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METRIC

TT-P-29K
October 31, 1991
SUPERSEDING
TT-P-29J
August 27, 1976

FEDERAL SPECIFICATION

PAINT, LATEX

This specification has been approved by the Commissioner General Services Administration for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION.

1.1 Scope. This specification covers a ready-mixed, latex base paint for interior walls and ceilings. This specification provides two types of flat paint.

1.2 Classification. The paint shall be of the following types.

Type I - Tints (pastels) and whites (FED-STD-595 colors 37875 and 37778)

Type II - A high-hiding white (no color number), suitable for use as is or as a tint-base (see 6.2)

2. APPLICABLE DOCUMENTS

2.1 Government publications. 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:
- H-B-420 - Brush, Paint, Flat, Metal-bound.
- H-R-550 - Roller, Kit, Paint.
- L-S-626 - Sponges, Synthetic.
- SS-L-30 - Lath, Sheathing, and Wallboard, Gypsum.
- TT-E-545 - Enamel, Odorless, Alkyd, Interior Undercoat, Tints and White.
- TT-P-650 - Primer, Coating, Latex base, Interior, White (For Gypsum Wallboard).
- TT-S-179 - Sealer, Surface: Pigmented Oil, Plaster and Wallboard.
- TT-T-291 - Thinner, Paint, Mineral Spirits, Regular and Odorless
- TT-T-390 - Tinting medium, Concentrate General-Purpose.

Federal Standards:
- FED-STD-141 - Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing.
- FED-STD-313 - Preparation and Submission of Material Safety Data Sheets (MSDS)
- FED-STD-595 - Colors.

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

(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)

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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 Conference of Governmental Industrial Hygienists (ACGIH)
Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

(Application for Copies should be addressed to American Conference of Governmental Industrial Hygienists (ACGIH) 6500 Glenway Ave. Bldg D-7, Cincinnati, OH, 45211.)

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American Society for Testing and Materials (ASTM) Standards:
D 523 - Specular Gloss
D 562 - Consistency of Paints Using the Stormer Viscometer
D 1210 - Fineness of Dispersion of Pigment-Vehicle Systems
D 1296 - Odor of Volatile Solvents and Diluents
D 1640 - Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
D 1729 - Visual Evaluation of Color Differences of Opaque Materials
D 1849 - Package Stability of Paint
D 2486 - Scrub Resistance of Interior Latex Flat Wall Paints
D 2697 - Volume Nonvolatile Matter in Clear or Pigmented Coatings
D 2805 - Hiding Power of Paints by Reflectometry
D 3273 - Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
D 3274 - Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
D 3335 - Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
D 3359 - Measuring Adhesion by Tape Test
D 3624 - Low Concentrations of Mercury in Paint by Atomic Absorption Spectroscopy
D 3960 - Volatile Organic Content (VOC) of Paints and Related Coatings
E 97 - Directional Reflectance Factor, 45-deg, 0-deg, of Opaque Specimens by Broad-Band Filter Reflectometry
E 260 - Packed Column Gas Chromatography

(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 an emulsion polymer pigment and additives, properly combined to produce ready-mixed paint meeting the requirements of this specification.

3.1.1 Prohibited materials. When tinted 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, and mercury and hexavalent chromium compounds shall not be detected. Lead content shall not exceed 0.06 percent of the nonvolatile content. ACGIH carcinogens and ACGIH suspected carcinogens shall not be used.

3.2 Qualitative requirements.

3.2.1 Condition in container. The paint, as received, shall be ready-to-use and shall show no evidence of biological growth, livering, skinning, putrefaction, corrosion of the container, or hard settling of the pigment. Any settled pigment shall be dispersible by stirring with a paddle for 5 minutes to a smooth and homogeneous consistency. Any foam or air bubbles shall dessipate within 30 minutes.

3.2.2 Accelerated storage stability. After storage at 49 deg. C (120 deg. F) for 30 days as specified in table II, the paint shall show no livering, curdling, hard caking, or gummy sediment. It shall mix by stirring with a spatula to a smooth and homogeneous consistency within 5 minutes.

3.2.3 Color. When tested as specified in 4.3.2 the color of type I paint shall match the color specified.

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3.2.4 Flexibility. When tested as in 4.3.3, the paint shall show no evidence of cracking, chipping, or flaking.

3.2.5 Adhesion (tape test). A film of the paint tested in 4.3.4 shall achieve a rating of 3A to 5A.

3.2.6 Working properties. The paint shall apply smoothly by brush, roller, or spray equipment when tested as specified in 4.3.5 The paint shall show no foaming, pinholing, spattering, or pigment separation during application.

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3.2.7 Appearance of the dried paint. When the paint is applied by brushing or rolling as specified in 4.3.5, the film shall dry to a smooth, uniform finish free from craters and other caused by bubble retention. There shall be no shiners or flashing, no streaking, and no conspicuous laps or objectionable brush marks on the dried film. Between any two of the eight films, the difference in 85 deg. specular gloss shall not be more than 2 units, and the difference in reflectance shall not be more than 1 percent (absolute).

3.2.8 Scrubbability. The film shall not be worn through to the panel in fewer than 400 cycles (800 separate strokes), when tested as specified in 4.3.6.

3.2.9 Washability. When painted the panels are tested as specified in 4.3.7, the soil shall be removed without exposure of the undercoat. The reflectance of the cleaned are shall be not less than 95 percent of the value measured on the unsoiled area before the test; the 85 deg. specular gloss of the washed area shall be not greater than 20. The color of the washed and unwashed areas shall be the same.

3.2.10 Freeze-thaw resistance. The paint as received shall withstand the freeze-thaw test as specified in 4.3.8, and the viscosity shall not change more than 5 K.U. After completion of this test, the paint shall dry to a smooth uniform finish when applied to a wallboard panel.

3.2.11 Water resistance. The firm shall show no wrinkling, re-emulsification, or other changes when tested as specified in 4.3.9.

3.2.12 Alkali resistance. When the paint film is tested as specified in 4.3.10, the film shall show no change in hue, lightness, or 85 deg. gloss.

3.2.13 Resistance to biological growth. When tested as specified in table II, the paint film shall have a surface disfigurement rating of 8 or greater. All biological growth shall be included in the evaluation of disfigurement.

3.2.14 Resistance to reflectance variation. When tested as specified in 4.3.11, the appearance of both tinted and untinted panels shall remain uniform; any variations in reflectance between sealed and unsealed areas shall not exceed 1.0 percent (absolute).

3.2.15 Compatibility (type II only). When tested as specified in 4.3.12, the dried film shall show uniform color, an 85 deg. gloss at 10 or less, and no streaks, craters, or pigment floating.

3.2.16 Odor. When tested as specified in 4.4.13, the odor of the paint shall not be putrid or otherwise offensive or irritating before, during, and after application. There shall be no residual odor after 24 hours of drying.

3.3 Quantitative requirements. The paint shall comply with all requirements in table 1.

TABLE I. Quantitative requirements

Characteristics	Min	Max
Consistency, KU	82	110
Nonvolatile, percent by volume of paint	50	-
Dry hard, minutes	-	60
85 deg. specular gloss	-	10
Fineness of grind	3	-
Yellowness index difference (after accelerated		

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yellowing), (type I, color 37875 and type II)	-	0.07
Opacity [at 15 M2/L (630 ft2/gal)]		
Directional Reflectance		
80 and above	0.95	-
79 - 76	0.96	-
75 - 72	0.97	-
71 - 68	0.98	-
67 and below	0.99	-
Dry minus rewetted opacity	-	0.02
Directional reflectance (type II only)	90	-
Volatile organic compound (VOC) content, g/L (lb/gal)	-	250 (2.08)

3.4 Special marking. Each container and shipping container shall be mark d:

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

3.5 Material Safety Data Sheet (MSDS). An 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 finish coating 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 coating 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 section 9 of FED-STD-141. Failure of any test requirement shall be cause for rejection of the lot from which the sample was taken.

TABLE II. Index of tests

Characteristic	Requirement Paragraph	Test Paragraph	ASTM Method	FED-STD-141 Method
Prohibited materials				
Solvents	3.1.1	--	E 260	--
Lead	3.1.1	4.3.1.1	D 3335	--
Mercury	3.1.1	--	D 3624	--
Hexavalent chromium	3.1.1	4.3.1.2	--	--
Condition in container	3.2.1	--	--	3011
Accelerated storage stability	3.2.2	--	D 1849	--
Color	3.2.3	4.3.2	D 1729	--
Flexibility	3.2.4	4.3.3	--	6221
Adhesion	3.2.5	4.3.4	D 3359	--
Working properties	3.2.6	4.3.5	--	--
Appearance	3.2.7	4.3.5	--	--
Scrubbability	3.2.8	4.3.6	D 2486	--
Washability	3.2.9	4.3.7	--	6141
Freeze-thaw resistance	3.2.10	4.3.8	--	--
Water resistance	3.2.11	4.3.9	--	--
Alkali resistance	3.2.12	4.3.10	--	--
Resistance to biological growth	3.2.13	--	D 3273 D 3274	--
Resistance to reflectance variation	3.2.14	4.3.11	--	--
Compatibility	3.2.15	4.3.12	--	--
Odor	3.3.16	4.3.13	D 1296	--
Consistency	Table I	--	D 562	--
Nonvolatile	Table I	--	D 2697	--

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Dry hard time	Table I	--	D 1640	--
Specular gloss	Table I	--	D 523	--
Fineness of grind	Table I	--	D 1210	--
Yellowness, accelerated	Table I	--	--	6132
Opacity, dry	Table I	--	D 2805	--
Opacity, rewetted	Table I	4.3.13	--	--
Reflectance	Table I	--	E 97	--
Volatile organic content	Table I	--	D 3960	--

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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 minimum range of 0.03 through 1.0 percent mass of non-volatile 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 indicated the presence of hexavalent chromium.

4.3.2 Color. The film shall be applied on a smooth, flat chart in successive coats, each having a wet-film thickness of 76 microns (0.003 inch), until complete hiding is achieved, and shall be allowed to dry for 24 hours at standard conditions. Determine the color of the dried film in accordance with ASTM D 1729 and evaluate for compliance with 3.2.3.

4.3.3 Flexibility. Prepare the test panel in accordance with method 2012 of FED-STD-141. Supplement the test panel cleaning procedure with an additional cleaning with an abrasive soap so that the entire surface of the panel is water-wet. Apply the paint in accordance with method 2162 of ED-STD-141, on the clean, dry panel to a dry-film thickness of 25 +/- 3 microns (0.001 +/- 0.0001 inch). Air dry for 18 hours at standard conditions and bake for 3 hours at 105 +/- 2 deg. C. Cool for 1/2 hour, bend over a 6.35 mm (1/4-inch) mandrel, and examine the film in accordance with method 6221 of FED-STD-141. Evaluate for compliance with 3.4.4.

4.3.4 Adhesion (tape test). Test in accordance with ASTM D 3359, method A on the panel from 4.3.3 above. Evaluate for compliance with 3.2.5.

4.3.5 Working properties. Prepare a 1.2m by 1.2 m (4 by 4 foot) panel of gypsum wall-board conforming to SS-L-30 by marking off into four 0.3m by 1.2m (one by four-foot) vertical sections. Leave the first section bare. Prime the second section with one coat of latex primer (TT-P-650), at a spreading rate of 11 square meters per liter (350 square few per gallon. Prime the third section with one coat of pigmented oil sealer (TT-S-179), at a spreading rate of 11 square meters per gallon (450 square feet per gallon). Saw a groove paralleling the long dimensions on the remaining section and apply joint cement of low absorption or of the same type used to fill joints on plasterboard so that a 15.2 cm (6-inch) wide strip 0.15 cm (1/16 inch) high in the center with feathered edges is produced. Sand the rough spots after joint cement has dried. Allow the panel to dry for 24 hours, and then apply the paint at a spreading rate of 13 square meters per liter (530 square feet per gallon) over the entire surface of the panel using a brush conforming to H-B-420, grade AA. Allow the panel to dry for 3 hours; then apply by brush, a second coat over the upper half of the panel at a spreading rate of 13 square meters per liter (530 square feet per gallon). Cover the lower half of the panel using a roller conforming to H-R-550, class II. While applying the second coat, observe leveling, application characteristics, and other film irregularities such as softening or lifting. After a 24-hour drying period, obtain gloss and reflectance readings in accordance with ASTM methods D 523 and E 97 respectively, on the roller-coated and brushed surfaces for a total of eight different readings. Compare the eight readings with each other, and evaluate for compliance with 3.2.7. After the examining for deficiencies as specified in 3.2.6 and 3.27, apply a spray coat over a portion of a panel to determine sprayability of the paint.

4.3.6 Scrub resistance. Determine the scrub resistance of the paint film in

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accordance with ASTM D 2486, except:

1. Use a sponge conforming to L-S-626, type II, porosity B, with dimensions of 95 x 73 x 38 mm (3-3/4 x 2-7/8 x 1/2 inches) when wet. The direction of least compressibility shall be in the 38 mm (1-1/2 inch) dimension. Soak the sponge for 30 minutes in distilled water at ambient laboratory temperatures, squeeze dry with maximum hand pressure, and evenly distribute 50 ml of distilled water over the surface of the sponge. Do not wet the panel with additional water. Spread 10 g of the specified scrub medium evenly over the wearing surface of the sponge. Recharge the sponge with 10 g of scrub medium after each 100 strokes.

2. Use of holder weighing 454 g (1.0 lb) suitable for hold the sponge. The apparatus used shall have a stroke length of 380 mm (15.0 inches). Evaluate for compliance with 3.2.8.

4.3.7 Washability. Prepare panels in accordance with method 6142 of FED-STD-141, except use enamel conforming to TT-E-545 as an undercoat. Using the raw umber soiling medium in method 6141 of FED-STD-141, perform the washability test on the prepared panels, except:

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1. Lave hand soap may be used.

2. Use a sponge conforming to L-S-626, type II, porosity B, with dimensions of 95 x 73 x 38 mm (3-3/4 x 2-7/8 x 1-1/2 inches) when wet. The direction of least compressibility shall be in the 38 mm (1-1/2 inch) dimension.

3. The stroke length of the tester shall be 380 mm (15 inches)

4. Recharge the sponge after every 25 cycles until a total of 100 cycles has run.

5. Measure gloss in accordance with ASTM D 523, except use 85 deg. gloss head.

6. Measure the reflectance according to ASTM E 97.

7. Evaluate for compliance with 3.2.9.

4.3.8 Freeze-thaw resistance. Fill a 1-pint resin-lined friction-top can two thirds full with the paint, as received, and close the can tightly. Expose the can and contents three times to the following temperature cycle:

1. Low temperature of -9 +/- 2 deg. C (+15 +/- 3 deg. F) for 16 hours.

2. High temperature of 25 +/- 3 deg. C (77 +/- 5 deg. F) for 8 hours.

At the completion of the exposure test measure the consistency of the paint using ASTM D 562, and compare with the original consistency to determine compliance with the requirements of 3.2.10. Brush the paint on a composition or gypsum wallboard panel and observe while brushing and after drying whether the paint is normal and usable in all respects. Compare with the unexposed paint with respect to freedom from coagulation, agglomeration, and change in sheen or color.

4.3.9 Water resistance. Prepare two glass panels in accordance with method 2021 of FED-STD-141. Apply the paint to a dry-film thickness of 0.076 mm (0.003 inch), and allow the film to air dry at standard conditions for 120 hours. On one panel, place on three different spots approximately an inch apart 1 ml of distilled water, and immediately cover the area with a 50-mm watchglass. After 4 hours remove the watchglass and note any change in the appearance of the exposed areas. Wipe off the water, and gently rub the film with cheesecloth. Allow 2 hours at standard conditions for recovery; then examine the film and evaluate for compliance with 3.2.11.

4.3.10 Alkali resistance. On the other glass panel prepared in 4.3.9, place 1 ml of an 0.5 percent solution of reagent-grade sodium hydroxide in distilled water on three different spots immediately cover the areas with a 50-mm watch glass. Allow 4 hours contact time, and remove the watch glasses. Wash off the alkali solution in running water and allow 2 hours recovery, then examine the film and evaluate for compliance with 3.2.12.

4.3.11 Resistance to reflectance variation. Apply the paint to a penetration chart to a dry film thickness of 76 microns (0.003 inch) and width of 89 mm (3-1/2 inches). Allow the material to dry, in a horizontal position, 24 hours at standard conditions. After the drying period, obtain 45 deg. directional reflectance measurements in accordance with ASTM E 97 on the sealed and unsealed portions of the penetration chart, and report the difference. Evaluate for compliance with 3.2.14.

4.3.12 Compatibility test (type II only). In a beaker containing

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approximately 100 ml of type II paint, place 2.0 g of tinting medium concentrate conforming to TT-T-390. Stir thoroughly until the tinting concentrate is evenly dispersed to a homogeneous mixture. Allow the mixture to stand undisturbed for 5 minutes. On one clear plate-glass panel, prepared In accordance with method 2021 of FED-STD-141, brush a cost of the mixture to approximately 25 microns (0.001 inch) dry film thickness and allow to dry at room temperature in a vertical position for 24 hours. While brushing, observe for streaks and pigment separation. On another panel prepared in the same way draw down a 50 micron (0.002 inch) wet film thickness of the mixture. While the paint is still wet, rub-up an area using the Index finger in a circular motion and continue for a minimum of 20 revolutions. Exert light pressure of the finger while rubbing so as not to rub off the film. Allow the point film to dry at standard conditions for 24 hours. Examine the dried film, and compare the rubbed area against the unrubbed area. A difference in color, 85 deg. gloss (tested in accordance with ASTM D 523), or texture of the dried film between these areas shall constitute incompatibility. Evaluate for conformance with 3.2.15.

4.3.13 Odor. Test In accordance with ASTM D 1296 using mineral spirits (TT-T-291) as a reference. Evaluate for compliance with 3.2.16.

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4.3.14 Rewetted opacity. Apply a cost of water-white mineral oil (U.S.P Liquid Petrolatum, Heavy) to a wet film thickness of 37 microns (0.0015 inch) over each dried test prepared for determining dry opacity.

Allow the panels to stand horizontally in a dust-free atmosphere for 10 minutes, blot the excess oil and determine opacity in accordance with ASTM D 2805. Evaluate for compliance with table I.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking. The primer coating shall be furnished in quantities specified (see 6.2). The packaging, packing and making shall be specified (see 6.2).

6. NOTES

6.1 Intended use. The latex-base paint in whites and pastel colors covered by this specification is intended for use on such interior wall and ceiling surfaces as wall board and plaster over TT-P-650, or it may be self-primed over wallboard, plaster, or concrete. It may be applied to previously painted wood, plaster, or drywall surfaces. Gloss finishes should be dulled either by sanding or washing with a solvent-type cleaner before application of the paint.

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) Quantity and type required (see 1.2).
(c) Color required (see 3.2.3).
(d) Packaging, packing and marking required (see 5.1).
(e) Instructions and address for submission of MSDS (See 3.5).

MILITARY INTEREST:

Custodians:
Air Force - 99
Navy - YD

REVIEW ACTIVITIES:
Air Force - 84

USER ACTIVITIES:
Army - CE

CIVIL AGENCY COORDINATING ACTIVITY

GSA - FSS

PREPARING ACTIVITY

GSA - FSS

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