 82 and finished with a surface roughness of 8 to 12 microinches. Allow the test panel to air dry one half hour and then bake for 24 hours at $105 \pm 2^{\circ}\text{C}$. ($221 \pm 4^{\circ}\text{F}$.). Condition the panel for one half hour at $23 \pm 1^{\circ}\text{C}$. Bend over a $1/4$ mandrel and examine for compliance with 3.4.8.

~~4.4.17~~ Knife test. Perform the knife test as in method 6304 of Fed. Test Method Std. No. 141 using a flat portion of the baked panel from the flexibility test. Observe for compliance with 3.4.9.

4.4.18 Adhesion, tape test.

4.4.18.1 Panel preparation. Condition the lacquer as in 4.4.13. Using a 0.0025 inch (0.0050 inch gap clearance) film applicator, draw down a 2 inch wide film of the lacquer on a steel panel phosphoric acid etched as in procedure B, method 2011 of Fed. Test Method Std. No. 141.

4.4.18.2 Procedure. Air dry the specimen for 1 hour under referee conditions and then score a line through to the metal across the width of the film using a sharp pointed knife. The film shall then be taped perpendicular to and across the score line with waterproof, pressure-sensitive adhesive tape (3/4 inch wide) conforming to PPP-T-60, Type IV. The tape shall be pressed in firm contact with the film and shall extend for approximately one inch on each side of the score line. All air bubbles shall be rolled out by firm pressure of the thumb. Allow approximately 10 seconds for the test area to return to room temperature. 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° . Observe the specimen for compliance with 3.4.10.

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4.4.19 Water resistance. Prepare two panels as in 4.4.18.1 and air dry for 48 hours. Coat all exposed uncoated metal surfaces with wax or other suitable coating and immerse one of the panels for 18 hours in distilled water at $23 \pm 1^\circ\text{C}$. ($73.4 \pm 2^\circ\text{F}$.) in accordance with method 6011 of Fed. Test Method Std. No. 141 and inspect for compliance with 3.4.11.

4.4.20 Hydrocarbon resistance. Prepare two panels as in 4.4.18.1 and air dry for 48 hours. Immerse one panel in hydrocarbon fluid conforming to TT-S-735, type III at $23 \pm 1^\circ\text{C}$. ($73.4 \pm 2^\circ\text{F}$.) for 4 hours in accordance with method 6011 of Fed. Test Method Std. No. 141. At the end of the test period remove the panel from the fluid and examine for compliance with 3.4.12. Any gum line above the level of test fluid should be disregarded.

4.4.21 Lacquer resistance. Draw a 3 inch wide film of white lacquer conforming to this specification across the width of each specimen described below using a 0.0030 inch (0.0060 inch gap clearance) film applicator. Allow to air dry 24 hours and examine for compliance with 3.4.13.

4.4.21.1 After air drying. Prepare 4 panels as in 4.4.1.1 and air dry 4, 8, 24, and 48 hours respectively. At the end of its drying period, test each panel as in 4.4.21.

4.4.21.2 After accelerated weathering. Upon completion of the accelerated weathering test (see 4.4.23), test the exposed panels as in 4.4.21.

4.4.21.3 After outdoor exposure. Upon completion of the weather resistance test (see 4.4.24), test one of the exposed panels as in 4.4.21.

4.4.22 Salt spray resistance. Three 4 by 12 inch steel panels, solvent cleaned in accordance with method 2011, shall be given a phosphate coating conforming to TT-C-490, type I. Condition the lacquer as in 4.4.13 and reduce for spraying as in 4.4.6. Spray the lacquer on the test panels to a uniform dry film thickness of 0.0009 to 0.0011 inch. Air dry for 48 hours, score all specimens, and expose to 5 percent salt spray for 336 hours in accordance with method 6061 of Fed. Test Method Std. No. 141. Upon removal, wash the panels gently in running water not more than 100°F . until free from any visible salt deposits and examine immediately for compliance with 3.4.14. Strip the lacquer film from the panels by means of lacquer thinner and inspect the steel for rust, pitting, or corrosion.

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4.4.23 Accelerated weathering. Using a 0.0025 inch (0.0050 inch gap clearance) film application draw down a 2 inch wide film of the lacquer on two flat tin plate panels and air dry for 48 hours. Measure the directional reflectance and expose the panel for 168 hours to accelerated weathering in accordance with method 6152 of Fed. Test Method Std. No. 141 using a twin arc apparatus. Examine the exposed panel for chalking by rubbing with a piece of velvet or cheesecloth wrapped around the finger. Using moderate pressure, draw the cloth across the width of the panel in two different directions.

Measure the directional reflectance (method 6121) on an unrubbed area of the exposed panel and determine the amount of color change, expressed as lightness difference estimate (ΔL), using method 6122 of Fed. Test Method Std. No. 141. Then test the panel for lacquer resistance as in 4.4.21.2. Check accelerated weathering results for compliance with 3.4.15.

4.4.24 Weather resistance. Prepare two scored test panels as in 4.4.22. Air dry for 48 hours and place on outdoor exposure for 18 months at an angle of 45° south in the climate of Washington, D. C. in accordance with method 6160 of Fed. Test Method Std. No. 141. At the conclusion of the exposure period test the panels for compliance with 3.4.16 and determine chalking as in 4.4.23. Wash the panels with a warm soap solution using a soft sponge or cloth; rinse, dry and examine for color change. Test the coating for lacquer resistance as in 4.4.21.3. Completely strip the lacquer from the panels by means of lacquer thinner and inspect the steel for rust, pitting, or corrosion.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking. The lacquer shall be packaged, packed and marked in accordance with TT-P-143. The level of packaging shall be A or C and the level of packing shall be A, B or C as specified (see 6.2). The lacquer shall be furnished in 1 quart or 1 gallon multiple friction top containers, in 5 gallon lug cover steel pails or in 55 gallon steel drums as specified (see 6.2).

5.2 Additional marking. In addition to the markings required by TT-P-143 each container of lacquer containing lead chromate pigment shall bear the following precautionary markings:

CAUTION: Contains lead chromate. Take adequate precautions when spraying. Avoid inhalation and repeated or prolonged skin contact.

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6. NOTES

6.1 Intended uses. The lacquer covered by this specification is intended for use as a finish coat on chemically treated and/or primed tanks, trucks, automotive components and fire control systems. This material may be used for hot spray application as packaged or may be reduced with lacquer thinner for conventional room temperature spray application. The lacquer is suitable for use over lacquer resistant type primers such as MIL-P-11414, TT-P-664, and TT-P-1757.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Composition required (see 1.2).
- (c) Size of containers (see section 5).
- (d) Level of packaging and level of packing (see section 5).
- (e) Color and color number (see 3.4.1).

6.3 The lacquer covered by this specification should be purchased by volume, the unit being one U.S. liquid gallon of 231 cubic inches at 68°F. (20°C.).

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are a set time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the U.S. Army Aberdeen Research and Development Center, Coating and Chemical Laboratory, Aberdeen Proving Ground, Maryland 21005 and information pertaining to qualification of products may be obtained from that activity.

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6.5 The olive drab lacquer is contemplated to be comparable in performance to the following approximate composition by weight:

Olive drab lacquer

- 23 lbs - Lead chromate
- 6 lbs - Synthetic red iron oxide
- 24 lbs - Synthetic yellow iron oxide
- 7 lbs - Carbon black
- 40 lbs - Talc
- 192 lbs - 35% phthalic anhydride, castor oil alkyd resin
65% solids in xylol. Gardner-Holdt viscosity W-2
- 21 lbs - Tricresyl phosphate
- 96 lbs - 1/2 second R.S. nitrocellulose (65% ethanol)
- 174 lbs - Methyl isobutyl ketone or butyl acetate
- 12 lbs - Ethanol
- 57 lbs - Butanol or methyl isobutyl carbinol
- 117 lbs - Xylol

Lacquers prepared at the lower end of the viscosity range may exhibit a tendency to settle hard. The use of suspension agents has been found to reduce the condition materially.

6.6 Composition L lacquer should be specified for use in areas with regulations controlling the emission of solvents into the atmosphere.

Custodian:
Army - MR

Preparing activity:
Army - MR

Review activities:
Army - MI

(Project No. 8010-A019)

User activities:
Army - AT, ME



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