

TT-L-54C  
 June 9, 1976  
 SUPERSEDING  
 Fed. Spec. TT-L-54B  
 February 18, 1964

FEDERAL SPECIFICATION

LACQUER: SPRAYING, ACID-RESISTANT, (FOR  
 ALUMINUM SURFACES AROUND  
 STORAGE BATTERIES)

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 two types of acid-, gasoline-, and oil-resistant spraying lacquer.

1.2 Classification. The lacquer covered by this specification shall be of the following types as specified (see 6.2):

Type I - Black  
 Type II - White

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:

QQ-A-250/1 - Aluminum 1100, Plate and Sheet.  
 QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet.  
 TT-B-838 - Butyl Acetate; Normal (For Use in Organic Coatings).  
 TT-B-846 - Butyl Alcohol; Normal (Butanol) (For Use in Organic Coatings).  
 TT-E-751 - Ethyl Acetate, Technical.  
 TT-N-95 - Naphtha; Aliphatic.  
 TT-T-548 - Toluene, Technical.  
 PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials; Packaging, Packing, and Marking.

Federal Standards:

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

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. 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 and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

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(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

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 476 - Titanium Dioxide Pigments.
- D 561 - Carbon Black.
- D 1200 - Viscosity of Paints, Varnishes, and Lacquers by Ford Viscosity Cup.
- D 1644 - Nonvolatile Content of Varnishes.

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

3. REQUIREMENTS

3.1 Materials.

3.1.1 Vehicle. The manufacturer is given latitude in the selection of the vehicle portion of the lacquer, provided that the requirements of this specification are met (see 4.1.1).

3.1.2 Pigment.

3.1.2.1 Type I. The pigment in type I lacquer shall be carbon black conforming to ASTM D 561.

3.1.2.2 Type II. The pigment in type II lacquer shall be rutile titanium dioxide conforming to ASTM D 476, type II.

3.1.3 Solvent. The manufacturer is given latitude in the selection of solvents or blend of solvents, provided the material meets the requirements specified in 3.1.3.1 and 3.1.3.2.

3.1.3.1 The solvent, when tested as specified in 4.5, shall not contain benzene or halogenated compounds.

3.1.3.2 The solvent, when tested as specified in 4.5, shall conform by volume to the requirements controlling the emission of solvents into the atmosphere as called out in (a), (b), (c), (d), and (e).

- (a) A combination of aldehydes or branched-chain ketones: 20 percent maximum.
- (b) A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene: 8 percent maximum.
- (c) A combination of ethylbenzene or toluene: 20 percent maximum.
- (d) A combination of solvents with olefinic or cyclo-olefinic unsaturation: 5 percent maximum.
- (e) Total of (a) + (b) + (c) + (d) = 20 percent maximum.

3.2 Quantitative requirements. When tested as specified in 4.5, the lacquer shall meet the requirements specified in table I.

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TABLE I. Quantitative requirements

Characteristics	Requirements	
	Minimum	Maximum
Nonvolatile, percent by weight of lacquer:		
Type I	25	---
Type II	30	---
Set-to-touch time, minutes	---	10
Dry-hard time, minutes	---	60
Viscosity, seconds	20	35
Dry opacity		
Type I	.99	---
Type II	.85	---

### 3.3 Qualitative requirements.

3.3.1 Condition in container. When tested as specified in 4.5, the lacquer shall be free from grit, skins, seeds, lumps, abnormal thickening, or livering, and any settling shall be easily redispersed by hand stirring with a paddle to a homogeneous state.

3.3.2 Spraying properties. When tested as specified in 4.5, the lacquer shall level out to a smooth, uniform coating free from sags, runs, pin holes, orange peel, blooming, and fogging, and the dried film shall be uniformly smooth and free from irregularities and rough particles.

3.3.3 Flexibility (cold cracking). When tested as specified in 4.5, the dried film of the lacquer shall show no cracking or flaking from the metal.

3.3.4 Knife test. When tested as specified in 4.5, the dried film of the lacquer shall adhere tightly and not flake or powder from the metal. The cut shall show beveled edges.

3.3.5 Self-lifting properties. When tested as specified in 4.5, the lacquer shall not be self-lifting, and there shall be no evidence of film irregularity.

3.3.6 Resistance to cold exposure. When tested as specified in 4.5, the exposed dried film of the lacquer shall show no visible difference when compared with the similarly prepared but unexposed dried film of the lacquer.

3.3.7 Hydrocarbon resistance. When tested as specified in 4.5, the dried film of the lacquer shall show no softening, wrinkling, blistering, or dissolution, and no more than slight dulling.

3.3.8 Oil resistance. When tested as specified in 4.5, the dried film of the lacquer shall show no blistering, softening, discoloration, or other defects.

3.3.9 Acid resistance. When tested as specified in 4.5, the dried film of the lacquer shall show no blistering, softening, discoloration, or other defects.

3.3.10 Storage stability. When stored as specified in 4.5, the lacquer shall show no skinning, seeding, livering, curdling, hard settlement, or caking; shall easily remix to a smooth homogeneous state; and shall meet the set-to-touch time, dry-hard time, and dry opacity requirements of table I. The viscosity of the lacquer shall be not less than 18 seconds and not more than 39 seconds.

3.3.11 Color. When tested as specified in 4.5, type I lacquer shall match color 17038 and type II lacquer shall match color 17875 of Federal Standard No. 595.

## 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 that supplies and services conform to prescribed requirements.

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4.1.1 The supplier shall submit to the contracting officer a certificate of compliance indicating that the lacquer complies with the storage stability requirement as specified in 3.3.10, in lieu of actual testing. When certificates of compliance are submitted, the Government reserves the right to test such items to determine the validity of the certificate.

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

4.3 Inspection of preparation for delivery requirements. The packaging, packing, and marking of the lacquer shall be inspected to determine compliance with the requirements of section 5 in accordance with PPP-P-1892.

4.4 Testing of the end item. Tests shall be performed on a sample unit basis. All test reports shall contain the individual values utilized in expressing the final result. The lot shall be unacceptable if one or more sample unit (see 4.4.1) fails to meet any test requirement specified.

4.4.1 Sampling for testing. For purposes of sampling, the lot shall be expressed in units of gallons of lacquer. The sample unit for testing shall be 1 quart of lacquer randomly selected from containers in the lot. The lacquer shall be placed in separate clean, dry, metal or glass containers, sealed, marked, and forwarded to the testing laboratory. The sample size shall be as follows:

<u>Lot size (gallons)</u>	<u>Sample size (quarts)</u>
800 or less	2
801 up to and including 22,000	3
22,001 and more	5

4.4.2 Standard test conditions. Unless otherwise specified, all test specimens shall be prepared and tested in a room having a temperature of  $23 \pm 1^{\circ}\text{C}$  ( $73 \pm 2^{\circ}\text{F}$ ) and a relative humidity of  $50 \pm 5$  percent.

4.4.3 Preparation of test panels. Panels measuring 7.6 x 15.2 cm (3 x 6 in), cut from 24-gage (0.05 cm) (0.02 in) aluminum sheet conforming to QQ-A-250/1 or aluminum alloy sheet conforming to QQ-A-250/4, and having all burrs removed, shall be thoroughly cleaned with an oil emulsifier or a suitable solvent such as toluene. The panels shall be further cleaned using the alcohol-phosphoric acid-water cleaner from method 2013 of Fed. Test Method Std. No. 141 by completely immersing the panels in the cleaner maintained at 60 to 70°C (140 to 158°F) until the surface of the panel presents a uniform appearance. The acid shall be washed from the panels with hot water, and the panels shall be thoroughly dried and used immediately.

4.4.4 Preparation of test films. For each test, a 5.1-cm (2-in) film shall be drawn down as described in method 4061 of Fed. Test Method Std. No. 141 on the freshly cleaned panels (see 4.4.3) and shall be allowed to dry at standard conditions (see 4.4.2) for 48 hours. All tests requiring test films shall be run in triplicate, and the failure of one or more test films in any test shall be cause for the failure of the sample unit and, therefore, the lot (see 4.4).

4.5 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.

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TABLE II. Test methods

Test	Methods		
	ASTM Standard	Fed. Test Method Std. No. 141	Paragraph reference
Pigment analysis	D 561, D 476	4021	4.5.1
Solvent analysis		7355, 7360, 5132	4.5.2
Nonvolatile	D 1644		
Drying time		4061	
Viscosity	D 1200		4.5.3
Dry opacity		4121	4.5.4
Condition in container		3011	
Spraying properties		4331	
Flexibility (cold cracking)		6223	4.5.5
Knife test		6304	
Self-lifting properties		6252	4.5.6
Resistance to cold exposure			4.5.7
Hydrocarbon resistance			4.5.8
Oil resistance			4.5.9
Acid resistance			4.5.10
Storage stability			4.5.11
Color		4250	4.5.12

4.5.1 Pigment analysis. The pigment shall be extracted from the lacquer in accordance with method 4021 of Fed. Test Method Std. No. 141. The extracted pigment shall be tested in accordance with the methods specified in the appropriate ASTM specification listed in 3.1.2.

#### 4.5.2 Solvent analysis.

4.5.2.1 Solvent extraction. The solvent shall be extracted from the lacquer in accordance with method 7355 of Fed. Test Method Std. No. 141.

4.5.2.2 Solvent composition. The composition of the solvent shall be determined in accordance with method 7360 of Fed. Test Method Std. No. 141, 4.5.2.2.1, and 4.5.2.2.2.

4.5.2.2.1 Halogenated compounds. The presence of halogenated compounds shall be determined in accordance with method 5132 of Fed. Test Method Std. No. 141.

4.5.2.2.2 Benzene. When the solvent is tested in accordance with 4.5.2.2, a trace benzene peak of not more than 2 percent of the toluene peak will be allowed.

4.5.3 Viscosity. The viscosity of the lacquer shall be determined in accordance with ASTM D 1200, using a No. 4 Ford cup. The lacquer shall be reduced before testing with an equal volume of thinner conforming to the following composition:

<u>Ingredients</u>	<u>Percent by weight</u>
Butyl acetate, conforming to TT-B-838	25
Ethyl acetate, conforming to TT-E-751	22
Butyl alcohol, conforming to TT-B-846	10
Toluene, conforming to TT-T-548	22
Aliphatic naphtha, conforming to TT-N-95	21

4.5.4 Dry opacity. The lacquer shall be applied by doctor blade at a maximum dry film thickness of 38 microns (1.5 mils).

4.5.5 Flexibility (cold cracking). The test film of the lacquer shall be prepared as specified in 4.4.4, except that the film shall be allowed to dry at standard conditions (see 4.4.2) for only 30 minutes and then baked at  $105 \pm 2^\circ\text{C}$  ( $221 \pm 4^\circ\text{F}$ ) for 48 hours. The 3.2 mm (1/8 in) mandrel shall be used.

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4.5.6 Self-lifting properties. The test film of the lacquer shall be prepared as specified in 4.4.4 on six panels prepared as specified in 4.4.3, except that the film on each panel shall be allowed to dry individually at standard conditions (see 4.4.2) for 4, 8, 24, 48, 96, and 168 hours. After drying as specified, a second coat of the lacquer shall be applied as specified in 4.4.4, and examined for defects.

4.5.7 Resistance to cold exposure. The test film, prepared as specified in 4.4.4, shall be placed in a freezer set to maintain a temperature of  $-18 \pm 5^{\circ}\text{C}$  ( $0 \pm 9^{\circ}\text{F}$ ) for seven days. A similarly prepared but unexposed test film shall be kept at standard conditions (see 4.4.2) for seven days. After the seven-day period, the exposed panel shall be removed from the freezer and allowed to equilibrate at standard conditions (see 4.4.2). The exposed panel shall be compared visually to the unexposed panel for visible differences.

4.5.8 Hydrocarbon resistance. The test film, prepared as specified in 4.4.4, shall be immersed to a depth of 7.6 cm (3 in) for 4 hours in the following hydrocarbon mixture:

<u>Component</u>	<u>Percent by weight</u>
Diisobutylene	60
Benzene	5
Toluene	20
Xylene	15

The test film shall be removed after 4 hours, allowed to dry at standard conditions (see 4.4.2), and examined for softening, wrinkling, blistering, dissolution, and dulling.

4.5.9 Oil resistance. Three drops of lubricating oil shall be placed in separate areas on the test film prepared as specified in 4.4.4 and covered with watch glasses. After 24 hours in an oven set to maintain a temperature of  $48 \pm 2^{\circ}\text{C}$  ( $120 \pm 4^{\circ}\text{F}$ ), the oil shall be removed with a clean cloth, and the film shall be examined for defects.

4.5.10 Acid resistance. Three drops of sulfuric acid (specific gravity 1.300, equal to 10.6 N, or greater) shall be placed in separate areas on the test film prepared as specified in 4.4.4 and covered with watch glasses. After 24 hours in an oven set to maintain a temperature of  $49 \pm 2^{\circ}\text{C}$  ( $120 \pm 4^{\circ}\text{F}$ ), the acid shall be removed by rinsing with distilled water, and the film shall be wiped dry with a clean cloth and examined for defects.

4.5.11 Storage stability. One pint of the lacquer shall be stored for two years from the date of manufacture at standard conditions (see 4.4.1) and then shall be tested to determine compliance with the requirements of 3.3.10.

4.5.12 Color. The test film shall be prepared as specified in 4.4.4.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking. The lacquer shall be packaged, packed, and marked in accordance with PPP-P-1892. The levels of packaging and packing shall be A, B or C, as specified (see 6.2). The lacquer shall be furnished in 1-pint, 1-quart or 1-gallon containers, in 5-gallon pails, or in 55-gallon drums (see 6.2).

5.2 Precautionary marking. In addition to the markings required by PPP-P-1892, containers shall bear the following precautionary label:

"Adequate precautions should be taken when spraying."

## 6. NOTES

6.1 Intended use. The lacquer covered by this specification is intended for aluminum surfaces around storage batteries.

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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 of lacquer required (see 1.2).
- (c) Size of container required (see 5.1).
- (d) Quantity required.
- (e) Level of packaging and packing required (see 5.1).

MILITARY CUSTODIANS:

Army - MR  
Navy - SH

Coordinating activity:

Army - MR

Review activity:

Army - EA

User activity:

Navy - YD

Preparing activity:

GSA-FSS

CIVIL AGENCY COORDINATING ACTIVITIES:

HEW - FDA  
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