TT-P-26C
June 26, 1973
SUPERSEDING
Fed. Spec. TT-P-26B
August 24, 1961

FEDERAL SPECIFICATION

PAINT, INTERIOR, WHITE, TINTS AND BLACK, FIRE RETARDANT

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 This specification covers a flat fire retardant paint for interior use.

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:

P-S-571 - Soap, Scouring, Cake Form.
QQ-S-698 - Steel, Sheet and Strip, Low Carbon.
TT-P-143 - Paint, Varnish, Lacquer, and Related Materials; Packaging, Packing, and Marking of.
TT-S-179 - Sealer Surface: Pigmented Oil, Plaster and Wallboard.
LLL-F-321 - Fiberboard, Insulating.

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.

(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.

(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:

C 209 - Methods of Testing Structural Insulating Board Made from Vegetable Fibers.
D 1360 - Test for Fire-Retardancy of Paints (Cabinet Method).
D 2088 - Determination of Low Concentrations of Lead in Paints.
E 84 - Test for Surface Burning Characteristics of Building Materials.

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

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Materials. The raw materials used in the manufacture of these paints shall be assembled and processed so as to produce homogeneous paints. No halogenated solvents are permissible. The solvent or solvent system shall comply with the "Los Angeles Air Pollution Regulations (Rule 66)"1/. A certificate to this effect is necessary.

3.2 Qualitative requirements.

3.2.1 Condition in container. The paints shall show no evidence of livering, skinning, or hard settling of the pigment. Any settled pigment shall be dispersible in the liquid portion with a paddle to form a smooth, homogeneous system free from persistant foam.

3.2.2 Odor. The odor shall not be offensive or irritating during or after application.

3.2.3 Color. The color shall be as specified in the procurement document (see 6.2). When tested as in 4.5.1. The color shall match the standard color chip in Fed. Std. No. 595.

3.2.4 Skinning. The paint shall show no skinning after storing in a three-quarter filled, closed, 8-ounce glass jar at room temperature (70°F. to 90°F.) for 48 hours.

3.2.5 Spraying properties. The paints when reduced with not more than 1 pint of solvent per gallon of paint and tested as specified in 4.5.3 shall spray satisfactorily in all respects, and shall show no running, sagging, or streaking. The dried film shall show no dusting, mottling or color separation, and shall present a smooth finish free from seeds. No benzol or halogenated solvents shall be used to reduce the paint.

3.2.6 Brushing properties. The paint shall have satisfactory brushing properties when tested as specified in 4.5.2 and shall dry to a uniform, smooth level appearance without streaking, running or sagging.

3.2.7 Fungus resistance. The paint shall show no fungus growth when tested as specified in 4.5.4.

3.2.8 Scrubbability. Coated panels shall show no evidence of removal of film through to the glass within the middle 6 inches of brush travel when tested as specified in 4.5.5, except that a few pinpoint areas shall be disregarded.

3.3 Quantitative requirements.

3.3.1 The paint shall conform to the quantitative requirements shown in table I.

TABLE I. Quantitative requirements

Characteristics	Requirements Minimum	Maximum
Coarse particles and skins, percent by weight of total paint	---	0.5
Dry opacity, contrast ratio;1/ 2/	0.95	---
Drying time, hours:		
Set to touch	---	4
Hard	---	18
Fineness of grind	3	---
Specular gloss	---	12
Directional reflectance (white paint)	86	---
Lead content, percent by weight of nonvolatile	---	0.5

1/ The dry opacity shall be determined at the same spreading rate (square feet per gallon) as tested for flame spread (see 4.5.10) and at the same coverage rate as being offered to the government(see 6.4).
2/ Colors having apparent reflectivity of 60 or lower, shall have a contrast ratio of not less than 0.98 when applied at the same coverage rate.

1/ Information on Rule 66 may be obtained from the Los Angeles Air Pollution Control District, Los Angeles, CA 90001.

3.3.2 Fire retardancy. When tested as in 4.5.7 the paint applied to an unprimed panel shall show an average weight loss of not more than 7.5 grams and a char volume of not more than 2.25 cubic inches.

3.3.3 Leaching test. When tested as specified in 4.5.8 the panels shall show an average weight loss of not more than 12 grams and a char volume of not more than 3.0 cubic inches.

3.3.4 Flexibility. There shall be no cracking, flaking, or spalling when the paint is tested as specified in 4.5.9.

3.3.5 Flame-spread test. When tested as in 4.5.10 the paint shall have a flame-spread rating of not more than 25 and a smoke development of not more than 50.

3.3.6 Application instructions. Each individual container of paint shall be marked with detailed application instructions, surfaces on which the material may be used and spreading rate required to obtain the specified flame-spread rating.

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, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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.

4.2 Sampling, inspection, and testing. Unless otherwise specified, sampling, inspection and testing of paint shall be in accordance with method 1031 of Fed. Test Method Std. No. 141.

4.3 Test procedures. The tests shall be conducted in accordance with Fed. Test Method Std. No. 141, except as otherwise specified herein. Test methods are indicated in table II.

TABLE II. Inspection Schedule

Characteristics	Requirement Reference	Applicable Tests	
		Fed. Test Method Std. No. 141	Paragraph Reference
Condition in container	3.2.1	3011	------
Odor	3.2.2	4401	------
Color	3.2.3	4250	4.5.1
Skinning	3.2.4	4141	------
Brushing properties	3.2.6	----	4.5.2
Spraying properties	3.2.5	4331	4.5.3
Fungus resistance	3.2.7	6271	4.5.4
Scrubbability	3.2.8	----	4.5.5
Coarse particles and skins	Table I	4092	------
Dry opacity	Table I	4121	------
Drying time	Table I	4062	------
Fineness of grind	Table I	4411	------
Specular gloss	Table I	6101	------
Daylight reflectance	Table I	6121	4.5.6
Lead content 1/	Table I	----	------
Fire retardancy	3.3.2	----	4.5.7
Leaching test	3.3.3	----	4.5.8
Flexibility	3.3.4	6221	4.5.9
Flame-spread test	3.3.5	----	4.5.10

1/ The lead content shall be determined in accordance with ASTM D 2088, Determination of Low Concentration of Lead in Paint, except that the calculation shall be done as follows:

$$\text{Lead, percent by weight of nonvolatiles} = \frac{A \times 0.86623 \times B}{C} \times 100$$

Where A = Grams of lead oxide (PbO_2) in ash.
B = Percent ash by weight of paint divided by 100.
C = Percent total nonvolatile of paint divided by 100.

4.5 Test procedures.

4.5.1 Color. Draw down a film of the paint on a white Morest or Leneta chart using a 0.003 (0.006 inch gap) film applicator and allow to dry at room temperature for 24 hours. Determine the color in accordance with method 4250 of Fed. Test Method Std. No. 141 for compliance with 3.2.3.

4.5.2 Brushing properties. Prepare a panel of laminated composition fiberboard conforming to LLL-F-321 at least 8 square feet in area by applying two uniform brushed coats of plaster and wall board primer-sealer conforming to TT-S-179 and allow the first coat to dry 24 hours before the second coat is applied and allow the latter also to dry 24 hours. Place the panel in a vertical position and apply the well-mixed paint with a 5-inch wall brush at the same coverage rate specified by the manufacturer for the flame spread test (see 4.5.10). In applying the paint, first brush across a section of the panel with back-and-forth strokes, then level the coat with light vertical strokes using the tip of the brush. Proceed to the next section in the same manner, always working to a set edge. Examine for compliance with 3.2.6.

4.5.3 Spraying properties. The paint shall be tested in accordance with Fed. Test Method Std. No. 141, method 4331. In lieu of a metal panel, a laminated fiberboard panel conforming to LLL-F-321 that has been previously primed as specified in 4.5.2, shall be used. The paint shall be reduced by using not more than one pint of solvent per gallon of paint. Apply the paint at the same coverage rate specified by the manufacturer for the flame spread test (see 4.5.10). Examine for compliance with 3.2.5.

4.5.4 Fungus resistance. The fungus resistance shall be determined in accordance with method 6271 of Fed. Test Method Std. No. 141. Test organism shall be aspergillus oryzae ATTC No. 10196 or QM No. 1273. Test specimens shall not be leached before incubation. The incubation period shall be 7 days. Upon completion of the incubation period examine the test specimens for compliance with 3.2.7.

4.5.5 Scrubbability.

4.5.5.1 Apparatus. The apparatus consists essentially of an electric motor fastened to a flat plate and a mechnism by which a brush is drawn in a reciprocating action length wise across the painted surface. The power transmission is by a belt, pulley, and gear-reduction box. The reciprocating action of the brush is actuated by a metal holder with flexible cable attached to each end. The path of travel of the brush across the sample shall be approximately 13 inches. The brush shall travel at a rate of 45 plus or minus 5 cycles per minute.

4.5.5.2 Abrading medium. The abrading medium shall consist of a brush thoroughly impregnated with a cake grit soap conforming to P-S-571, type I. The brush and holder shall produce a 1-pound pressure on the paint film to be tested. The block of the brush shall be aluminum or close-grain hardwood 3-3/4 inches long, 1-1/2 inches wide, 1 inch thick, and free from all defects. The brush stock shall be stiff, black, but-cut, Chinese hog bristle. There shall be sixty 5/32-inch-diameter holes in the block, solidly filled with bristles. The bristles shall extend for 3/4 inch at right angles from the face of the block.

4.5.5.3 Preparation of brush. Before the test is started, the bristles shall be immersed in water at 25° to 30°C. for 30 minutes to a depth of 1/2 inch. After immersion, the brush shall be rubbed briskly over the cake grit soap for about 45 seconds. The soap shall be worked well up into the bristles by using the corners and edges of the cake.

4.5.5.4 Preparation of test panels. A plate glass panel, approximately 6.5 x 17 inches, which has previously been ground uniformly on one side with 1F Carborundum shall be given a coating of paint applied lenghtwise on the panel by means of a film applicator, at the equivalent wet film thickness that the paint was tested for flame spread (see 4.5.10). Allow the paint to air-dry for 5 days in a well ventilated room or chamber free from drafts or dust and not in the direct rays of the sun. The temperature shall be 20°C. plus or minus 1.1°C. and the relative humidity shall be 50 percent plus or minus 5 percent. For other than umpire tests, the prevailing laboratory temperature and relative humidity will be satisfactory.

4.5.5.5 Performance of test. The panel shall be placed in the abrasion tester so that the general direction of travel of the brush shall be along the direction of the drawdown. The tester shall be operated to complete 1,000 oscillations (2,000 complete strokes) of the brush. At the end of each 250 strokes, the brush shall be washed out and rescaped. During the test, water shall be added drop by drop just sufficient to keep the panel wet. The panel shall then be removed from the tester, carefully washed to remove loose material, and allowed to dry. The middle part of the panel in the path of brush travel shall be examined by both reflected and transmitted light.

4.5.6 Daylight reflectance. The test shall be performed in accordance with method 6121 of Fed. Test Method Std. No. 141. The panel for test shall be prepared by applying the paint at the same coverage rate specified by the manufacturer for the flame spread rating (see 4.5.10) to a flat piece of opague white glass. Air dry for 48 hours at 25°C ± 1.0°C. before making readings. Determine compliance with the requirements in table I.

4.5.7 Fire-retardancy test. The fire retardancy shall be determined in accordance with the Standard Method of Test for Fire Retardancy of Paints (Cabinet Method), ASTM D 1360 and as specified herein.

4.5.7.1 Position of cup. A position shall be marked on the pedestal to indicate the position of the cup when the cup lip (base of flame) is exactly 1 inch from the exposed panel.

4.5.7.2 Weight loss. Allow the panel to cool to room temperature and weigh to the nearest 0.1 grams. Determine the weight loss in grams by subtracting this value from the weight of the panel before burning. If the painted wood panel loses no more weight than 7.5 grams when the average weight loss from five duplicate panels is determined and the standard deviation is no more than 0.75 grams, no further action is required for this section of the test. If the standard deviation between the duplicate panels is greater than plus or minus 0.75 grams, an additional 5 panels shall be tested and the average weight loss based on the 10 panels shall be used. A value greater than 7.5 grams or a standard deviation greater than plus or minus 0.75 grams shall constitute failure of this test.

4.5.7.2.1 Standard deviation formula. The standard deviation shall be computed by using the following formula:

$$s = \sqrt{\frac{\Sigma X^2}{N} - Y^2}$$

Where s = Standard deviation
ΣX^2 = Sum of the squares of the individual panel loss values.
Y^2 = Square of the mean or average value.
N = Number of individual values.

4.5.7.3 Char volume. The panel shall be cut with a fine-toothed saw once longitudinally along the line of maximum length and depth of attack. In order to ascertain the maximum length, width, and depth of char, the panel shall be scraped lightly with a blunt instrument such as a spatula. The char depth shall be determined by the use of a micrometer. Measure the burned and unburned portions of the panel. The difference between these portions of the panel will give the maximum char, the width of char, and the depth of char. If the average value for the char volume of five duplicate wood panels is not more than 2.25 cubic inches and the standard deviation is not more than 0.225 inch, no further action is required for this section of the test. If the standard deviation as determined by the above formula is greater than 0.225 inch, the char volume on an additional 5 panels shall be determined and the average value of the 10 panels shall be used. An average value of more than 2.25 cubic inches or a standard deviation greater than 0.225 cubic inch shall constitute failure of this test.

4.5.8 Leaching test. Five additional panels conforming to and conditioned as specified in the Standard Method of Test for Fire Retardancy of Paints (Cabinet Method) ASTM D 1360 shall be coated and conditioned in the same manner as specified for the panels for the flame-spread test (see 4.5.10). Immerse each panel in a sealed container with 150 mils of distilled water at 120°F. ± 3°F. for 40 hours. The panels shall be air dried for 8 hours and again conditioned by placing in an oven at 120°F. ± 3°F. for a period of 40 hours and then tested for fire retardancy as specified in 4.5.7 to 4.5.7.3 inclusive. An average weight loss of more than 12 grams and a char volume of greater than 3.0 cubic inches shall constitute failure of this test.

4.5.9 Flexibility. Apply the paint for the flame spread rating at the coverage rate (square feet per gallon) and number of coats specified by the manufacturer for the flame spread rating. The test panel shall conform to QQ-S-698. Air dry the film for 24 hours at 25°C ± 1°C. (77°F ± 2°F) and relative humidity of 50 to 60 percent. The bake for 24 hours at 49°C ± 1°C. (120°F ± 2°F). Cool at room temperature for 30 minutes, then bend rapidly over a one inch mandrel to an angle of 180° in accordance with method 6221 of Fed. Test Method Std. No. 141. Evaluate for requirements as per 3.3.4.

4.5.10 Flame spread test. The paint shall be tested for flame spread in accordance with ASTM method E 84. The panels used shall be nominal 1-inch thick, tongue and groove, select Douglas Fir, and 1/2-inch thick cellulose accoustical tile, average weight of 750 lbs per 1000 square feet, transverse strength of 18 lbs. (ASTM C 209), and shall be perforated on a regular pattern. The panels shall be coated with the paint at the coverage rate (square feet per gallon) and number of coats specified by the manufacturer. Coated panels shall be conditioned to a constant weight at a temperature of 70°F ± 5°F. and at a relative humidity of 25 to 40 percent. Report of the test results shall include the coverage rate and number of coats at which the paint was tested (see 6.4). A flame spread rating of more than 25 or a smoke development of more than 50 shall constitute failure of this test (see 6.3).

4.6 Inspection of preparation for delivery. The packaging, packing, and marking shall be examined and tested to determine compliance with section 5 of this specification.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking. The paint shall be packaged, packed, and marked in accordance with TT-P-143. The level of packaging shall be A, B, or C, and the level of packing shall be A, B, or C, as specified (see 6.2). The paint shall be furnished in 1-quart or 1-gallon multiple friction top containers, in 5-gallon lug cover steel pails or in 55-gallon steel drums as specified (see 6.2). In addition to the marking required by TT-P-143, each container shall be marked as follows:

"CAUTION - Avoid prolonged breathing of vapor or contact with skin."

5.2 Directions for use.

5.2.1 The directions for use shall include surface preparation, optional methods of application, the coverage rate and number of coats at which flame spread and smoke development ratings were obtained. If thinning is required for spray application, the type of thinner and the maximum quantity of thinner to be used shall be specified. The directions shall be legible and shall be shown on the opposite side bearing the identification of the paint or paint system.

6. NOTES

6.1 Intended use. The paint covered by this specification is intended for use as a fire-retardant paint for interior use on walls, ceilings and woodwork where it is necessary to reduce the surface burning characteristics of the exposed materials of construction. The need for and effectiveness of fire-retardant paints depend on the type of construction, nature of occupancy, and other technical features of the building.

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) Color of paint required (see 3.2.3 and 6.5).
(c) Administrative provisions for inspection records (see 4.1).
(d) Level of packaging and level of packing required (see 5.1).
(e) Quantity required (see 5.1).

6.3 Procurement officer may waive the requirements for flame spread test if the manufacturer can furnish certification by an approved laboratory (see 6.7) that the paint to be furnished has a flame spread rating of 25 or less and a smoke development rating of 50 or less on unprimed Douglas Fir when test in accordance with ASTM method E 84. Black paint furnished under this specification will not be accepted unless the black paint is specifically certified by an approved laboratory (see 6.7) that the black paint has been tested and has a flame spread rating of 25 or less and a smoke development rating of 50 or less on unprimed Douglas Fir when tested in accordance with ASTM E 84. Certification based on extension of basic materials will not be acceptable for any color if the pigmentation of the color varies by more than 5 percent from the specifically certified material. In the event such a waiver is allowed, each container of paint furnished under this specification should be required to bear a label of an approved laboratory (see 6.7) showing the flame spread rating, smoke development rating, the coverage rate and number of coats at which it was obtained.

6.4 Evaluation of bids. Inasmuch as the flame-spread rating is to be determined at the coverage rate established by the paint manufacturer, based upon the flame-spread test, procurement officers should consider cost of paint per square foot of coverage in evaluating bids.

6.5 Reference standards. Unless other provisions are made by the bureau, department, or other Government activity concerned, the contracting officer should arrange to furnish the manufacturer with the necessary reference color standards.

6.6 Test organism. The organism used in the fungus-resistance test specified in 4.5.4 may be obtained from the American Type Culture Collection, 2112 M Street N.W., Washington, D. C. 20007, or for service use, from the Pioneering Research Division, Quartermaster Research and Development Center, Natick, Massachusetts.

6.7 Approved Laboratories.

Underwriter's Laboratories, Inc., Chicago, Illinois
Underwriter's Laboratories of Canada, Toronto, Ontario, Canada
Southwest Research Institute, San Antonio, Texas
Factory Mutual Research Corporation, Norwood, Massachusetts

MILITARY CUSTODIANS:

Army - ME
Navy - YD
Air Force - 84

Review Interest:

MR

User Interest:

SH, MC

MILITARY COORDINATING ACTIVITY

Army - ME

Preparing Activity:

GSA-FSS

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