

MIL-L-26380  
21 October 1975  
SUPERSEDING  
MIL-L-2638C  
16 October 1968

## MILITARY SPECIFICATION

### LACQUER, VINYL RESIN, GASOLINE AND WATER RESISTANT

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

#### 1. SCOPE

1.1 Scope. This specification covers gasoline and water-resistant vinyl resin lacquer for lining storage tanks and pipe.

1.2 Classification. The lacquer shall be of the following types as specified:

- Type I - Prime coat.
- Type II - Body coat.
- Type III - Seal coat.

#### 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

PPP-B-601  
PPP-B-621  
PPP-P-1892

- Boxes, Wood, Cleated-Plywood.
- Boxes, Wood, Nailed and Lock-Corner.
- Paint, Varnish, Lacquer, and Related Materials; Packaging, Packing and Marking of.

##### Military

MIL-G-5572  
MIL-T-5624

- Gasoline, Aviation, Grades 80/87, 100/130, 115/145.
- Turbine Fuel, Aviation, Grades JP-4 and JP-5.

FSC 8010

MIL-L-2638D

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 and standards required by suppliers 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 otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 381 - Existent Gum In Fuels By Jet Evaporation.

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

AMERICAN PUBLIC HEALTH ASSOCIATION

Standard Methods for the Examination of Water and Sewage.

(Application for copies should be addressed to the American Public Health Association, 1790 Broadway, New York, NY 10019.)

COUNTY OF LOS ANGELES - AIR POLLUTION CONTROL DISTRICT

Rule 66 - Organic Solvents.

(Application for copies should be addressed to the County of Los Angeles - Air Pollution Control District, 434 S. San Pedro Street, Los Angeles, CA 90013.)

3. REQUIREMENTS

3.1 Material. Material shall be as specified herein. Material not specified shall be selected by the supplier and shall be subject to all provisions

MIL-L-2638D

of this specification. Material which might cause the contents of tanks and pipe coated with the lacquer to become toxic shall not be used. Solvents used in the manufacture of the lacquer shall be in accordance with Rule 66. The supplier shall certify that the material complies with Rule 66, Air Pollution Control District, County of Los Angeles, CA.

3.1.1 Pigments. The pigment for white, light tints, and gray shall be composed primarily of titanium dioxide and other suitable tinting and extender pigments as necessary. The prime pigment for olive drab and brown shall consist of iron oxides. All pigments shall be compatible with the vehicle, shall be nontoxic, and shall provide complete hiding at the film thickness specified.

3.2 Quantitative requirements. The lacquer shall conform to Table I.

Table I Quantitative Requirements

Characteristics	Requirements (minimum)
Pigment, percent by weight	
Type I	13.5
Type II	32.5
Type III	6.0
Nonvolatile in vehicle <sup>1/</sup> , percent by weight	
Type I	16.0
Type II	17.0
Type III	16.0
Weight per gallon, pounds	
Type I	7.5
Type II	9.0
Type III	7.0

<sup>1/</sup> The vehicle solids of each type lacquer shall consist entirely of suitable vinyl chloride-acetate resins (see 6.4), and the volatile portion shall be a combination of solvents and diluents with which the resin is compatible.

3.3 Qualitative requirements.

3.3.1 Condition in container. The lacquer in a freshly opened container shall show no curdling, livering, caking, or skinning, and no pigment settling which cannot be redispersed to a homogeneous mixture by stirring with a paddle.

MIL-L-2638D

3.3.2 Storage stability. The lacquer, after 30 days storage in a partially filled container, shall show no skinning, livering, or caking, and no pigment settling which cannot be redispersed to a homogeneous mixture by stirring with a paddle.

3.3.3 Color. The lacquer shall be of the color specified and shall match the appropriate color chip of FED. STD. No. 595.

3.3.4 Self-lifting properties. Recoating the prime coat with the body coat after 2 hours air drying, and the body coat with the seal coat after 4 hours air drying shall produce no film irregularity.

3.3.5 Drying properties. The vinyl resin lacquer shall air dry so that the three-coat system can be applied, and will dry through within 8 hours when the vinyl resin lacquers are applied on steel panels in the following order and dry film thicknesses as applied in accordance with 4.4.1.2:

Type I - 0.5 to 1.2 mils  
Type II - 2.5 to 3.5 mils  
Type III - 1.0 to 1.5 mils

3.3.6 Working properties. The lacquer when applied by spraying or dipping shall show no lapping, sagging, or other imperfections.

3.3.7 Three-coat system. The three types of vinyl resin lacquers applied as a three-coat system as specified in 4.4.1.2 shall meet the requirements of 3.3.7.1 through 3.3.7.8.

3.3.7.1 Flexibility. The coating system shall withstand bending without cracking, flaking, or loss of adhesion both before and after exposure to 900 hours of accelerated weathering.

3.3.7.2 Leachable content. The coating system shall not leach more than 5 mgs (5 ppm) when tested as specified in 4.4.4.

3.3.7.3 Effect on gum content of gasoline. The coating system shall not increase the gum content of 100/130 octane gasoline conforming to MIL-G-5572 more than 1 milligram per 100 milliliters of gasoline.

3.3.7.4 Fuel resistance. The coating system shall be resistant to 100/130 octane gasoline conforming to MIL-G-5572 and to turbine fuel conforming to MIL-T-5625, Grade JP-4 for 21 days; and 24 hours after removal from the test fluid, shall show no softening, blistering, peeling, loss of adhesion, or other film irregularities.

MIL-L-2638D

3.3.7.5 Water resistance. The coating system shall show no softening, blistering, peeling, loss of adhesion, or other film irregularities after 21 days immersion in distilled water.

3.3.7.6 Saltwater resistance. The coating system shall show no softening, blistering, loss of adhesion, or other film irregularities after 21 days of immersion in a 5 percent aqueous solution of sodium chloride.

3.3.7.7 Salt-spray resistance. The coating system shall show no softening, blistering, peeling, embrittlement, or corrosion extending beyond 1/8 inch of the score line of the test panel after 300 hours exposure to salt spray.

3.3.7.8 Accelerated weathering resistance. The coating system shall show no film failure except for no more than moderate chalking after 900 hours accelerated weathering. Moderate chalking shall be defined as not more than a rating of 4 when tested as specified in 4.4.2. After gently removing dust due to chalking with a damp cloth, the maximum reduction in film thickness shall be 1/10 mil.

#### 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 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 Classification of inspections. Inspections shall be classified as follows:

- (a) Quality conformance inspection (see 4.3).
- (b) Inspection of preparation for delivery (see 4.5).

#### 4.3 Quality conformance inspection.

4.3.1 Sampling and inspection. Sampling and inspection shall be in accordance with FED. TEST METHOD STD. No. 141, Method 1031.

4.3.2 Tests. Samples selected in accordance with 4.3.1 shall be tested as specified in 4.4. Failure to pass any test shall be cause for rejection of the lot which the sample represents.

MIL-L-2638D

4.4 Test procedures.4.4.1 Preparation of test panels.

4.4.1.1 Test panels. Test panels shall be No. 20 U.S. standard gage (0.0375 inch) 1020 cold-rolled steel panels, 3 inches by 5 inches, sand-blasted and solvent-cleaned with mineral spirits.

4.4.1.2 Application of coatings. Dip-coat each test panel with one coat of each type vinyl resin lacquer. The air-drying time between coats at 23° C, plus or minus 1.1° C, and 50 percent, plus or minus 4 percent, relative humidity shall be as specified in Table II. The dry-film thickness of each coat and the order of coating shall be as specified in Table II. All system coated panels shall then be air dried for not less than 72 hours before testing. Measure film thickness with electrometer type devices.

Table II Application of Coatings

Coat	Vinyl resin lacquer composition	Maximum air drying time before application of next coat	Dry film thickness
First	Type I - Prime coat	2 hours	0.5 to 1.2 mils
Second	Type II - Body coat	4 hours	2.5 to 3.5 mils
Third	Type III - Seal coat	-----	1.0 to 1.5 mils

4.4.2 Tests. The lacquer shall be subjected to the tests specified in Table III and 4.4.3 to 4.4.5. Nonconformance to the requirements of the applicable test in Table III and 4.4.3 to 4.4.5 shall constitute failure of that test.

Table III Test Methods

Tests	FED. TEST METHOD STD. No. 141	Requirements Paragraphs
Weight per gallon	4184	Table I
Condition in container	3011	3.3.1
Storage stability	3021	3.3.2
Color	4250	3.3.3
Spraying properties	4331	3.3.6
Dipping properties	4341	3.3.6
Salt spray test 1/	6061	3.3.7.7
Chalking	6411	3.3.7.8
Accelerated weathering 1/	6151 1/	3.3.7.8
Flexibility 2/	6221	3.3.7.1
Self-lifting 1/	6252	3.3.4
Pigment content	4021	Table I
Nonvolatile content	4041	Table I

MIL-L-2638D

- 1/ Prepare coated test panels as specified in 4.4.1.
- 2/ Prepare coated test panels as specified in 4.4.1 and determine flexibility before and after exposure to 900 + 24 hours of accelerated weathering by bending the coated panels 180 degrees around a 1-inch mandrel.

4.4.3 Effect on gum content of gasoline. Three glass jars, approximately 2-1/2 inches in diameter by 5-1/2 inches high, shall be flow-coated on the interior with the lacquers, following the same drying as specified for test panels in Table II. Pour 400 milliliters of 100/130 octane gasoline conforming to MIL-G-5572 into each coated jar and into one uncoated jar. Tightly cover the jars and allow to stand at room temperature for 21 days. Determine the gum content of the gasoline in each jar before and after the test in accordance with ASTM D 381. An increase in gum content of more than 1 milligram per 100 milliliters of gasoline from the coated jars over that in the uncoated jar shall constitute failure of this test.

4.4.4 Leachable content. Place two system coated steel panels diagonally upright on opposite sides of a 1 liter beaker. Add 1000 gms of distilled water to the beaker, and also 1000 gms of distilled water to an empty beaker to serve as a blank. Cover beakers with watch glasses and place in a 120° F + 2° F oven for 24 hours + 1 hour. At end of time, remove panels and evaporate water in beakers to about the 100 ml plus or minus 25 ml level. Transfer remainder from blank and test beakers to accurately-weighed (+ vol mg) 250 ml beakers respectively. Reduce to dryness on low-heat hot plate; cool in dessicator and weigh to constant weight. Nonconformance to 3.3.7.2 shall constitute failure of this test.

4.4.5 Fuel resistance. Prepare coated test panels as specified in 4.4.1, and immerse the panels to a depth of two-thirds of the panel length for 21 days + 1 day in (a) 100/130 octane gasoline conforming to MIL-G-5572 and (b) turbine fuel conforming to MIL-T-5624, Grade JP-4. Examine 24 hours after removal from the test fluid. Nonconformance to 3.3.7.4 shall constitute failure of this test.

4.4.6 Water resistance. Prepare a coated test panel as specified in 4.4.1, and immerse the panel for 21 days + 1 day in distilled water at 25° C plus or minus 2° C to a depth of two-thirds of the panel length. At the end of the immersion time, remove the panel from the distilled water and examine the film. Nonconformance to 3.3.7.5 shall constitute failure of this test.

4.4.7 Saltwater resistance. Prepare a coated test panel as specified in 4.4.1, and immerse the panel to a depth of not less than two-thirds of the panel length for 21 days + 1 day in a 5 percent + 1 percent aqueous solution of sodium chloride. At the end of the immersion time, remove the panel from the saltwater and examine the film. Nonconformance to 3.3.7.6 shall constitute failure of this test.

MIL-L-2638D

4.5 Inspection of preparation for delivery.

4.5.1 Quality conformance inspection of pack. The packaging, packing, and marking shall be examined in accordance with the sampling, inspection, and test procedures specified in PPP-P-1892.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking. The lacquer shall be packaged, packed, and marked in accordance with PPP-P-1892 except that wood boxes conforming to PPP-B-601 or PPP-B-621 shall be used for Level A packing. Packaging shall be Level A or C and packing shall be Level A, B, or C, as specified (see 6.2). The lacquer shall be furnished in the size of container specified (see 6.2), in which 1 gallon equals 231 cubic inches at 20° C.

5.1.1 Additional marking. In addition to the marking requirements specified in 5.1, each container shall be marked or labeled with the type of solvent for thinning purposes recommended by the manufacturer, plus thinning instructions, and each shipment of Type I lacquer shall include a set of instructions with the following information:

## INSTRUCTIONS FOR USE

To obtain maximum benefit from the use of the coating system, the lacquer should be applied to a sandblasted metal surface blasted to near white condition. Remove grease, old coatings, moisture, dust from blasting, or other extraneous matter. The Type I prime coat should be applied without delay by spraying or brushing it into the metal surface, leaving no uncovered areas. The total coverage should be a maximum of 250 square feet per gallon and a minimum drying time of 2 hours should be allowed before the application of the body coat (Type II). The Type II body coat should then be spray applied at a maximum coverage of 150 square feet per gallon. Four hours air drying time should be allowed before application of the seal coat (Type III). Before application of the Type III seal coat, any overspray dust should be removed by sanding lightly. The seal coat should be applied by spraying at a maximum coverage of 200 square feet per gallon. A final drying time of 72 hours should be allowed before placing the coating system in service. The body and seal coat-type lacquers are not intended for application by brushing. However, small damaged areas may be repaired by recoating by brush using a flow-out technique with each type of lacquer in the proper sequence. To insure adequate coverage of film thickness the following precautions should be taken:

- (a) Mix body coat thoroughly before use and agitate frequently during application. All body coats should be sprayed, keeping fluid and atomization pressure as low as practicable.



MIL-L-2638D

- (b) Hold spray gun about 9 inches from the work and perpendicular to the surface at all times.
- (c) Particular attention should be given to the thorough coating of welds, seams, corners, rivets, and similar surface irregularities. All such areas should be double lapped.

A mask approved by National Institute for Occupational Safety and Health (NIOSH) for protection against lacquer vapors should be provided for the operator, as well as an exhaust fan of sufficient capacity to keep solvent vapors below 1 percent by volume of air. Safety glasses shall be worn. In case of entry of sprayed material in the eyes, immediately wash eyes out copiously with water, and obtain medical aid.

## 6. NOTES

6.1 Intended use. The vinyl coating system, although primarily intended as a three-coat lining for steel storage tanks and pipe, is not limited solely to this application. The coating system possesses good resistance to exterior exposure conditions and is also resistant to a wide range of chemicals. The coating system is suitable for application to concrete provided proper surface preparation and application precautions are observed.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2 and 6.3).
- (c) Color required (see 3.3.3 and 6.3).
- (d) Level of packaging and packing and level of marking required (see 5.1).
- (e) Quantity and size of container required (see 5.1).

6.3 Compatibility. The three types of lacquer are formulated for use together as a protective coating system for steel or concrete surfaces and it is probable that lacquers from various manufacturers will not be suitable for use with each other. Therefore, the activity concerned should purchase all three types from the same manufacturer and should specify in the invitation for bids that the three types of lacquer be furnished in contrasting colors; for example with primer, blue-gray body, and white seal coat to facilitate coverage in application.

6.4 Composition. The lacquer procured under this specification should be comparable to the following composition, however, the Government assumes no responsibility for the acceptance of a product claimed to be manufactured under an identical composition:

MIL-L-2638D

Type I

Satisfactory Type I prime coat has been manufactured using 50 percent each of the following type vinyl resins:

- (a) A vinyl chloride-acetate resin with a vinyl chloride to vinyl acetate ratio of about 86 to 13. Maleic acid amounting to about 1 percent of the total composition is conjointly polymerized into this resin. Intrinsic viscosity is in the range of 0.52 to 0.54.
- (b) A vinyl chloride-acetate resin with a vinyl chloride to vinyl acetate ratio of about 87 to 13. Intrinsic viscosity is in the range of 0.52 to 0.54.

Type II and Type III

Satisfactory Type II body coat and Type III seal coat have been made only with the resin specified in (b) above.

Custodians:

Army - ME  
Navy - YD  
Air Force - 84

Preparing activity:

Army - ME  
Project No. 8010-0716

Review activities:

Army - MI, MU, MR

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐ VENDOR

☐ USER

☐ MANUFACTURER

☐ OTHER (Specify): \_\_\_\_\_

3b. ADDRESS (Street, City, State, ZIP Code)

## 5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

## 6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)

**INSTRUCTIONS:** In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

**NOTE:** This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE \$300

**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO. 12062 WASHINGTON D. C.

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE ARMY

Commander  
US Army Mobility Equipment Research & Development  
Command  
ATTN: DRDME-DS  
Fort Belvoir, VA 22060

NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES