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SUPERSEDING
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August 20, 1965

FEDERAL SPECIFICATION

VARNISH, OIL, RUBBING (FOR METAL AND WOOD FURNITURE)

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 two types of varnish (see 6.1); each of the two compositions of which one is suitable for use under Air Pollution Regulations (see 6.4).

1.2 Classification.

1.2.1 Types and compositions. The varnish shall be of the following types and compositions, as specified (see 6.2).

Type I - Air Dry.

Composition G - General Use.
Composition L - Limited Use (See 6.4).

Type II - Low bake.

Composition G - General Use.
Composition L - Limited Use (see 6.4).

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:

TT-F-336	-	Filler, Wood, Paste.
TT-L-57	-	Lacquer, Rubbing, Clear, (For Wood Furniture).

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TT-S-300	-	Shellac, Cut.
TT-S-720	-	Stain: Wood, Non-Grain-Raising, Solvent Dye Type.
CCC-C-440	-	Cloth; Cheesecloth, Cotton, Bleached and Unbleached.
PPP-B-636	-	Box, Fiberboard.
PPP-C-96	-	Cans, Metal, 28 Gage and Lighter.

Federal Standards:

FED-STD-123	-	Marking for Domestic Shipment (Civil Agencies).
FED-STD-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, D.C. 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.)

Military Specifications:

MIL-W-6110	-	Wood: Determination of Moisture Content Of.

Military Standards:

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	-	Marking for Shipment and Storage.
MIL-STD-147	-	Palletized and Containerized Unit Loads 40" X 48" Pallets, Skids, Runners, or Pallet - Type Base.

(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.)

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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 Society for Testing and Materials (ASTM) Standard:

D-1644-59 - Nonvolatile Content of Varnishes

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

United States Department of Commerce Commercial Standards:

CS-35-56 - Hardwood Plywood.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

American Walnut Manufacturer's Association:

"The Story of American Walnut", Tenth Edition and "Walnut Veneer Types" Supplement.

(Application for copies should be addressed to the American Walnut Manufacturers' Association, 666 Lake Shore Drive, Chicago, IL 60611.)

The Mahogany Association Incorporation

"The Mahogany Book" (Eighth Edition) or "Figure Types in Mahogany".

(Application for copies should be addressed to the Mahogany Associated Inc., 666 Lake Shore Drive, Chicago, IL 60611.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., 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, Tariff Publishing Officer, Room 202 Union Station, 516 W. Jackson Blvd., Chicago, IL 60606.)

(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.)

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3. REQUIREMENTS

3.1 Composition.

3.1.1 Type I, composition G. The varnish for composition G shall contain not less than 45 percent, by weight, nonvolatile material. Other than the above, the manufacturer is given wide latitude in the selection of raw materials and processes of manufacture, provided the varnish produced meets the requirements of this specification.

3.1.2 Type I, composition L. The varnish for composition L shall be the same as in 3.1.1 except that the volatile solvents used, shall conform to the following requirements by volume, when tested as specified in 4.2.4.

a. Aromatic compounds with eight or more carbon atoms except ethylbenzene: 8 percent maximum.

b. Ethylbenzene and toluene: 20 percent maximum.

c. Solvents with an olefinic or cyclo-olefinic type of unsaturation: negative test.

d. Ketones: negative test.

e. Total of a & b: 20 percent maximum.

3.1.3 Type II, composition G. The varnish shall be catalyzed urea or melamine formaldehyde resin type. The varnish may contain the catalyst or may have a separately packaged catalyst which is mixed in at the time of application of the varnish. Any selection of raw materials may be used provided the low bake varnish produced meets the requirements of this specification, except that the varnish shall contain no benzene, chlorinated compounds, hydrolyzed chlorine derivaties, or phenolic resin.

3.1.4 Type II, composition L. The varnish for composition L shall be the same as in 3.1.3 except that the volatile solvents shall conform to the requirements by volume, specified in 3.1.2, when tested as specified in 4.2.4.

3.2 Chemical and physical properties. The varnish shall possess the properties listed in table I when tested as specified in 4.2.4.

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TABLE I. Physical and Chemical requirements

	Requirements			
	Type I		Type II	
Property	Min.	Max.	Min.	Max.
Non-volatile matter (percent by weight)	45	-	40	-
Viscosity (Gardner letter)	F	H	A	B
Color	No darker than 14		No darker than 6	

3.3 Appearance. The varnish shall be clear, transparent, and homogeneous, when tested as specified in 4.2.4.

3.4 Skinning. There shall be no visible skinning or gelling of the varnish as received and when tested as specified in 4.2.4, after 48 hours in the glass test container.

3.5 Application properties and appearance of dried film.

3.5.1 Type I. When applied by brushing or spraying, the varnish shall be capable of easy application, be a freely working product and have acceptable flowing and leveling properties. The air-dried film shall be smooth and free from runs, blisters, and sags. The dried coating shall be hard and glossy.

3.5.2 Type II. The varnish shall be manufactured for application by spraying. When preparing panels as specified, the varnish shall have good spraying, flowing, covering and leveling properties and the dried film shall be free from running, sagging, grit and seeding. The varnish shall not clog the spray gun, but shall be readily discharged in a smooth even spray. The film, after low-bake curing, as specified by the supplier (see 6.2(c)), shall be a uniform, smooth finish free from dusting, bubbling, wrinkling, pinholing, pitting, cratering, orange peel, blushing, blooming, blisters or other defects.

3.6 The print resistance, cold check resistance, spotting resistance, hot water resistance, chemical resistance and solvent resistance shall meet the requirements of table II on rubbed (unwaxed) surfaces of test panels, when tested as specified in 4.2.4.

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TABLE II.

Property	Type I	Type II
Print resistance	-	Shall not print.
Cold check resistance	-	Shall not check.
Spotting resistance	-	Shall not spot or soften.
Hot water (212 deg. F.)	Shall show no whitening or dulling when observed six hours after removal from water.	Shall not spot or soften.
Chemical resistance		Shall not soften, stain or show other visible damage.
Solvent resistance		Shall not spot or soften.

3.7 Draft proofness, type I. The dried film shall show no pitting, wrinkling, or crow's footing when tested as specified in 4.2.4.

3.8 Adhesion, type I. The varnish should possess good adhesive properties when tested as specified in 4.2.4.

3.9 Rubbing properties (types I & II). The rubbing varnish shall yield a smooth, dull film when tested as specified in 4.2.4. There shall be no evidence of gumming and no sweating shall occur anywhere on the film within 18 hours after rubbing.

3.10 Instructions. The label shall contain the manufacturers recommended instructions for use of the varnish to include but not be limited to, properties such as thinning, bake cycle (type II), addition of catalyst (if applicable) and humidity control.

3.11 Workmanship. The varnish shall be a clean, homogeneous liquid, uniform in appearance, free from foreign matter, and shall conform to the quality provisions of the specification. The occurrence of defects shall not exceed the applicable quality levels in section 4.

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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 in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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 supplies and services conform to prescribed requirements.

4.1.1 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Inspection. Sampling for inspection shall be performed in accordance with the provisions set forth in MIL-STD-105, except where otherwise indicated hereinafter.

4.2.1 Inspection of materials and components. The supplier is responsible for insuring that the quality assurance provisions for components or materials shall be in accordance with this specification and with subsidiary specifications referenced herein to the extent applicable.

4.2.2 Examination of the end item. The end item shall be examined for the defects in the applicable subparagraphs at the inspection levels and AQL's set forth in 4.2.3.3. The lot size, for purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in filled unit containers for examination in 4.2.2.1 and 4.2.2.2, and in units of shipping container for the examination in 4.2.3.1 and in units of pallets for examination in 4.2.3.2.

4.2.2.1 Visual examination. The packaged varnish shall be examined for defects in appearance, fill, closure, condition of container and spraying consistency. The sample unit shall be one container of varnish. The lot size for purposes of sampling shall be expressed in units of one container of varnish each.

Examine	Defect
Appearance	Not liquid. Not clear, homogeneous, transparent. Any dirt or foreign matter. Any skinning. Any suspended matter or sediment. Any gelling. Not uniform in color.

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4.2.2.2 Examination for defects in net contents. The sample unit for this examination shall be one filled container. The quality of the lot shall be unacceptable if the average net content per container examined is less than the specified or indicated quantity.

4.2.3 Examination of preparation for delivery.

4.2.3.1 Examination for packaging, packing and marking requirements. An examination shall be made to determine that packaging, packing, and marking comply with the section 5 requirements. Defects shall be scored in accordance with the list below. The sample unit for this examination shall be one shipping container fully prepared for delivery, and need not be sealed. Shipping containers fully prepared for delivery shall be examined for defects of closure. The lot size shall be the number of shipping containers in the end item inspection lot.

Examine	Defect
Markings (exterior and interior)	Incorrect, illegible, omitted; of improper size, location, sequence or method of application.
Materials	Any nonconforming component; component missing, damaged, or otherwise defective.
Workmanship	Inadequate application of components such as: incomplete closure of container flaps, loose or inadequate sealing, strapping, or stapling. Bulged or distorted container.
Packing	Not in accordance with contract requirements. Shipping container not as specified. Any leakage of contents.

4.2.3.2 Examination for palletization. An examination shall be made to determine that the palletization complies with the section 5 requirements. Defects shall be scored in accordance with the list below. The sample unit shall be one palletized unit load fully prepared for delivery. The lot size shall be the number of palletized unit loads in the end item inspection lot.

Examine	Defects
Finished dimensions	Length, width, or height exceeds specified maximum requirement.
Palletization	Not as specified. Pallet pattern not as specified. Interlocking of loads not as specified. Load not bonded with required straps as specified.

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Examine	Defects
Weight	Exceeds maximum load limits.
Marking	Omitted; incorrect; illegible; incomplete; or improper size, location, sequence, or method of application.

4.2.3.3 Inspection levels and acceptable quality levels (AQLs) for examination. The inspection levels for determining the sample size and the acceptable quality levels (AQLs) expressed in defects per 100 units shall be as follows:

Examination paragraph	Inspection levels	AQLs
4.2.2.1	I	2.5
4.2.2.2	S-2	N/A
4.2.3.1	S-2	4.0
4.2.3.2	S-1	6.5

4.2.4 Testing of the end item. The varnish shall be tested for the characteristics listed in table IV. The sample for test shall consist of a one gallon composite, together with sufficient catalyst when applicable. Sampling of the lost for purpose of obtaining the composite shall be in accordance with table III. For purpose of sampling, the lot shall be expressed in units of one gallon containers each. The composite sample shall be poured in a one gallon container of the type designated for delivery and the container suitably sealed to prevent loss of volatile matter. There shall be no evidence of failure of any test determination to meet the requirements specified. The methods of testing specified in FED-STD-141, whenever applicable as listed in table IV, shall be followed.

TABLE III.

Lot size (number of gallon containers	Containers to be sampled for composite
800 or less	5
801 up to and including 22,000	7
22,001 and over	10

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TABLE IV. Instructions for testing of end item

Characteristic	Specification reference Requirement	Test method [3]	Number determinations per composite unit	Results reported Pass or Fail	as Numerically to nearest
Composition [1]	3.1	[1]			
Color	Table I	4241 and 4248	1	X	
Appearance [2]	3.3	4261	1	X	
Skinning	3.4	3021	1	X	
Nonvolatile matter (Type I)	Table I	ASTM D1644-59	Average of 2		percent
Viscosity (Gardner) letter	Table I	4271 Procedure B	1	X	
Print resistance (Type II)	3.4	4.3.3	1	X	
Chemical resistance (Type II)	3.6	4.3.3	1	X	
Cold check resistance (Type II)	3.6	4.3.5	1	X	
Spotting resistance (Type II)	3.6	4.3.6	1	X	
Solvent resistance (Type II)	3.6	4.3.7	1	X	
Hot-water resistance	3.6	4.3.8	1	X	
Draft proofness (Type I)	3.7	4.3.9	1	X	
Adhesion (Type I)	3.8	4.3.10	1	X	
Rubbing properties	3.9	4.3.11	1	X	
Solvent analysis	3.1.2 and 3.1.4	4.3.12	1	X	

[1] See paragraph 4.1.1.

[2] Failure of the material to meet any of the test characteristics shall be recorded as a failure.

[3] Unless otherwise specified, method of test shall be FED-STD-141.

4.3 Tests.

4.3.1 Panels for testing.

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4.3.1.1 Maple, type I varnish. White maple panels for testing type I varnish shall be as specified in method 2031 of FED-STD-141. The size of the panels shall be 3 inches by 7 inches.

4.3.1.2 Hardwood-plywood, type II varnish. Two panels shall be used to perform all the tests. These test panels shall be 12 inches by 12 inches hardwood-plywood conforming to type II, Commercial Standard CS 35-56 and table V. Plywood shall be 5-ply lumber core 13/15 inches total thickness. Plywood shall be sanded on the face surfaces and shall be constructed of the species and grades of veneers, crossbands and cores as herein specified. Moisture content of panels shall be from 5 percent to 9 percent determined in conformance with MIL-W-6110. When back veneers are of a different kind of wood then the face veneers, density and thickness of face and back veneers shall be in balance to prevent supping, twisting and bowing.

TABLE V.

Species of wood	Components of laminate
Mahogany, American Mahogany, African Walnut, American	Face and Back veneers
Aspen Alder red Basswood Butternut Chestnut Cottonwood Gum Sweet Magnolia Poplar	Back veneer, crossbands
Ash Hackberry Gum, black Gum, sweet Tupelo	Back veneer
Alder red Ash Aspen Basswood Butternut Chestnut Cottonwood Magnolia Maple, soft Poplar Redwood, Calif. (vertical grain grade A) Willow	Lumber core

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4.3.1.2.1 Face veneers. Face veneers shall be not less than 1/28 inch thick before sanding. Face veneers shall be full-length pieces with no piece less than 3 inches in width when laid up in panel form and without appreciable taper (not exceeding 1/4 inch per foot of length). Face veneers shall be grade 1.

4.3.1.2.1.1 Walnut-face veneers. Walnut-face veneers shall be "half round, plain sliced or plain quartered" with wood figure (grain character) corresponding to figures typified in illustrations Nos. 4, 5, 7, 15 and 18 of Walnut Veneer Types Supplement to "The Story of American Walnut (Tenth Edition)".

4.3.1.2.1.2 Mahogany-face veneers. Mahogany-face veneers shall be "plain sliced or flat cut" with wood figure (grain character) corresponding to figures typified in illustrations Nos. 4, 7, 33 and 34 of "The Mahogany Book (Eighth Edition)" or "Figure Types in Mahogany".

4.3.1.2.2 Back veneers. Back veneers shall be of the kinds of woods specified in table V and shall be grade 2 or better.

4.3.1.2.3 Crossbands. Crossbands shall be of the kinds of wood specified in table V and may be rotary cut, sliced or sawed and shall be not less than 1/24 inch thick. Crossbands, under grade 1 veneers, shall be grade 2 or better and under back veneers shall be grade 3 or better. Voids at exposed edges of finished panels shall be filled to present a smooth surface.

4.3.2 Panel preparation.

4.3.2.1 For testing type I varnish. Apply type I rubbing varnish to four white maple panels, as specified in 4.3.1.1 with dimensions not less than 1/2 inch thick, 3-inches wide, and 7-inches long with a 0.002-inch (approximately 0.0004-inch gap clearance) Bird film applicator or any other doctor blade which produces a film of the same thickness as that produced by the Bird blade. The panels should be coated on back and edges to prevent water from reaching under side of varnish film under test and allowed to air dry under standard conditions for 48 hours.

4.3.2.2 For testing type II varnish. Prior to finishing, test panel surfaces, as specified in 4.3.1.2, shall have been thoroughly sanded smooth with 5/0 or finer sandpaper. Glue size may be used before sanding in order to stiffen the wood fibers. The surface shall be thoroughly cleaned immediately before application of stain.

4.3.2.2.1 A stain conforming to TT-S-720 shall be applied to the face veneer surface and allowed to thoroughly dry not less than 30 minutes. There shall be no perceptible solvent odor after drying.

4.3.2.2.2 Washcoat. Washcoat shall conform to one of the following alternates at the option of the supplier.

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4.3.2.2.2.1 Alternate A. Shall consist of shellac varnish conforming to type I, grade B, body 1, TT-S-300, thinned with four parts of denatured alcohol.

4.3.2.2.2.2 Alternate B. Shall consist of lacquer conforming to TT-L-57 reduced for application to 5 to 8 percent solids.

4.3.2.2.3 Alternate C. Shall be a lacquer specially formulated for washcoat purposes, to be applied at 5 to 8 percent solids and to contain no zinc sterate or other sanding aid.

4.3.2.2.3 A washcoat as specified in 4.3.2.2.2 shall be applied to the face veneer surface. After the washcoat has thoroughly air-dried for not less than 30 minutes, the surface shall be scuffed with 5/0 or finer sandpaper and loose particles and dust removed.

4.3.2.2.4 A paste wood filler conforming to TT-F-336 shall be applied to the face veneer surface. When the filler has dried to a proper wiping consistency, it shall be worked into the pores by any means so that all pores shall be completely filled. Excess filler shall be cleaned from the surface and crevices. Finish components up to this stage may be force dried.

4.3.2.2.5 A spray coat of the clear baking varnish shall then be applied to the exposed face veneer and edges. Baking shall be preceded by a 20 to 30 minute drying period at room temperature or a gradual rise to the baking temperature. The baking period shall be a maximum surface temperature of 140 degree F. for a minimum of 2-hours or a time-temperature cycle recommended by the supplier. After the panel has cooled to room temperature, the veneer surface shall be lightly sanded with 5/0 sandpaper and cleaned.

4.3.2.2.6 A second coat of varnish shall be applied to the exposed face veneer surface and baked as required in 4.3.2.2.5. When cool, the face veneer surface shall be rubbed to a uniform satin finish using No. 320 paper followed by pumice and lubricant.

4.3.2.2.7 Preparation for tests. The varnish test surface, prior to testing, shall be thoroughly cleaned of all rubbing oil or compound with xylol or mineral spirits.

4.3.3 Print test (type II). The finish shall be tested in conformance with Method No. 6211, FED-STD-141. The test shall be conducted on the rubbed test panel (4.3.2.2.7) which has been conditioned for 4 hours minimum at 73.4 deg. F and 50 +/- 4 percent relative humidity after rubbing. Under the above conditions of temperature and humidity, using a cheesecloth conforming to type I, class 1, CCC-C-440, a pressure of 1 p.s.i. shall be applied for four hours.

4.3.4 Chemical resistance tests (type II). Individual pools, approximately 2 inches across of each of the following substances: Vinegar, lemon, orange and tomato juices and a pat of salted butter shall be placed into contact with the finished surface of a test panel (4.3.2.2.7) for twenty-four hours. Each pool and the pat shall be covered with a watch glass during the exposure period. At the end of the twenty-four-hour period, the surface shall be washed

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off with clear water and dried with a clean cloth and then examined for softening, staining or other visible damage. Failure is defined as any softening, staining or other visible damages which persists for more than two hours.

4.3.5 Cold crack resistance (type II). The edges and back of the test panel (4.3.2.2.7) shall be thoroughly sealed with a heavy brushed coat of a flexible lacquer or any suitable sealer. The test shall commence not sooner than 5 days after the panel has been rubbed. The finished panel shall be subjected to 10 cycles. Each cycle shall consist of exposure at 120 deg. F for one hour in a circulating air oven, then followed immediately by exposure, within one minute, to conditions of 5 deg. F +/- 2 degrees F for one hour, followed by a relaxation period of 15 minutes at room temperature. The panel shall be examined for checking within 15 minutes after relaxation.

4.3.6 Spot-resistance test (type II). A spot-resistance test shall be made at room temperature using 50 percent pure ethyl alcohol. The alcohol shall be applied to a rubbed panel (4.3.2.2.7) in one pool and covered with a small watchglass over which a larger watchglass is superimposed. The latter shall be taped all around at the contact surface to form an air-tight enclosure. Duration of the test shall be for eighteen hours, after which the test surface shall be examined for evidence of spotting and softening. Spotting which can be substantially removed with a damp, clean cloth or furniture polish will be acceptable. Softening which recovers in one hour will be acceptable.

4.3.7 Solvent-resistance test (type II). A solvent-resistance test shall be made in the following manner: A pool, approximately 2 inches across, of the following solvent mixture shall be placed on a rubbed test panel(4.3.2.2.7) and allowed to remain for five minutes:

Butyl acetate	20	percent (by volume)
Butyl alcohol	15	percent (by volume)
Ethyl acetate	15	percent (by volume)
Ethyl alcohol	10	percent (by volume)
Toluol	40	percent (by volume)
	100	percent

The surface shall then be wiped clean. After five minutes, the surface shall be inspected for evidence of permanent spotting or softening of the finish.

4.3.8 Hot water resistance.

4.3.8.1 Type I varnish. Place one of the varnished panels (4.3.2.1) in a beaker containing about 2.5 inches of distilled water at room temperature (70 deg. to 90 deg. F.) and leave in water for 72 hours. After removing the panel from the water and drying for 6 hours, the varnish shall show no whitening and no dulling or other defects. Place another panel (4.3.2.1) in a beaker containing about 2.5 inches of boiling distilled water, and allow to remain in the boiling water for 15 minutes. After removing the panel from the water and drying for 6 hours, the varnish shall show no whitening, no dulling, or other visible defects.

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4.3.8.2 Type II varnish. Twenty-five cc of boiling distilled water (212 deg. F) shall be poured on a level finished surface of one varnished test panel (4.3.2.2) and allowed to cool to room temperature. The water shall be wiped from the surface, and the surface then examined for spotting or softening.

4.3.9 Draft proofness (type I). Flow the varnish on a white maple panel as specified in 4.3.1.1 and immediately place the panel in the direct draft of an 8-10 inch electric fan running at full speed. The panel should be placed approximately 2 feet from the fan in a nearly vertical position and at an angle of 45 deg. to the line of air current. Allow the panel to remain in this position for 5 hours, remove, and allow to remain overnight. The varnish shall show no dulling, "crow's footing", or frosting.

4.3.10 Adhesion (type I). Using a panel prepared as in 4.3.2.1, make 10 vertical score lines about 2 inches long and 1/16 inch apart, using a razor blade. Using the same razor blade, make 10 lines perpendicular to the vertical lines. A number of small squares will be formed. To indicate good adhesive properties, not more than 10 percent of the squares should flake off.

4.3.11 Rubbing. Panels prepared as in 4.3.2.1 for type I varnish and 4.3.2.2 for type II varnish shall be used for the rubbing test. The surface of the test panel shall be rubbed first with pumice flour and water with long, even, firm strokes back and forth until every portion of the panel has been rubbed. Most of the pumice shall then be removed from the rubbing pad and panel, and the varnish given a "water rub" with the pad. The panel surface shall be wiped dry with a soft cloth. The rubbed surface shall be examined immediately, and after 18 hours, for conformance to requirements of 3.9.

4.3.12 Solvent analysis (types I and II).

4.3.12.1 Separation of volatile portion. Pour about 15 grams of the varnish into a 50 ml. distilling flask. Add 10 ml. of tricresyl phosphate and several anti-bumping stones or Berl saddles. Fit a release valve into the mouth of the flask and attach a delivery tube to the side arm, extending into a receiver. The receiver consists of a test tube (20 x 150 mm.) with side arm for attaching to a vacuum pump. The glass delivery tube should reach 1-1/2 inches from the bottom of the tube. Immerse the receiver in a dry ice-acetone bath. Preheat a silicone oil bath to 180 deg. C. Raise the oil bath until the oil reaches the sample level. Reduce the pressure slowly to 10 mm. of mercury. After all solvent has distilled, carefully release the vacuum using the vale that is connected to the distilling flask. Reserve the collected distillate for the aromatic solvent determination and the test for ketone, olefinic and cyclo-olefinic compounds.

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4.3.12.2 Determination of aromatic hydrocarbons.

Apparatus: A gas chromatograph equipped with a thermal conductivity detector.

Column Preparation: Two lengths of 1/4-inch copper tubing, 6-ft. and 18-ft. long, are packed with 35 percent N,N-Bis (2-cyanoethyl) formamide on 60- to 80-mesh Chromosorb P.

Operating Conditions:

	6-ft.	18-ft.
Detector cell temperature, deg. C.	300	300
Detector cell current, ma.	150	150
Injection port temperature, deg. C.	300	300
Helium flow at exit, cc/minute	175	110
Column temperature, deg. C.	125	70

4.3.12.2.1 Aromatic and exygenated solvents - procedure A. Install the 6-ft. column and follow the operating conditions described above. Inject about 3 microliters of the isolated distillate and scan the chromatogram. 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, select an internal standard that will be free of interference, such as cyclopentanol or cyclohexanol. Add 0.6 ml. of internal standard to 3 ml. of the distillate, analyze according to the above procedure. Peaks emerging after 1 minute are aromatic solvents along with any oxygenated solvents that may be present. Calculate the percent of aromatic and oxygenated solvents as follows:

$$\text{Percent aromatic and oxygenated solvents, v/v} = \frac{20^{*} \times A}{1.02^{**} \times B}$$

Where A = area of aromatic and oxygenated solvents
B = area of internal standard
* = percent of internal standard added
** = correction factor if cyclopentanol is used. If another internal standard is used, calibrate to determine the correction factor

NOTE: If the above determination exceeds 8 percent, continue with the following procedure:

4.3.12.2.2 Total aromatic content - procedure B. Place 5 ml. of the distillate in a 10-ml glass stoppered graduate. Add 5 ml. of 85 percent sulfuric acid slowly

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while the graduate is being cooled with tap water. After the acid has been added, shake vigorously for 2 minutes then allow the layers to separate. Remove as much of the top layer as possible and wash with distilled water. Carefully pipet 3 ml. of the washed solvent into a small flask followed by 0.6 ml. of the internal standard. Mix and analyze according to procedure A. Calculate the percent of aromatics after acid treatment in the same manner as in procedure A and the percent of total aromatic solvents as follows:

$$\text{Percent total aromatic solvents, v/v} = \frac{B \times (100 - A)}{100 - B}$$

Where A = percent of aromatic and oxygenated solvents from procedure A
B = percent of aromatic solvents after acid treatment

NOTE: If the total aromatic content of the solvent is between 8 percent and 20 percent, continue with the following procedure:

4.3.12.2.3 Toluene and ethylbenzene - procedure C. Install the 18-ft. column and follow the operating conditions described for that column. Add 0.3 ml. of a high purity benzene to the 3 ml. sample used in procedure A. If the results of procedures A and B indicated the presence of onygenated solvents, treat this sample with 85 percent sulfuric acid (use 3 ml. acid) as described in procedure B. Inject about 3 microliters of sample and allow the chromatograph to develop until all the xylene isomers appear. Purge the column by raising the column temperature to 120 deg. C. After the high boiling materials emerge, reset the column temperature to 100 deg. C. Calculate the percent of toluene and ethylbenzene as follows:

$$\text{Percent toluene, v/v} = \frac{(\text{area of toluene peak})\ (1.017)^{*}\ (10)^{**}}{(\text{area of benzene peak})}$$

$$\text{Percent ethylbenzene, v/v} = \frac{(\text{area of ethylbenzene peak})\ (1.054)^{*}\ (10)^{**}}{(\text{area of benzene peak})}$$

Where * is the correction factor for the detector response
** is the percentage of internal standard added

NOTE: Sensitivity of the instrument should be adjusted to keep peaks from running off the scale. Appropriate corrections must be made for changes in sensitivity when computing the peak areas.

4.3.12.3 Test for olefinic or cyclo-olefinic compounds. Take 2 test tubes and place 2 drops of the distillate in each. Dissolve the first sample in 1 ml. of carbon tetrachloride and add 1 drop of 1 percent bromine in carbon tetrachloride. Shade and allow to set for 5 minutes. A positive test is indicated by the complete absence of yellow color when observed against a white background. Dissolve the second sample in 1 ml. of acetone and add 1 drop of 1 percent permanganate solution (1 gram of potassium permanganate crystals in 95 mls. of acetone and 5 mls. of water). Shade and allow to set for 2 minutes. A positive test is indicated by the decolorization of the purple solution. The solvent is considered to fail the test for olefinic and cyclo-olefinic compounds if either of the above tests is position (see 3.1.2).

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4.3.12.4 Test for ketones.

4.3.12.4.1 Reagent. Two grams of 2, 4-dinitrophenylhydrazine + 4 mls. of concentrated sulfuric acid + 30 mls. methanol (add slowly) + 10 mls. water.

4.3.12.4.2 Procedure. Pipette 1 ml. of reagent into a 20 x 170 mm. test tube. Add 10 drops of distillate and shake for 30 seconds. A yellow precipitate cloud in the reagent layer indicates the presence of ketones. Run a black using one milliliter of reagent and 10 drops of mineral spirits.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A, B, or C as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Type I. Type I varnish shall be furnished in 1-gallon round cans conforming to type V, class 2 of PPP-C-96. Each can shall be securely closed.

5.1.1.2 Type II. Type II varnish shall be furnished in 1-gallon oblong cans conforming to type V, class 4 of PPP-C-96. Each can shall be provided with a formed bridge type handle securely affixed to the top. Each can shall be securely closed to provide a leakproof seal. When specified (see 6.2), catalyst material shall be furnished in approximate 2-1/2 ounce packages.

5.1.2 Level B (civil agencies). Type I and type II varnish and catalyst material (when applicable) shall be packaged in accordance with 5.1.1.1 and 5.1.1.2, respectively (see 6.2).

5.1.3 Level C. Varnish and catalyst material (when applicable) shall be packaged to afford adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity. The supplier may use his standard practice when it meets these requirements.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. Four gallons of type I varnish or six gallons of type II varnish packaged as specified in 5.1, shall be packed in accordance with the applicable level A requirements specified in the appendix of PPP-C-96, except fiberboard containers shall conform to grade V2s of PPP-B-636. When specified (see 6.2), six packages of catalyst material, packaged as specified in 5.1.1.2, shall be packed in each container containing type II varnish. The catalyst material shall be cushioned and immobilized to prevent movement while the container is in transit.

5.2.2 Level B. Four gallons of type I varnish or six gallons of type II varnish packaged as specified in 5.1, shall be packed in accordance with the applicable level B requirements specified in the appendix of PPP-C-96. When specified (see 6.2), six packages of catalyst material, packaged as specified in 5.1.1.2, shall be packed in each container containing type II varnish. The

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catalyst material shall be cushioned and immobilized to prevent movement while the container is in transit.

5.2.2.1 When specified (see 6.2), the fiberboard shipping container (as applicable) shall be a grade V3c, V3s, or V4s fiberboard box fabricated in accordance with PPP-B-636 and closed in accordance with the appendix of the container specification.

5.2.3 Level C. Varnish and catalyst material (when applicable), packaged as specified in 5.1, shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies. Containers shall be in accordance with Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable.

5.3 Palletization. Unless otherwise specified (see 6.2), type II varnish and catalyst material (when applicable), packed as specified in 5.2, shall be palletized in accordance with Load Type I of MIL-STD-147. Each prepared load shall be bonded with primary and secondary straps in accordance with bonding means K and L. Pallet patterns shall be in accordance with the appendix of MIL-STD-147. Interlocking of loads shall be effected by reversing the pattern of each course. If the container is of a size which does not conform to any of the pallet patterns specified in MIL-STD-147, the pallet pattern used shall first be approved by the contracting officer.

5.4 Marking.

5.4.1 Civil agencies. In addition to any special marking required by the contract or order, interior packages and shipping containers shall be marked in accordance with FED-STD-123.

5.4.2 Military requirements. In addition to any special marking required by the contract or order, interior packages, shipping containers, and palletized unit loads shall be marked in accordance with MIL-STD-129. Marking of interior packages shall be accomplished by printing or stamping on a paper label which shall be affixed to each can.

5.4.2.1 Precautionary marking. The following precautionary marking shall be placed on each label:

"WARNING: FLAMMABLE

HARMFUL IF INHALED OR ABSORBED THROUGH SKIN.

Keep away from heat and open flame.
Avoid prolonged breathing of vapor.
Avoid contact with eyes and skin.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling."

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6. NOTES

6.1 Intended use. Type I varnish - air dry - cabinet rubbing varnish is for interior use when a rubbed finish is desired. It is made especially for wood, such as chairs, tables, desks, and other furniture. Type II varnish - bake type - is for use on metal or where a baking varnish is required.

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) The type and composition required (see 1.2.1).
(c) When level B packaging is required for civil agencies (see 5.1.2).
(d) Whether catalyst material is to be procured together with type II varnish (see 5.1.1.2, 5.1.2, 5.2.1 and 5.2.2).
(e) Selection of the applicable levels of packaging and packing (see 5.1 and 5.2).
(f) When weather-resistant grade fiberboard shipping containers are required for level B packing (see 5.2.2.1).
(g) When palletization of type II varnish is not required (see 5.3).

6.3 Basis of purchase. The varnish should be purchased by volume, the unit being a gallon of 231 cubic inches at 15.5 deg. C. (60 deg. F.).

6.4 Varnish using thinner under "limited use" should be specified for use in areas with regulations controlling the emission of solvents (thinner) into the atmosphere (air pollution).

MILITARY CUSTODIANS:

Army - GL
Air Force - 84

Review activities:

Army - MD, MR, MU

Preparing activity:

Army - GL

CIVIL AGENCIES INTEREST:

COM
GSA
JUS-FPI
VA

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain copies and other documents referenced herein.

GSA DC-01902902

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FEDERAL SPECIFICATION

VARNISH, OIL, RUBBING (FOR METAL AND WOOD FURNITURE)

This amendment, which forms a part of Federal Specification TT-V-86C, dated September 24, 1971, was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

PAGE 3

Paragraph 2.2, under "American Society for Testing and Materials (ASTM) Standards", add "D3335 - Determination of Low Concentration of Lead in Paints by Atomic Absorption Spectroscopy".

PAGE 6

Add paragraph 3.12:

3.12 Lead content. The content of lead shall not exceed 0.06 percent by weight of total non-volatile.

PAGE 18

Insert the following new paragraphs:

"4.3.13 Lead content. The method described in 4.3.13.1 or the method described in 4.3.13.2 shall be used. The X-ray flourescence spectrometry method described in 4.3.13.1 shall be the final determinant of compliance in all cases.

4.3.13.1 Analysis for lead by X-ray flourescence spectrometery. 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 the 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
Mo	20.33	$I_{[Mo]}$
Background I	33.50	I'
Pb	33.93	$I_{[Pb]}$
Background II	34.50	I"

4.3.13.1.1 Calculation. Determine the ration R of the lead and molybdenum lines as follows:

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

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4.3.13.1.2 Procedure. Duplicate drawdowns of the well-mixed paint shall be made on the sealed portion of a standard paint penetration chart, using a mechanical applicator plate and a film applicator with a 150 m gap. The drawdowns shall be at 250 mm long, and shall

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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 paint 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 3.12.

4.3.13.2 Analysis for lead by Atomic Absorption Spectrometry. ASTM Method D3335 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 3.12."