

[METRIC]
TT-P-1952D
January 7, 1994
SUPERSEDING
TT-P-001952C
February 7, 1979

FEDERAL SPECIFICATION

PAINT, TRAFFIC AND AIRFIELD MARKING, WATERBORNE

The General Services Administration has authorized the use of the Federal Specification, by all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers two types of low VOC, ready-mixed, one component, 100 percent acrylic waterborne airfield and traffic marking paint. The paint is suitable for application on such traffic-bearing surfaces as Portland cement concrete, bituminous cement concrete, asphalt, tar, and previously painted areas of these surfaces. The paint may be used either alone or to bind reflective beads.

1.2 Classification.

1.2.1 Types. The paint shall be furnished in the following types as specified (see 6.2):

- Type I - For use under normal conditions
- Type II - For use under adverse conditions (see 6.1)

1.2.2 Color. Traffic paint shall be furnished in white and any Federal Standard 595 color, as specified (see 3.2.7 and 6.3).

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 Specification:

TT-B-1325 - Beads (Glass Spheres), Retroreflective.

PPP-P-1892 - Paint, Varnish, Lacquer and Related Materials; Packaging, Packing and Marking of.

Federal Standards:

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

Fed. Std. No. 595 - Colors used in Government Procurement.

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| Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data which may improve this document should be sent to: General Services Administration, Engineering and Commodity Management Division (9FTE-10), 400 15th St., SW, Auburn, WA 98001. |
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Military Standards:

Military Standard 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.)

Federal Regulations:

40 CFR Part 60, Appendix A

29 CFR Part 1910.1200

(The Code of Federal Regulations (CFR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

2.2 Other publications. The following documents form a part of this description 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 522 - Standard Test methods for Mandrel Bend Test of Attached Organic Coatings.
- D 562 - Consistency of Paints Using the Stormer Viscosimeter.
- D 711 - No-Pick-Up Time of Traffic Paint.
- D 968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
- D 969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
- D 1210 - Fineness of Dispersion of Pigment-Vehicle Systems.
- D 1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
- D 1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
- D 1729 - Standard Practice for Visual Evaluation of Color Differences of Opaque Materials.
- D 1849 - Standard Test Method for Package Stability of Paint.
- D 2243 - Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings.
- D 2244 - Instrumental Evaluation of Color Differences of Opaque Materials.
- D 2486 - Scrub Resistance of Interior Latex Flat Wall Paint.
- D 2697 - Standard Test Method for Volume Nonvolatile matter in Clear or Pigmented Coatings.
- D 3335 - Standard Test Method for Low Concentrations of Lead, Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy.
- D 3718 - Standard Test Method for Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy.
- D 3723 - Standard Test Method for Pigment Content of Water-Emulsion Paints by Low-Temperature Ashing.
- E 97 - Standard Test Method for Directional Reflectance Factor, 45-Deg 0-Deg, of Opaque Specimens by Broad-Band Filter Reflectometry.
- 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

3.1.1 Materials. The non-volatile portion of the vehicle shall be composed of a 100 percent acrylic polymer as determined by infrared spectral analysis. Any acrylic monomer can be used as long as the finished product meets the requirements of this specification.

3.1.2 Prohibited material. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, toluene, chlorinated solvents, hydrolyzable chlorine derivatives, ethylene based glycol ethers and their acetates, nor any carcinogen, as defined in 29 CFR 1910.1200. When tested as specified in 4.3.1, the lead content shall not exceed 0.06 percent by weight of the dry film and the test for chromium content shall be negative.

3.2 Qualitative Requirements.

3.2.1 Condition in container. When tested as specified in 4.3.2, the paint, as received, shall show no evidence of biological growth, corrosion of the container, livering, or hard settling. The paint shall be dispersible by hand stirring for 5 minutes to form a homogeneous consistency, exempt of gel structures, persistent foam or air bubbles.

3.2.2 Appearance. When tested as specified in 4.3.3, the paint shall produce a film which is smooth, uniform, free from grit, undispersed particles, craters, and pinholes.

3.2.3 Accelerated package stability. After storage as specified in 4.3.4, the sample shall conform to the requirements of 3.2.1 and 3.2.2. The sample shall no change in consistency greater than 5 K.U. from the value in Table I.

3.2.4 Flexibility. When tested as specified in 4.3.5, the paint shall not crack, chip, or flake after the test panel is bent 180 degrees over a 13mm (1/2-in) mandrel.

3.2.5 Water resistance. When tested as specified in 4.3.6, the paint film shall not soften, blister, wrinkle, lose adhesion, change color, or show other evidence of deterioration.

3.2.6 Freeze-thaw stability. When tested as specified in 4.3.8, the paint shall show no coagulation or flocculation, change in consistency greater than 10 K.U. from the value in Table I, nor a decrease in scrub resistance of more than 10 percent of the requirement in 3.2.13.

3.2.7 Color requirements.

3.2.7.1 Color match. for all colors except white and yellow, when tested as specified in 4.3.9.3, the paint shall match the specified Federal Standard 595 color number within a [DELTA] E of 6.0 CIELAB units.

3.2.7.2 Daylight directional reflectance. When tested as specified in 4.3.9.2, the white paint shall have the daylight directional reflectance specified in Table I.

3.2.7.3 Yellow color match. The yellow traffic paint shall be approximate color match to Fed. Std. 595 color number 33538 when tested in accordance with 4.3.9.4.

3.2.8 Heat-shear stability. When tested as specified in 4.3.13, the sample shall not show signs of gelling or other instability. The consistency shall be in compliance with Table I.

3.2.9 Skinning. The paint shall not skin when tested as specified in 4.3.14.

3.2.10 Dry-Through (Early Washout). For Type II only, the paint when tested as specified in 4.3.15 shall have a dry-through time less than 120 minutes.

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3.2.11 Abrasion resistance. When tested as specified in 4.3.7, both baked and weathered paint films shall require not less than 150 liters of sand to abrade the paint film through to the substrate.

3.2.12 Accelerated weathering. When tested as specified in 4.3.10, the colored samples after weathering shall be in conformance with 3.2.7. The directional reflectance of white paint shall meet the requirement in Table I. After performing the scrub resistance test in accordance with 4.3.12, the paint shall be in conformance with 3.2.13.

3.2.13 Scrub resistance. When tested as specified in 4.3.12, it shall not take less than 500 cycles to remove the paint film.

3.2.14 Titanium dioxide content. When tested in accordance with 4.3.16, the yellow, green and blue colored paint shall contain a maximum of 23.7 g/L (0.2 lb/gal) rutile titanium dioxide. The white paint shall contain a minimum of 120 g/L (1 lb/gal) rutile titanium dioxide.

3.3 Quantitative requirements. The paint shall meet the quantitative requirements specified in Table I.

TABLE I - Quantitative Requirements

| Characteristics | Min | Max |
|---|------|-----|
| Consistency, Krebs Units (K.U.) | 80 | 90 |
| Volatile Organic Content, grams/liter | -- | 150 |
| Solids by Volume [1] | | -- |
| Yellow or white | 60 | |
| Other colors | 58 | |
| Pigment, Percent by weight | 60 | 62 |
| Dry opacity | | |
| White and colors | 0.92 | -- |
| Black | 1.00 | -- |
| Directional reflectance of white paint, percent | 85 | -- |
| Drying time for no pick up, min. | -- | 10 |
| Fineness of dispersion, Hegman | 3.0 | -- |
| Heat-Shear Stability, Consistency, KU | 68 | 105 |
| Bleeding ratio | 0.95 | -- |

[1] Manufacturers may calculate this requirement from batch card data but in case of dispute the method specified in Table II must be used.

3.5 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 as specified herein.

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

- (a) Inspection of preparation for delivery (see 4.2.1).
- (b) Quality conformance inspection (see 4.2.2).

4.2.1 Inspection of 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 section 5.

4.2.2 Quality Conformance Inspection. Testing for acceptance of individual lots shall be done in accordance with section 1000 of Fed. Std. 141 and shall consist of tests and inspections as indicated in Table II.

4.3 Test methods. Samples shall be tested as specified in table II. Unless otherwise specified, tests shall be performed at standard conditions, which are 25 degrees +/- 1 degree C and 50 percent +/- 5 percent relative humidity. All test reports shall contain the individual values utilized in expressing the final result. Test results shall be evaluated for conformance to requirements. The sample shall be unacceptable if any test result is not in conformance with the corresponding requirement in section 3.

TABLE II - Index

| Characteristic | Acceptance Testing | Requirement Paragraph | FED-STD 141C | ASTM Method | Test Paragraph |
|-------------------------------|--------------------|-----------------------|--------------|-------------|----------------|
| Lead content | | 3.1.2 | - | D 3335 | 4.3.1.1 |
| Chromium content | | 3.1.2 | - | D 3718 | 4.3.1.2 |
| Condition in container | Yes | 3.2.1 | - | - | 4.3.2 |
| Appearance | Yes | 3.2.2 | - | - | 4.3.3 |
| Accelerated package stability | | 3.2.3 | - | D 1849 | 4.3.4 |
| Flexibility | Yes | 3.2.4 | - | D 552 | 4.3.5 |
| Water resistance | Yes | 3.2.5 | - | - | 4.3.6 |
| Freeze-thaw stability | Yes | 3.2.6 | - | D 2243 | 4.3.8 |
| Color | Yes | 3.2.7 | - | D 2244 | 4.3.9 |
| Directional Reflectance | Yes | 3.2.7.2 | - | E 97 | 4.3.9.2 |
| Yellow color match | Yes | 3.2.7.3 | - | D 1729 | 4.3.9.4 |
| Heat-Shear stability | Yes | 3.2.8 | - | - | 4.3.13 |
| Skinning | Yes | 3.2.9 | 3021 | - | 4.3.14 |
| Dry-Through (Early Washout) | Yes | 3.2.10 | - | D 1640 | 4.3.15 |
| Abrasion resistance | Yes | 3.2.11 | - | D 968 | 4.3.7 |
| Accelerated weathering | | 3.2.12 | 2013 | G 53 | 4.3.10 |
| Scrub resistance | Yes | 3.2.13 | - | D 2486 | 4.3.12 |
| Volatile Organic Content | | Table I | - | D 2369 | |
| Consistency | Yes | Table I | - | D 562 | - |
| Solids by Volume | Yes | Table I | - | D 2697 | - |
| Dry opacity | Yes | Table I | 4121 | - | 4.3.11 |
| Dry time (no pick up) | Yes | Table I | - | D 711 | - |
| Fineness of dispersion | Yes | Table I | - | D 1210 | - |
| Bleeding ratio | | Table I | - | D 969 | - |
| Pigment, percent by weight | | Table I | - | D 3723 | - |
| Titanium Dioxide | | 3.2.14 | - | D 1394 | 4.3.16 |

4.3.1 Prohibited Materials.

4.3.1.1 Lead content. Determine lead in accordance with ASTM D 3335 or by the use of an X-ray fluorescence spectrometer in accordance with the manufacturer's manual. The X-ray method shall be used in case of dispute. Evaluate for compliance with 3.1.2.

4.3.1.2 Chromium (hexavalent) content. Add 5 ml of 25 percent aqueous KOH to 0.5 g of the extracted pigment contained in a centrifuge tube. Agitate by shaking and centrifuge. A yellow color in the supernatant liquid indicates the

presence of hexavalent chromium. If the results of the above test are inconclusive, then use the procedure in ASTM D 3718 to test for chromium content. Evaluate results for compliance with 3.1.2.

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4.3.2 Condition in the container. Before stirring the contents of the container in which the material was originally packaged, check for evidence of biological growth and corrosion. Then lower a spatula into the container and determine whether the paint has livered or developed hard settling. Disperse the paint with the spatula for 5 minutes and examine for compliance with 3.2.1.

4.3.3 Appearance. Draw down the paint on a clear glass panel to a wet film thickness of 0.33 mm (0.013 in), and allow to dry to 24 hours at standard conditions. Evaluate for compliance with 3.2.2.

4.3.4 Accelerated package stability. Fill a 550 ml (1 pint) resin-lined friction-top can with the sample. Ensure that the bulk sample from which the cans are filled is well-stirred and uniform, that the containers used are clean, and that the lids are applied promptly to the cans to prevent evaporation losses. Store at a temperature of 52 degrees C. for 2 weeks. Evaluate following the procedure in ASTM D 1849, except allow hand stirring for 5 minutes to ensure uniform distribution. Evaluate the consistency for conformance with Table I. Draw down the paint as in paragraph 4.3.3. Evaluate for compliance with 3.2.3.

4.3.5 Flexibility. Determine flexibility in accordance with Method B of ASTM D 522. Draw down the paint to a wet film thickness of 0.13 mm (0.005 in) on a clean bare cold rolled steel panel. Air dry the panel for 24 hours at standard conditions, then bake for 5 hours at 105 degrees C. +/- 2 degrees C, and finally condition the panel for 30 minutes at standard conditions. Bend over a 13 mm (1/2 inch) diameter cylindrical mandrel and examine under a magnification of 7 diameters for compliance with 3.2.4.

4.3.7 Abrasion resistance.

4.3.7.1 Sample preparation. Draw down the paint on four glass panels measuring 100 by 200 mm to a dry film thickness of 0.102 to 0.107 mm.

4.3.7.2 Baked films. Air dry two of the panels for 24 hours at standard conditions and then bake for 5 hours at 105 degrees C +/- 2 degrees C. After baking, condition the panels for 30 minutes at standard conditions and then run the abrasion test as specified in 4.3.7.4.

4.3.7.3 Weathered films. Air dry the other two panels for 48 hours at standard conditions. Then subject the panels to accelerated weathering in accordance with 4.3.10. Remove the panels and condition for 24 hours at standard conditions, then run the abrasion test as specified in 4.3.7.4.

4.3.7.4 Test. Subject the panels prepared to the abrasion test in accordance with ASTM Method D 968, Method A, except that the inside diameter of the metal guide tube shall be from 18.97 to 19.05 mm. Five liters of unused sand shall be used for each test panel. The test shall be run on two test panels. [Note: Five liters of sand weighs 7.94 kg]. Evaluate for compliance with 3.2.11.

4.3.8 Freeze-thaw stability. Test in accordance with ASTM D 2243 for 3 freeze-thaw cycles. Perform the consistency test in accordance with ASTM D 562 and the scrub resistance test as described in 4.3.12. Check for conformance with 3.2.6.

4.3.9 Color.

4.3.9.1 Sample preparation. Use the test panels prepared for the accelerated weathering test (4.3.10.1).

4.3.9.2 Daylight directional reflectance. For the white paint, determine the directional reflectance before and after weathering in accordance with ASTM E 97. Evaluate for conformance with Table I.

4.3.9.3 Color match. For colors other than white and yellow, determine the color difference of the paint before and after weathering in accordance with ASTM D 2244 using CIE Illuminant D 65 with the 10 degree standard observer. Evaluate for conformance with 3.2.7.

4.3.9.4 Yellow color match. Determine the color match for yellow paint before and after weathering in accordance with ASTM D 1729 with the daylight illumination represented by CIE illuminant D75 or D65. Evaluate for conformance with 3.2.7.3.

4.3.10 Accelerated weathering.

4.3.10.1 Sample preparation. Apply the paint at a wet film thickness of 0.33 mm (0.013 inch) to four 8 by 15 cm aluminum panels prepared as described in Method 2013 of Fed. Test Method Standard No. 141. Air dry the sample 48 hours under standard conditions.

4.3.10.2 Testing conditions. Test in accordance with ASTM G 53 using both Ultra Violet Light (UV-B PS-40) and condensate exposure, 300 hours total, alternating 4 hour UV exposure at 60 degrees C, and 4 hours condensate exposure at 40 degrees C.

4.3.10.3 Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in 4.3.9.2 and 4.3.9.3. Evaluate for conformance with the color requirements in 3.2.7. Using the procedure described in 4.3.12, run the scrub resistance test. Evaluate for conformance with 3.2.13.

4.3.11 Dry opacity. Use procedure B, Method B of Method 4121 of Fed. Test Method Standard No. 141. The wet film thickness shall be 0.13 mm (0.005 in). Evaluate for conformance with Table I.

4.3.12 Scrub resistance. Using the procedure of ASTM D 2486 modified to use the 8 X 15 cm test panels from the accelerated weathering test (4.5.10), evaluate for conformance with 3.2.13.

4.3.13 Heat-shear stability. One pint of the paint is sheared in a Waring Blender at high speed to 65 degrees C. The blender should have tight fitting lid and be taped to minimize volatile loss. When the paint reaches 65 degrees C, stop the blender, immediately can, and apply cover. Let cool a minimum of 12 hours and examine for gelling or other signs of instability. Evaluate for compliance with 3.2.8.

4.3.14 Skinning. Place 188 ml of the paint in a 250 ml container, seal, and test in accordance with method 3021 of Fed. Test Method Standard 141. After 48 hours examine for compliance with 3.2.9.

4.3.15. Dry-Through (Early Washout). (For Type II only.) Draw down the paint on a glass panel to a wet film thickness of 0.33 mm (0.013 inch). Immediately place in a humidity chamber maintained at 23 degrees C +/- 2 degrees C and 90 percent +/- 3 percent relative humidity. Test in accordance with ASTM D 1640

except that the pressure exerted will be the minimum needed to maintain contact with the thumb and film. Check for compliance with 3.2.10.

4.3.16 Titanium dioxide content. Determine the titanium dioxide content using the Aluminum Reduction Method of ASTM D 1394. Evaluate for conformance with 3.2.14.

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5. PACKAGING

5.1 Packaging, packing and marking. The paint shall be packaged, packed, and marked in accordance with PPP-P-1892 unless otherwise specified.

5.2 Special marking.

5.2.1 Shipping container markings. Each shipping container shall be marked:

"PROTECT FROM FREEZING - STORE ABOVE 2 DEGREES C (35 DEGREES F)"

5.2.2 Unit container markings. Each unit container shall be marked as follows:

"PROTECT FROM FREEZING - STORE ABOVE 2 DEGREES C (35 DEGREES F)"

"After opening, maintain a thin layer of water on surface of paint during storage to prevent skinning."

"Use only in equipment designed for water based paints."

"This paint may be reflectorized by dropping glass conforming to TT-B-1325 onto the wet paint. The surface to be coated shall be free from dirt, oil, grease, other contaminants, and loose, peeling or poorly bonded paint. The paint shall be applied to the surface at a wet film thickness of 0.33 mm (0.013 inch), while air and surface temperatures are above 7 degrees C (45 degrees F) and rising."

6. NOTES

6.1 Intended use. These paints are intended for use on concrete, bituminous, brick, or stone surfaces of airfields, highways, bridges, tunnels, streets, or parking lots when applied at a wet film thickness of 0.33 mm (0.013 inch) by means of traffic striping equipment designed for water based paints. The white and yellow paint stripes should preferably be reflectorized for night visibility by adding glass beads conforming to TT-B-1325. The black paint is intended for use as an obliterating paint, for painting out white or yellow markings to permit remarking in a different manner.

Type I - for use under normal weather conditions, i.e. 50 percent relative humidity, moderate temperatures and slight breezes.

Type II - for use under adverse conditions, i.e. night striping, higher humidity (around 80 percent), low air movement and lower surface temperatures, down to 12 degrees C (55 degrees Fahrenheit).

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

- (a) Title, and date of this specification.
- (b) Type required (see 1.2).
- (c) Color required (see 1.2.2 and 6.3).
- (d) Size of container required (see 5.1).
- (e) Packaging and packing level (see 5.1).
- (f) Marking required (see 5.2).
- (g) Requirements for Material Safety Data Sheets.

6.3 Colors. The most common colors are:

| | | | |
|--------|-------|-------|-------|
| Yellow | 33538 | Green | 34108 |
| Black | 37038 | Blue | 35180 |
| Red | 31136 | White | |

6.4 Part numbers. Part numbers for cataloging purposes under this specification may be coded as follows:

TT-P-1952-XX-XXXXX

color

container size L * J

type

specification

L * J Container size codes:

| | | | | | |
|---|---|-------|--------|-----|----------|
| 1 | - | 3.78 | Liters | (1 | Gallon) |
| 2 | - | 18.9 | Liters | (5 | Gallons) |
| 3 | - | 113.4 | Liters | (30 | Gallons) |
| 4 | - | 207.9 | Liters | (55 | Gallons) |

Military custodian:
Air Force - 99

Preparing activity:
GSA-FSS

Military reviewer:
Air Force - 84

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