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TT-S-711C
June 1, 1978
SUPERSEDING
Fed. Spec. TT-S-711b
March 6, 1963

FEDERAL SPECIFICATION

STAIN; OIL TYPE, WOOD, INTERIOR

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers semi-transparent stains for interior wood surfaces.

1.2 Classification. Stain covered by this specification shall be of the oil type and be furnished ready for use in the following colors, as specified (see 6.2):

cherry
light oak
dark oak
light walnut
walnut
dark walnut
light mahogany
mahogany
red mahogany
dark mahogany
maple

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:

PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-C-96 - Cans, Metal, 28 Gage and Lighter.

Federal Standard:

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

(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

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Services Administration Regional Offices in Boston, New York, Philadelphia, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Houston, 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.)

FSC 8010

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Military Standard:

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

(Copies of Military Specifications and Standards required by contractors 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 a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

American Society for Testing and Materials (ASTM) Standards:

D 93 - Flash Point by Pensky-Martens Closed Tester.
D 1200 - Viscosity of Paints, Varnishes, and Lacquers by Ford Viscosity Cup.
D 1296 - Odor of Volatile Solvents and Diluents.
D 1542 - Rosin in Varnishes.
D 2369 - Volatile Contents of Paints.
D 3272 - Vacuum Distillation of Solvents from Solvent Base Paints for Analysis.

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

3. REQUIREMENTS

3.1 Material.

3.1.1 Cherry, light oak, dark oak, light walnut, walnut, dark walnut, and maple stains shall consist of suitable inorganic pigments (earth colors), without admixtures of organic colors (toners), ground with a suitable drying oil, and reduced to the specified consistency with suitable thinner and added drier.

3.1.2 Mahogany stains shall consist of suitable inorganic pigments (earth colors) and organic colors (toners) if necessary, to meet the color requirement, ground with a suitable drying oil, and reduced to the specified consistency with suitable thinner and added drier.

3.2 Stability and condition in container. The stain as received shall not liver, thicken, curdle, gel, or show any other objectionable properties. Any settled pigments shall be capable of being readily broken up with a paddle to a uniform consistency.

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3.3 Miscibility with mineral spirits. The stain shall be completely miscible with regular mineral spirits when tested in accordance with 4.3.1.

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3.4 Color. The color shall be visual match to the standard stain card when tested as specified in 4.3.2 (see 6.8).

3.5 Penetration. There shall be no change in appearance when compared to an unrubbed portion of the coated chip when tested as specified in 4.3.3.

3.6 Working properties.

3.6.1 The color of the final coat shall blend evenly and uniformly with the first, producing a darker color. The grain shall not be obscured by the second coat. Testing shall be as specified in 4.3.4.1.

3.6.2 The varnished surface shall be uniform in color and gloss when tested as specified in 4.3.4.2.

3.6.7 Solvent resistance. There shall be no discoloration of the surface of the filter paper or of the cotton, caused by bleeding of the stain, when the dried film is tested as specified in 4.3.5. This requirement shall not apply to mahogany stains (see 6.4).

3.8 Odor. The odor of the wet stain and of the film at any interval of drying shall not be obnoxious or objectionable when tested in accordance with ASTM method D 1296 as specified in table II.

3.9 Resistance to color change. The stain shall not be lightened when tested as specified in 4.3.5.

3.10 Rosin, rosin derivatives, and phenolic resins. Rosin, rosin derivatives, and phenolic resins shall be absent when tested as specified in 4.3.6 and 4.3.9.

3.11 Quantitative requirement. The stain shall meet the quantitative requirements specified in table I.

TABLE I. Quantitative requirements

Characteristics	Requirements	
	Minimum	Maximum
Total solids, percent by weight of stain-------	30	-
Consistency:		
No. 4 Ford cup, seconds----------	15	75
Drying time, hours----------	-	8
Flash point, deg F----------	100	--
Lead, percent by weight of total solids--------	-	0.06

3.12 Volatile portion. The volatile portion when tested as specified in 4.4, shall conform to the following requirements by volume:

(a) The total of solvents with olefinic or cyclo olefinic unsaturation shall not exceed 5 percent.

(b) The total of aromatic compounds with 8 or more carbon atoms in the

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molecule, except ethylbenzene, methyl benzoate, and phenyl acetate, shall not exceed 8 percent.

(c) The total of ethylbenzene, toluene, and branched-chain ketones shall not exceed 20 percent.

(d) A solvent which may be classified into more than one of the above groups shall be considered a member of the group having the lowest allowable concentration.

(e) The total of (a), (b), and (c) shall not exceed 20 percent.

(f) Halogenated solvents shall not be present.

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3.13 Special Markings.

WARNING! HARMFUL IF SWALLOWED, INHALED, OR (ABSORBED THROUGH SKIN)

Avoid breathing vapor.
Avoid contract with eyes, skin, and clothing.

Keep container closed when not in use.
Use with adequate ventilation.
Wash thoroughly after handling.

FIRST AID: If swallowed, do not induce vomiting. While administering first aid give 15g (1/2 ounce or heaping teaspoon) of "Universal Antidote" in half glass of warm water. Call a physician. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen. Call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 20 minutes while removing contaminated clothing. Call a physician. Wash clothing before reuse.

3.14 Each unit container shall be marked with the following:

"DIRECTIONS FOR USE. This is an oil-type stain and is intended for general purpose use on interior wood surfaces. Apply the stain with a brush, let it soak in for about one-half hour, and then wipe off all excess of stain from the surface. For a lighter color effect, wipe off sooner. The oil stain should be allowed to dry thoroughly before applying finishing treatments such as shellac, varnish, or polishing wax. This type of stain does not raise the grain of the wood, is easy to apply, and one coat will cover approximately 400 to 500 square feet per gallon, depending upon the porosity of the wood. This spain may be thinned with regular mineral spirits."

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility of preparation for delivery. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government.

4.2 Sampling and inspection.

4.2.1 Examination of preparation for delivery. An examination shall be made to determine compliance with the requirements of 3.13, 3.14 and Section 5. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-2 with an AQL of 4.0 expressed in terms of percent defective.

4.2.2 Testing of the end item.

4.2.2.1 Lot. The stain shall be assembled into lots as specified in MIL-STD-105. In MIL-STD-105, the words "essentially the same conditions" shall be interpreted to mean a manufacturer’s batch, which is defined as the end product of all raw materials mixed, blended, or processed in a single operation.

4.2.2.2. Sampling of the end item for tests. For the purpose of sampling,

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the lot shall be expressed in units of gallons. Samples from lots shall be taken in accordance with MIL-STD-105 using inspection level S-2 and an acceptable quality level (AQL) of 4.0.

4.3 Test methods. All tests shall be conducted in accordance with the methods specified in table II to determine compliance with the requirements of section 3. Unless otherwise specified, all tests shall be conducted at standard conditions which are 23 deg. C +/- 1 deg. C and a relative humidity of 50 +/- 5 percent. All test reports shall contain the individual values utilized in expressing the final result. Failure to pass any test, or noncompliance with any requirement shall be cause for rejection of the sample.

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TABLE II. Index

Characteristics	Requirement reference	Applicable test: Fed. Test Method Std. No. 141	Applicable test: ASTM	Applicable test: Paragraph reference
Condition in container	3.2	3011	-	-
Miscibility with mineral spirits	3.3	-	-	4.3.1
Color	3.4	-	-	4.3.2
Penetration	3.5	-	-	4.3.3
Working properties	3.6	-	-	4.3.4
Solvent resistance	3.7	-	-	4.3.5
Resistance to color change	3.9	6151	-	4.3.6
Drying time	Table I	4061	-	4.3.7
Rosin	3.10	-	D 1542	4.3.8
Phenolic resin	3.10	5141	-	4.3.9
Lead	Table I	-	-	4.3.10
Odor	3.8	-	D 1296	-
Total solids	Table I	-	D 2309	-
Consistency	Table I	-	D 1200	-
Flash point	Table I	-	D 93	-
Solvent analysis	3.12	7356	D 3272	4.4

4.3.1 Miscibility with paint thinner. Place 80 ml of the thoroughly mixed stain in a 100-ml glass-stoppered graduate. Dilute to 100 ml with regular mineral spirits and mix thoroughly. Allow to stand undisturbed for 24 hours at standard laboratory conditions. Examine for evidence of separation of the thinned stain into liquid layers and curdling or precipitation of any component of the vehicle. Settling of pigment or slight cloudiness in the liquid shall be disregarded.

4.3.2 Color. Place a 3- by 5-inch sheet of uncoated Japan wood veneer (see 6.7) horizontally on several sheets of absorbent paper. Ensure that the sheet is flat. Apply a thick coat of the stain by brush to the entire surface of the sheet, taking care that the stain puddles on the surface but does not seep under the sheet and stain the bottom of the sheet. Allow the sheet to remain undisturbed for three minutes; then wipe off excess stain with a clean cotton cloth. Immediately compare the hue of this sheet to that of a standard stain card under CIE Standard Illuminant C, and evaluate for compliance with the requirement of 3.4.

4.3.3 Penetration. Coat Japan wood veneer (see 6.7) as in 4.3.2. Twenty-four hours after staining, rub the surface of the wood veneer stained with the sample under test with a clean white cloth. Rub in the direction of the wood grain twenty times (10 back and forth strokes), and evaluate for compliance with 3.5.

4.3.4 Working properties.

4.3.4.1 Application and finish. Brush a full coat of the stain on a sanded and dusted white birch wood panel and allow to remain for 15 minutes. Wipe off excess stain with pad of clean cheesecloth. The excess shall wipe off smoothly and evenly without smearing or streaking. After drying for 24 hours at standard laboratory conditions, the stained surface shall have an even flat finish. The grain of the wood shall not be raised or obscured by the stain. Allow the sheet to remain undisturbed for three minutes; then wipe off excess stain with a clean cotton cloth. Immediately compare the hue

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of this sheet to that of a standard stain card under CIE Standard Illuminant C, and evaluate for compliance with the requirement of 3.4.

4.3.3 Penetration. Coat Japan wood veneer (see 6.7) as in 4.3.2. Twenty-four hours after staining, rub the surface of the wood veneer stained with the sample under test with a clean white cloth. Rub in the direction of the wood grain twenty times (10 back and forth strokes), and evaluate for compliance with 3.5.

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4.3.4.2 Application of finishing material. Brush a coat of the stain on a clean, dry glass panel. Allow to dry in a horizontal position at standard laboratory conditions for 24 hours. Brush a coat of interior varnish over the panel. Allow to dry for 24 hours at standard laboratory conditions, and evaluate for compliance with 3.6.2.

4.3.5 Solvent resistance (all stains except mahogany, see 6.4). Brush a coat of stain on each of 4 clean glass panels. Allow to dry in a horizontal position at standard laboratory conditions for 48 hours. Place a piece of quantitative double acid-washed medium-texture filter paper, equal to Whatman No. 40 filter paper, on the stained surface of a panel. On the filter paper place a wad of U.S.P. grade absorbent cotton which has been saturated with turpentine. Cover with an inverted small beaker and allow to remain for 5 minutes. Repeat the procedure on each of the remaining panels, using respectively, distilled water, ethyl alcohol (95 percent), and regular mineral spirits. Examine in each case for discoloration of the upper surface of the filter paper or of the cotton, caused by bleeding of the stain.

4.3.6 Resistance to color change. Dip a sanded and dusted, uncoated white birch wood panel in the stain for 3 minutes. Wipe off with a dry rag after air-drying for 15 minutes. Air-dry the panel for 24 hours. Then expose for 24 hours in the accelerated weathering apparatus described in method 6151 of Fed. Test Method Std. No. 141. No water spray shall be used. Compare the color with a panel similarly prepared but not exposed in the accelerated weathering apparatus.

4.3.7 Drying time. Apply the stain to a glass panel to give a wet film thickness of 38 [mu]m (0.0015-in) in accordance with method 2162 of Fed. Test Method Std. No. 141. Determine time to dry in accordance with method 4061, paragraph 4.2.6, of Fed Test Method Std. No. 141. Test the film with the finger using moderate pressure. The film shall be considered dry when the soft tacky condition no longer exists and the film feels firm.

4.3.8 Rosin and resin derivatives. Test for rosin and rosin derivatives in accordance with method 5031 of Fed. Test Method Std. No. 141. Use a portion of the separated nonvolatile vehicle for the test.

4.3.9 Phenolic resins. Test for phenolic resins in accordance with method 5141, paragraph 4.2, of Fed. Std. 141. Use a portion of the separated nonvolatile vehicle for the test.

4.3.10 Lead content. The method described in 4.3.10.1 or the method described in 4.3.10.2, shall be used. The X-ray fluorescence spectrometry method described in 4.3.10.1 shall be the final determinant of compliance in all cases.

4.3.10.1 Analysis for lead by X-ray fluorescence spectrometry. Lead content shall be determined using an X-ray fluorescence spectrometer capable of determining lead content at a minimum level of 0.03 percent by weight. The molybdenum X-ray source shall be operated at 60Kv and 45Ma; a lithium fluoride crystal cut along with 200 planes shall be used to disperse fluorescent X-rays; the detector collimeter shall be set at fine; and flow and scintillation counters shall be used as detectors. Pulse height selection shall be used in all measurements, and the counting time shall be 100 seconds. Place the sample disc in the sample holder, and measure the count rates of lead, lead background, and the molybdenum Rayleigh-scattered background from the X-ray tube at the following angles:

Analytical Line	Angle	Intensity

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NO	20.33	I┌Mo┐
Background I	33.50	I’
Ph	33.93	I┌Pb┐
Background II	34.50	I"

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4.3.10.1.1 Calculation. Determine the ratio R of the lead and molybdenum lines as follows:

$$R = \frac{2I_{[Pb]} - I' - I''}{2I_{[Mo]}}$$

4.3.10.1.2 Procedure. Duplicate drawdowns of the well-mixed stain shall be made on the sealed portion of a standard paint penetration chart, using a mechanical applicator plate and a film applicator with a 150um gap. The drawdowns shall be at least 250mm long, and shall be allowed to air-dry for 24 hours at standard conditions. Discs shall then be cut from each drawdown to fit the sample holder of an X-ray fluorescence spectrometer. Standard samples of the same type of stain containing known amounts of lead shall be prepared and measured in the same way, and the R values shall be plotted against the lead concentration to obtain a working curve. By use of the working curve, the value of R obtained for the test sample shall be converted to the lead concentration in percent by weight, and the result shall be evaluated for compliance with the requirement in Table I.

4.3.10.2 Analysis for lead by Atomic Absorption Spectrometry. ASTM Method D 3335 shall be used to determine the concentration of lead in percent by weight, and the result shall be evaluated for compliance with the requirement in Table I.

4.4 Solvent analysis.

4.4.1 Solvent extraction. The solvent shall be extracted from the stain in accordance with ASTM D 3272.

4.4.2 Solvent composition. The solvent composition shall be determined in accordance with 4.4.2.1, and method 7356 of Fed. Test Method Std. No. 141 to determine compliance with the requirement of 3.1.2.

4.4.2.1 Aromatic and oxygenated solvents. The 1.83m (6 ft) column shall be installed and the operating conditions described in method 7356 shall be followed. About 3 microliters of the isolated distillate shall be injected and the chromatogram scanned. The aliphatic solvents will emerge within 1 minute and the complete chromatogram should develop in about 5 minutes. From the position of the peaks observed on the chromatogram, an internal standard that will be free of interference shall be selected, such as cyclopentanol or cyclohexanol. Six-tenths of a milliliter of internal standard shall be added to 3 ml of the distillate. The sample shall be analyzed according to the oxygenated solvents that may be present. The percent of aromatic and oxygenated solvents shall be calculated as follows:

$$\text{percent aromatic and oxygenated solvents, v/v} = \frac{A \times B}{C \times D}$$

where: A = Percent of internal standard added (in this case, 20)
B = Area of aromatic and oxygenated solvents.
C = Calibration factor for the internal standard. This factor is dependent on the internal standard used and on the performance of the chromatograph, and should be determined daily.
D = Area of the internal standard (in this case, cyclopentanol or cyclohexanol.

5. PREPARATION FOR DELIVERY

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5.1 Packaging. The packaging shall be Level A or Commercial, as specified (see 6.2).

5.1.1 Level A. The 1-pint, 1-quart, and 1-gallon quantities of stain shall be packaged in metal cans conforming to PPP-C-96, Type V, Class 2. Exterior Plan B coating and side seam stripping shall be required. The 1-gallon cans shall be provided with wire handles which shall be galvanized or otherwise protectively coated to resist corrosion.

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5.1.2 Commercial. The 1-pint, 1-quart and 1-gallon quantities of stain shall be packaged in accordance with normal commercial practice. The complete package shall be designed to protect the item against damage during shipment, handling and storage.

5.2 Packing. Packing shall be Level A or Commercial, as specified (see 6.2).

5.2.1 Level A. Forty-eight 1-pint cans or twelve 1-quart cans or four 1-gallon cans of stain, packaged as specified in 5.1, shall be packed in a close-fitting box conforming to PPP-B-636, grades V3c, V3s, or V2s. The boxes shall be closed, waterproofed, and reinforced in accordance with the appendix to PPP-B-636. Alternatively wirebound, cleated plywood, or nailed wood boxes shall be acceptable shipping containers when lined with a waterproof barrier material. The barrier material shall be sealed at the edges with waterproof tape or adhesive.

5.2.2 Commercial. The stain, packaged as specified in 5.1, shall be packed in fiberboard boxes that will assure acceptance by common carrier and provide product protection against loss and damage during multiple shipments, handling and storage. The shipping container shall be in compliance with the National Motor Freight Classification and Uniform Freight Classification.

5.3 Marking. Marking shall be as specified in the contract or order.

5.4 Special marking. See paragraphs 3.13 and 3.14.

6. NOTES

6.1 Intended use. Stains covered by this specification are for general use on inside wood surfaces.

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 required (1.2).
(c) Size of containers (5.1).
(d) Level of packaging and level of packing required (see 5.1 and 5.2).

6.3 The function of an interior wood stain is to change or modify the color and bring out the grain and texture of the wood, but not to obscure it. The major types of wood stains are water stains, oil stains (both penetrating and nonpentrating), spirit stains, and non-grain-raising stains. The stains meeting this specification are non-penetrating oil stains. This type dries and penetrates slowly so that brush marks and excess stain can be readily wiped off the wood. It does not raise the grain of the wood. It is used mainly for interior wood work, wood floors, and for refinishing furniture.

6.4 Bleeding tests may rule out oil soluble dyes and certain organic pigments such as rose pink and Bismarck brown, used in some richly colored wood stains in order to obtain the color desired. Therefore, the solvent resistance test specified under 4.3.5 is not required of the mahogany color in which the presence of organic colors (toners) is permitted in this specification. (see 3.1.2).

6.5 Exterior wood stains (pigmented linseed oil type) are covered by TT-S-708.

6.6 Uncoated Japan wood veneer is available commercially. A suggested source is Carl Gorr Card, Inc., 4242 West Filmore Street, Chicago, IL 60624.

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6.7 Standard color cards may be obtained from General Services Administration, Federal Supply Service, Chemicals and Paints Division, Paints Branch, FMBP, Washington, DC 20406.

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6.8 Shelf-life surveillance. For the purpose of shelf-life surveillance, the stain stored in the original, unopened containers shall show no skinning, livering, thickening, curdling, gelling; hard, dry caking, or gummy sediment, and shall readily remix to a uniform state. In addition, the stain shall meet the drying requirements in table I.

MILITARY INTERESTS:

User Interest:

Army - MR
Navy - SH

Review Interest:

Army - MR

Civil Agencies Coordinating Activity:

GSA - FSS
GPO
HUD - FHA
VA - DMS
COM - CPS, NBS

Preparing Activity:

GSA - FSS

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