METRIC

TT-P-102F
January 21, 1992
SUPERSEDING
TT-P-102E
April 15, 1980

FEDERAL SPECIFICATION

PAINT, OIL, (ALKYD MODIFIED, EXTERIOR, LOW VOC)

This has been approved by the Federal Supply Service, General Services Administration for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION

1.1. Scope. This specification covers long-oil alkyd paints designed for general exterior use on new or previously painted wood trim, siding, primed metal, and sealed concrete. They are lead and chromate free and have a low volatile organic compound (VOC) content.

1.2 Classification. The paints shall be of the following types and classes as specified (see 6.2):

Type I - Self-cleaning white.
Type II - Chalk resistant white.
Type III - Tints.
Class 1 - Gloss
Class 2 - Semigloss
Class 3 - Flat

2. APPLICABLE DOCUMENTS.

The following specifications and standards, 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:
TT-T-291 - Thinner, Paint, Mineral Spirits, Regular and Odorless
Federal Standards:
FED-STD-141 - Paint, Varnish, Lacquer and Related Materials; Method of Inspection, Sampling and Testing
Military Standards:
FED-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

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

2.2 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 562 - Consistency of Paints Using the Stormer Viscometer
D 659 - Evaluating Degree of Chalking of Exterior Paints
D 1210 - Fineness of Dispersion of Pigment-Vehicle Systems

D 1640 - Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
D 1729 - Visual Evaluation of Color Differences of Opaque Materials
D 2244 - Instrumental Evaluation of Color Differences of Opaque Materials

 FSC 8010

D 2369 - Volatile Content of Paints
D 2697 - Volume Nonvolatile Matter in Clear or Pigmented Coatings
D 2805 - Hiding Power of Paints
D 3273 - Resistance to Growth of Mold on the Surface on Interior Coatings in an Environmental Chamber
D 3274 - Evaluating Degree of Surface Disfigurement of Paint Films by Fungal Growth or Soil and Dirt Accumulation
D 3335 - Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
D 3924 - Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials
D 3960 - Volatile Organic Content (VOC) of Paints and Related Coatings
D 3624 - Low Concentrations of Mercury in Paint by Atomic Absorption Spectroscopy
D 4017 - Water in Paints and Paint Materials by Karl Fischer Method
D 97 - 45-deg, 0-deg Directional Reflectance Factor of Opaque Specimens by Broad-Band Filter Reflectometry
E 260 - General Gas Chromatography Procedures
G 53 - Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation 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.)

3. REQUIREMENTS

3.1 Materials. The paint shall consist of a drying oil modified alkyd resin with necessary solvents, driers and pigments to meet all requirements of this specification.

3.1.1 Prohibited materials. When tested as specified in Table II and 4.3.1, the paint shall not contain benzene, chlorinated solvents or ethylene-based glycol ethers and their acetates. Lead content shall not exceed 0.06 percent of the nonvolatile content. Mercury and hexavalent chromium compounds shall not be used.

3.2 Qualitative requirements.

3.2.1 Condition in container. The paint in a freshly opened container, when tested as specified in Table II, shall show no settling which cannot be easily redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling or caking, and shall be free from seeds.

3.2.2 Skinning. The paint shall show no skinning after 48 hours when tested as specified in Table II.

3.2.3 Color. When tested as specified in Table II at complete hiding, Type III paint shall match the color specified.

3.2.4 Brushing properties. The paint shall have satisfactory brushing properties when tested as specified in 4.3.2 and shall dry to a uniform, smooth level appearance without streaking, running, or sagging. Moderate brush marks in the dried film shall not cause for rejection.

3.2.5 Recoating. When tested as specified in 4.3.2, recoating a dried film shall produce no lifting or film irregularities.

3.2.6 Dilution stability. When thinned as in 4.3.3, the paint shall remain stable and uniform and shall show no precipitation, curdling, or separation. Slight pigment settling shall not be cause for rejection.

3.2.7 Spraying properties. The paint, when tested as specified in 4.3.4, shall spray satisfactorily and shall show no running, sagging or streaking. The dry film shall be smooth and uniform.

3.2.8 Flexibility. When tested as in 4.3.5, the paint film shall not crack or flake.

3.2.9 Knife test. A film of paint prepared and tested as specified in 4.3.6 shall adhere tightly to and shall not flake or crack from the metal. The film shall curl when cut from the metal, and the cut shall show beveled edges.

3.2.10 Biological growth. When tested as specified in table II, the paint shall attain a surface disfigurement rating of 8 or greater when evaluated against Adjunct No. 12-432740-00 specified in ASTM D 3274.

3.2.11 Accelerated weathering. The paint shall meet the following requirements when tested as specified in 4.3.7

Chalking:
Type I - No. 8 max
Types II and III - None
Gloss retention:
Types II and III - 60 % minimum of initial gloss
Color change:
Types I and II - Yellowness index difference 0.09 max
Types III - delta E 4.0 maximum for yellow, orange or red hues and 2.0 for other hues.

3.3 Quantitative requirements. The paint shall comply with all requirements in table I.

TABLE I. Quantitative requirements

Characteristics	Min	Max
Total solids, percent volume of paint	70	-
Water, percent by weight of paint	-	0.5
Coarse particles and skins (retained on No. 325 sieve), percent by weight of pigment	-	0.1
Fineness of grind (Hegman scale)	4.0	-
Consistency, Krebs-Stormer, (200 rpm sheering rate) Equivalent K.U.	80	90
Drying time		
Set-to-touch, hours	-	8
Dry hard, hours	-	48
Directional reflectance, Types I and II	86	-
Gloss (60 deg. specular)		
Types I, II and type III, class 1	60	-
Type III, class 2	25	50
Type III, class 3	-	15
Absorption, inches	0.25	-
Contrast ratio at 12 M^{-2}/L(500 ft^{-2}/gal)	0.98	-
Volatile organic compound (V)C) content, (less water and exempt solvents)Grams/liter(lb/gal)	-	250 (2.08)

3.4 Material Safety Data Sheet. A Material Safety Data Sheet (MSDS) shall be submitted in accordance with FED-STD-313 (See 6.2).

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 specified herein using facilities approved by the Government. The Government reserves the right to perform any of the Inspections set forth herein when deemed necessary to assure that the paint

conforms 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 4.2.1)

4.2.1 Preparation for delivery. A random sample of filled containers shall be selected in accordance with MIL-STD-105, inspection level S-2, acceptable quality level (AQL) 2.5 percent defective, and examined for compliance with 3.4 and 5.

4.3 Quality conformance inspection. The paint shall be tested in accordance with the methods specified in Table II and as otherwise specified herein to determine compliance with the requirements of section 3. Unless otherwise specified, all tests shall be conducted at conditions specified in ASTM D 3924. Failure of any test requirement shall be cause for rejection of the lot from which the sample was taken.

TABLE II. Index of tests

Characteristics	Requirement Paragraph	Test Paragraph	ASTM Method	FED-STD-141 Method
Solvent	3.1	--	E 260	--
Prohibited materials				
Solvents	3.1.1	--	E 260	--
Lead	3.1.1	4.3.1.1	D 3335	--
Hexavalent Chromium	3.1.1	4.3.1.2	--	--
Mercury	3.1.1	--	D 3624	--
Condition in container	3.2.1	--	--	3011
Skinning	3.2.3	--	--	3021
Color	3.2.3	--	D 1729	--
Brushing properties	3.2.4	4.3.2	--	2141
Recoating	3.2.5	4.3.2	--	--
Dilution stability	3.2.6	4.3.3	--	--
Spraying properties	3.2.7	4.3.4	--	--
Flexibility	3.2.8	4.3.5	--	6221
Knife test	3.2.9	4.3.6	--	6304
Biological growth	3.2.10	--	D 3273, D 3274	--
Accelerated weathering	3.2.11	4.3.7	D2244, D659, G53	6131
Total Solids volume	Table I	--	D 2697	--
Water content	Table I	--	D 4017	--
Coarse particles and skins	Table I	--	D 185	--
Fineness of grind	Table I	--	D 1210	--
Consistency, Krebs-Stormer	Table I	--	D 562	--
Drying time	Table I	--	D 1640	
Directional reflectance	Table I	--	E 97	--
60 deg. Specular gloss	Table I	--	D 523	--
Absorption	Table I	4.3.8	--	--
Contrast ratio	Table I	--	D 2805	--

4.3.1 Prohibited materials.

4.3.1.1 Lead content. Determine lead content in accordance with ASTM D 3335 or by the use of an x-ray fluorescence spectrometer capable of determining lead at a minimum range of 0.03 through 1.0 percent mass of nonvolatile with an accuracy within plus or minus 5.0 percent. The X-ray method shall be used in case of dispute.

4.3.1.2 Hexavalent chromium content. Add 5 mL 25 percent aqueous KOH to 1/2 gram extracted pigment in a centrifuge tube. Agitate by shaking and centrifuge. A yellow color in the supernatant liquid indicates the presence of hexavalent chromium.

4.3.2 Brushing properties. Brush the paint in accordance with method 2141, FED-STD-141 at a spreading rate of 12 M[2]/L(500 ft[2]/Gal) on a smooth metal panel. Allow to air dry 48 hours and similarly brush a second coat crosswise to the first. Evaluate during brushing and after drying for compliance with 3.2.4 and 3.2.5.

4.3.3 Dilution stability. Mix eight parts by volume of paint with one part by volume of mineral spirits conforming to Type I, TT-T-291 in a 100 mL stoppered graduated cylinder. The material shall mix readily and easily without excess stirring or shaking. Let the diluted material stand undisturbed for 4 hours and observe for compliance with 3.2.4. If doubt exists as to the condition of the material after the standing period, flow an amount of the material onto a glass panel without agitating it and examine for compliance with 3.2.6.

4.3.4 Spraying properties. Spray the paint thinned with not more than 10 percent by volume of mineral spirits on a steel panel to a dry film thickness of 25 microns (0.001 inch). While spraying, the gun shall be held perpendicular to the panel and moved in a straight line across the face of the panel at a distance 200 to 250 mm (10 to 12 inches) from the panel. Immediately place the panel in a nearly vertical position and observe for compliance with 3.2.7.

4.3.5 Flexibility. Prepare the test panel in accordance with method 2012, FED-STD-141. Supplement the panel cleaning with an additional cleaning with abrasive soap so that the surface shows no water break. Drawn down the paint on the clean, dry panel with a film applicator to obtain a dry-film thickness of 25 +/- 2 microns (0.001 +/- 0.0001 inch). Air dry 18 hours, bake at 105 +/- 2 deg. C (221 +/- 4 deg. F) for 3 hours, and cool 1/2 hour at room temperature. Bend over a 3.18 mm (1.8 inch) diameter cylindrical mandrel and examine under a magnification of 7 diameters in accordance with method 6221, FED-STD-141. Evaluate for compliance with 3.2.8.

4.3.6 Knife test. Cut a narrow ribbon of the coating as specified in method 6304, FED-STD-141 from a flat portion of the panel used for the flexibility test and evaluate for compliance with 3.2.9.

4.3.7 Accelerated weathering.

4.3.7.1 Panel preparation. Drawn down duplicate films on plane, aluminum panels with a film applicator to obtain dry-film thicknesses of 37 +/- 2 microns (0.0015 +/- 0.0001 inch). Air dry 168 hours and measure color in accordance with ASTM D 2244 using illuminant D[65] for Type III, gloss in accordance with ASTM D 523 for Types II and III or tristimulus values in accordance with method 6131, FED-STD-141 for Types I and II.

4.3.7.2 Exposure. Weather the panels for 200 hours in accordance with ASTM G 53 using UV-A-351/302 lamps and a cycle of 8 hours UV exposure at 60 deg. C (140 deg. F) followed by 4 hours condensation at 50 deg. C (122 deg. F).

4.3.7.3 Evaluation. Examine the exposed panels for chalking in accordance with ASTM D 659 using a black velvet cloth. Measure color and gloss as in 4.3.7.1 and calculate color difference, delta E, in accordance with ASTM D 2244 for Type III or yellowness index difference for Types I and II and percent gloss retained for Types II and III.

4.3.8 Absorption. Fill a one-half pint friction-top can plug with a portion of the thoroughly mixed sample and then place a No. 2 Whatman filter paper flat on the surface of liquid with the center of the filter paper approximately over the center of the liquid. Allow to remain at room temperature for 3 hours and

then measure the average radial distance on the filter paper from the edge of the area originally "wetted" with the liquid to the farthest extent of the absorption of the liquid. Examine for compliance with table 1.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking. The paint shall be furnished in quantities specified (see 6.2). The packaging, packing and marking shall be as specified (see 6.2).

6. NOTES

6.1 Intended use. These paints are intended for exterior use on properly primed or previously painted wood, concrete, or steel surfaces. Type I paint is a self-cleaning white. Type II white and Type III tints are chalk resistant and are suitable for trim painting. The paints are lead, mercury and chromate free. They may be used in areas which limit the use of organic solvents. Theoretical spreading rate at 1.0 mil dry film thickness - 1000 square feet.

Recommended primers
Wood - TT-P-25
Metal - TT-P-664
Concrete - TT-P-19

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, class and color required.
(c) Quantities required.
(d) Instructions and address for MSDS submission.
(e) Packaging, packing, and marking required.

MILITARY COORDINATING ACTIVITY	PREPARING ACTIVITY
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PROJECT 8010-0448