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SUPERSEDING
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August 21, 1964

FEDERAL SPECIFICATION

LACQUER
(BRUSHING, CLEAR AND PIGMENTED FOR EXTERIOR AND INTERIOR USE)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers clear and pigmented gloss lacquers for brush application to exterior surfaces.

1.2 Classification.

Type I - Clear
Type II - Pigmented

2. APPLICABLE DOCUMENTS

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

Federal Specifications:

PPP-B-636 - Boxes, Shipping, Fiberboard
PPP-C-96 - Cans, Metal, 28 Gauge and Lighter

Federal Standards:

Fed. Std. No. 595 - Colors
Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer, and Related Materials, Methods of Inspection, Sampling and Testing

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification, other Federal specifications, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Philadelphia; Washington, DC; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

(Federal Government activities may obtain copies of Federal specifications, standards, and commercial item descriptions and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Standard:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of Military specifications and standards 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 documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

D 185 - Coarse Particles in Pigments, Pastes, and Paints
D 523 - Specular Gloss
D 659 - Evaluating Dergee of Chalking of Exterior Paints
D 822 - Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products
D 1200 - Viscosity of Paints, Varnishes, and Lacquers By Ford Viscosity Cup
D 1210 - Fineness of Dispersion of Pigment-Vehicle System
D 1364 - Water in Volatile Solvents (Fischer Reagent Titration Method)
D 1544 - Color of Transparent Liquids (Gardner Color Scale)
D 1545 - Viscosity of Transparent Liquids by Bubble Time Method
D 1640 - Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
D 1644 - Nonvolatile Content of Varnishes
D 1729 - Visual Evaluation of Color Differences of Opaque Materials
D 1737 - Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus
D 3272 - Vacuum Distillation of Solvents from Solvent-Base Paints for Analysis
D 3335 - Low Concentrations of Lead and Cadmium in Paint by Atomic Absorption Spectroscopy
E 97 - 45-DEG, 0-DEG Directional Reflectance of Opaque Specimens by Filter Photometry
E 260 - General Gas Chromatography Procedures
G 23 - Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials

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

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Solvent. When tested as specified in 4.4.1, the solvent shall conform to the following requirements by volume:

(a) Aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene: 8 percent maximum.
(b) Ethylbenzene and toluene: 20 percent maximum.
(c) Solvent with olefinic or cylco olefinic unsaturation: negative test.
(d) Aldehydes and branched chain ketones: negative test.
(e) Total of (a) plus (b): 20 percent maximum.

3.2 Quantitative requirements. The quantitative requirements of the lacquer shall be as specified in table I.

TABLE I. Quantitative requirements

Characteristics	Requirements Minimum	Maximum
Nonvolatile content, percent by weight of lacquer, type I only	20.0	
Drying time: at 25 ± 3 um dry film thickness:		
Tack free, minutes	----	15
Dry through, hours	----	2
After tack 1/		
Water content, percent by weight	----	0.5
Coarse particles and skins, percent by weight	----	1.0
Viscosity:		
Type I, Gardner Bubble Tube	C	F
Type II, No. 4 Ford Cup, seconds	40	70
Fineness of dispersion, Hegman	6	----
Specular gloss, 60°	70	
Contrast ratio, type II only:		
White, yellow, orange	.90	----
reds	.80	----
All other colors	.98	----
Lead, percent by weight of total nonvolatile	----	0.06

1/ The film shall be free from aftertack 24-hours after application, and shall remain free from aftertack after 7 days.

3.3 Qualitative requirements

3.3.1 Conditions in container. When tested as specified in 4.4.3, the lacquer shall be free from biological growth, grit, skins, seeds, lumps, and livering, and any settling shall be easily redispersed by hand stirring with a paddle to a homogeneous state.

3.3.2 Brushing properties and appearance. When tested as specified in 4.4.4, laps shall be picked up without pulling under the brush, and the lacquer shall dry to a smooth uniform film free from any defects.

3.3.3 Self-lifting properties. When tested as specified in 4.4.5, the lacquer shall not be self-lifting and there shall be no evidence of film irregularities.

3.3.4 Print resistance. When tested as specified in 4.4.6, the lacquer shall show no print when examined 1-hour after the pressure has been removed.

3.3.5 Resistance to alcohol and water. When tested as specified in 4.4.7, the dry lacquer shall show no softening, wrinkling, blistering, or whitening 1-hour after removal from water and after drops of alcohol have evaporated.

3.3.6 Flexibility. When tested as specified in 4.4.8, the lacquer shall not crack or flake from the metal.

3.3.7 Cold cracking. When tested as specified in 4.4.9, the lacquer shall not crack or flake from the metal.

3.3.8 Color.

3.3.8.1 Clear lacquer. When tested as specified in 4.4.10, the type I lacquer shall not be darker than a Gardner Color Standard No. 3.

3.3.8.2 Pigmented lacquer. When tested as specified in 4.4.10.2, type II lacquer shall be a critical match to the specified color of Fed. Std. No. 595.

3.3.9 Accelerated weathering. When tested as specified in 4.4.11, the type II lacquer shall show no chalking, cracking, or peeling, and the 60° gloss shall not change more than 10 percent from the original value, and the color shall be a general match to the color specified.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein.

4.2 Examination of preparation for delivery. An examination shall be made to determine compliance with the requirements of section 5. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-1 and the acceptable quality level (AQL) shall be 4.0 expressed in terms of percent defective.

4.3 Sampling and inspection for acceptance

4.3.1 Lot. For the purpose of sampling, a lot of the lacquer shall consist of a manufacturer's batch. A batch is defined as the end product of all raw materials mixed, blended, or processed in a single operation.

4.3.2 Sampling for test. Sampling shall be in accordance with MIL-STD-105. The lot shall be expressed in units of gallons. The inspection level shall be S-1 and the AQL shall be 4.0 expressed in terms of percent defective.

4.4 Test methods. All tests shall be conducted in accordance with the methods specified in table II to determine compliance with the requirements of section 3. Unless otherwise specified, all tests shall be conducted at standard conditions which are $25^{\circ} \pm 1^{\circ}$ C and a relative humidity of 50 ± 5 percent. All test reports shall contain the individual values utilized in expressing the final result. Failure to pass any test, or noncompliance with any requirement shall be cause for rejection of the sample.

4.4.1 Solvent analysis. Analyze the solvent by gas chromotography. The solvent shall be separated from the lacquer, as specified in ASTM D 3272, and then injected into a gas chromatograph, or the lacquer shall be injected directly, using equipment specifically designed for that purpose. The procedure specified in ASTM E 260 and any apparatus, operating conditions, columns, and the options permitted therein, shall be used for the chromatographic analysis. The accuracy of the analysis shall be 0.5 percent absolute by weight or less for each component, and the reproducibility shall be 0.25 percent absolute by weight over three or more runs. All peaks 0.5 percent of the sample or greater shall be identified and qualified. Convert percent by weight to percent by volume. The presence of olefins shall be determined in accordance with paragraph 4.4 Method 7356 of Fed. Test Method Std. No. 141. Evaluate the results of compliance with 3.1.

TABLE II. Index

Characteristics	Requirement Paragraph	Applicable ASTM Test	Test Paragraph
Solvent	3.1	D 3272/E 260	4.4.1
Nonvolatile content	Table I	D 1644	-----
Drying time	Table I	D 1640	-----
Water content	Table I	D 1364	-----
Coarse particles and skins	Table I	D 185	-----
Viscosity:			
Type I	Table I	D 1545	-----
Type II	Table I	D 1200	-----
Fineness of dispersion (Hegman)	Table I	D 1210	-----
Specular gloss	Table I	D 523	-----
Contrast ratio	Table I	E 97	4.4.2
Lead	Table I	D 3335	-----
Condition in container	3.3.1	-------	4.4.3
Brushing properties and appearance	3.3.2	-------	4.4.4
Self-lifting properties	3.3.3	-------	4.4.5
Print resistance	3.3.4	-------	4.4.6
Resistance to alcohol and water	3.3.5	-------	4.4.7
Flexibility	3.3.6	D 1737	4.4.8
Cold cracking	3.3.7	-------	4.4.9
Color	3.3.8	D 1729/ D 1544	4.4.10
Accelerated weathering	3.3.9	D 822	4.4.11

4.4.2 Contrast ratio, type II only. The contrast ratio shall be determined at a dry film thickness of 25 µm as follows: Three doctor blades of different gap clearances (which will result in dry film thickness above and below 25 µm) shall be used. Three draw-downs of the lacquer shall be made with each blade on sealed black and white hiding power charts. Measure the thickness of each chart with a micrometer (to the nearest 0.3 µm) in three different places before application of the film and again after a 24-hour period of air drying of the applicable film. Compute the average film thickness on each chart. Find the 45° directional reflectance over the black and white areas. Graph the contrast ratio for a dry film thickness of 25 µm from the graph and check for compliance with Table I.

4.4.3 Condition in container. The freshly opened container shall be visually checked for evidence of biological growth. Then lower a spatula into the container and determine whether the lacquer has livered or developed hard settling. Disperse the lacquer with the spatula for 5 minutes and examine for compliance with 3.3.1.

4.4.4 Brushing properties and appearance. Apply a full coat of the lacquer on a clean phosphated steel panel measuring 300 x 300 mm using a 25 or 38 mm lacquer brush. Observe how the lacquer brushes, flows, and levels during application, and check the appearance of the dried film for conformance with 3.3.2.

4.4.5 Self-lifting properties. Apply a full coat of the lacquer as in 4.4.4 and allow to dry for 4-hours. Then recoat the film with the same lacquer and examine over a period of 2-hours for conformance with 3.3.3.

4.4.6 Print test. Draw down a film of the lacquer on a clean plate glass panel to a dry film thickness of 25 ± 0.3 µm. Allow the lacquer to dry for 2-hours and lay a piece of cheese cloth measuring 75 x 100 mm on the test film. Place a weight of 70 g/sq cm (1 lb/sq in) on the cheesecloth. After 1 hour, remove the weight and examine the lacquer for conformance with 3.3.4.

4.4.7 Resistance to alcohol and water. Draw down the lacquer on two clean tin panels to a dry film thickness of 25 ± 0.3 µm. Allow to dry for 48 hours. Sprinkle ethyl alcohol on one panel and allow to evaporate. Immerse half of the other panel in distilled water for 18 hours, then allow to dry for 1 hour. Polish the exposed areas with a soft cloth and examine for compliance with 3.3.5.

4.4.8 Flexibility. Draw down the lacquer on a clean tin panel to a dry film thickness of 25 ± 0.3 µm. Allow to dry for 1/2 hour and bake for 48- hours at 105° ± 2° C. Cool panel and test flexibility by ASTM Method D 1737 over a 12.7 mm mandrel. Examine the panel at the bend with a 7-power lens and check for compliance with 3.3.6.

4.4.9 Cold cracking. Draw down the lacquer on a clean tin panel to a dry film thickness of 25 ± 0.3 µm. Allow the lacquer to dry for 1/2 hour and then bake it for 48-hours at 105° ± 2° C. Immediately place in a freezer at -15° C. Remove the sample, and within 30 - 32 seconds bend at standard conditions over a 12.7 mm mandrel by ASTM Method D 1737. Examine the panel at the bend with a 7-power lens and check for compliance with 3.3.7.

4.4.10 Color

4.4.10.1 The type I lacquer shall be tested by ASTM Method D 1544 for compliance with 3.3.8.1.

4.4.10.2 The type II lacquer shall be brushed to complete hiding on a phosphated steel panel and dried for 24 hours. Then determine the color by ASTM Method D 1729 and check for compliance with 3.3.8.2.

4.4.11 Accelerated weathering. Apply a full coat of the lacquer with a 38 mm lacquer brush to a phosphated steel panel, dry for 48 hours, and expose for 168-hours in the weatherometer by ASTM Method D 822, chalking by ASTM D 659, color by ASTM D 1729 and gloss by ASTM D 523. Check for compliance with 3.3.9.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or commercial, as specified (see 6.2).

5.1.1 Level A. The 1-pint, 1-quart, and 1-gallon quantities of lacquer shall be packaged in metal cans conforming to PPP-C-96, type V, class 2. Exterior Plan B coating shall be required.

See paragraph 5.2.1 for the preparation for delivery of 5-gallon quantities.

5.1.2 Commercial. The 1-pint, 1-quart, and 1-gallon quantities of lacquer shall be packaged in accordance with normal commercial practice. The complete package shall be designed to protect the lacquer against damage during shipment, handling, and storage.

See paragraph 5.2.1 for the preparation of delivery of 5-gallon quantities.

5.2 Packing. Packing shall be level A or commercial, as specified (see 6.2).

5.2.1 Level A. Forty-eight 1-pint cans, or twelve 1-quart cans, or four 1-gallon cans of lacquer, packaged as specified in 5.1, shall be packaged in close-fitting boxes conforming to PPP-B-636, grades V3c, V3s, or V2s. The boxes shall be closed, waterproofed and reinforced in accordance with the appendix of PPP-B-636. Alternatively, wirebound, cleated plywood, or nailed wood boxes shall be acceptable shipping containers when lined with a waterproof barrier material. The barrier material shall be sealed at the edges with waterproof tape or adhesive. The 5-gallon quantities of lacquer shall be furnished in metal cans conforming to Item 260 of the National Motor Freight Classification and Rule 40 of the Uniform Freight Classification.

5.2.2 Commercial. The lacquer shall be packed in a manner that will assure acceptance by common carrier and provide product protection against loss and damage during multiple shipments, handling, and storage. The shipping container shall be in compliance with the National Motor Freight Classification and Uniform Freight Classification.

5.3 Marking. Marking shall be as specified in the contract or order.

6. NOTES

6.1 Intended use. This lacquer is recommended for interior or exterior use on primed metal or sealed wood surfaces. The clear lacquer can be used directly on copper and brass surfaces without priming.

The lacquer is intended to be applied either by brush or cloth; for spraying, the lacquer should be thinned in accordance with manufacturers directions.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

(a) Title, number, and date of this specification.
(b) Type and color required (see 1.2).
(c) Applicable levels of packaging and packing required (see 5.1 and 5.2).
(d) Size of container required (see 5.5.5 and 5.1.2).

Military Coordinating Activity:

Army - ME

Preparing Activity:

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.