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MIL-I-24092D
SUPPLEMENT 1
21 September 1993

MILITARY SPECIFICATION

INSULATING VARNISHES AND SOLVENTLESS RESINS FOR APPLICATION BY THE DIP PROCESS

This supplement forms a part of MIL-I-24092D, dated 21 September 1993.

SPECIFICATION SHEETS

MIL-I-24092/1 - Insulating Varnish, Solvent Containing, Air-Dry for Spot Patching and Emergency Repairs, Grade CA, Class 130 and 155 Thermal Class.

MIL-I-24092/2 - Insulating Varnish, Solvent Containing, Baking, Flexible, for Dip Processing, Grade CB, Class 130 to 180 Thermal Class.

MIL-I-24092/3 - Insulating Varnish, Solvent Containing, Baking, Semi-Rigid, for Dip Processing, Grade CBH, Class 130 to 200 Thermal Class.

MIL-I-24092/4 - Insulating Varnish, Solvent Containing, Baking, Silicone for Dip Processing, Grade CBS, Class 180 to 220 Thermal Class.

MIL-I-24092/5 - Insulating Resin, Solventless, Baking, Flexible, for Dip Processing, Grade SF, Class 130 to 180 Thermal Class.

MIL-I-24092/6 - Insulating Resin, Solventless, Thixotropic, Baking, Flexible, for Dip Processing, Grade SFT, Class 130 to 180 Thermal Class.

MIL-I-24092/7 - Insulating Resin, Solventless, Baking, Semi-Rigid, for Dip Processing, Grade SH, Class 155 to 200 Thermal Class.

MIL-I-24092/8 - Insulating Resin, Solventless, Thixotropic, Baking, Semi-Rigid, for Dip Processing, Grade SHT, Class 155 to 200 Thermal Class.

MIL-I-24092/9 - Insulating Resin, Solventless, Silicone, Baking, for Dip Processing, Grade SS, Class 180 to 220 Thermal Class.

MIL-I-24092/10 - Insulating Varnish, Water Base, Baking, Flexible, for Dip Processing, Grade WB, Class 130 to 180 Thermal Class.

MIL-I-24092/11 - Insulating Varnish, Water Base, Baking, Semi-Rigid, for Dip Processing, Grade WBH, Class 130 to 200 Thermal Class.

Preparing activity:
Navy - SH

AMSC N/A FSC 5970

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MIL-I-24092D
21 September 1993
SUPERSEDING
MIL-I-24092C
4 May 1989
(See 6.12)

MILITARY SPECIFICATION

INSULATING VARNISHES AND SOLVENTLESS RESINS FOR APPLICATION BY THE DIP PROCESS

This specification is approved for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers clear solvent type varnishes and clear solventless resin systems used to insulate and bond electrical coils and windings.

1.2 Classification. Varnishes and resins are of the following grades, classes, and compositions as specified (see 6.2).

Grade (see 1.2.1)			Class (see 1.2.2)	Composition (see 1.2.3)
CA	-	Clear, solvent, air-dry	130 and 155	I, II
CB	-	Clear, solvent, baking, flexible	130 to 180	I, II
CB	-	Clear, flexible, baking, varnish	200 and 220	I, II
CBH	-	Clear, solvent, baking, semi-rigid	130 to 200	I, II
CBS	-	Clear, solvent, baking, silicone	180 to 220	I, II

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, SEA 03Q42, Naval Sea Systems Command, 2531 Jefferson Davis Hwy, Arlington, VA 22242-5160 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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Grade (see 1.2.1)			Class (see 1.2.2)	Composition (see 1.2.3)
SF	-	Solventless flexible	130 to 180	IV
SFT	-	Solventless flexible thixotropic	130 to 180	IV
SH	-	Solventless semi-rigid	155 to 200	IV
SHT	-	Solventless semi-rigid thixotropic	155 to 200	IV
SS	-	Solventless silicone	180 to 220	IV
WB	-	Water base flexible	130 to 200	III
WBH	-	Water base semi-rigid	130 to 200	III
PK	-	Patching kit	130 and 155	IV

1.2.1 Grade. Grades of material are classified according to composition a function (see 3.1).

1.2.2 Class. Classes are designated in degrees Celsius (deg. C) according to the maximum continuous operating temperature.

1.2.3 Composition. Compositions are classified according to the type of solvent or monomer in the varnish or resin, as follows:

I - Organic solvent system.
II - Organic system in accordance with Rule 442(66).
III - Water reducible.
IV - Organic monomer or diluent.

1.3 Safety practice. This specification may require the use of hazardous material, operations, and equipment. It is the responsibility of the user to establish appropriate safety practices and to determine the applicability of regulatory limitations prior to use.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications a Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

J-W-1177 - Wire, Magnet, Electrical, General Specification.
J-W-1177/14 - Wire Magnet, Electrical, Class 200, Type K, Polyester, Polyester-Imide or Polyester-Amid-Imide Overcoated With Polyamide-Imide, Round.
J-W-1177/15 - Wire, Magnet, Electrical, Class 220, Type M, Polyamide Coated, Round.
P-D-680 - Dry Cleaning and Degreasing Solvent.

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FEDERAL (Continued)

PPP-F-320	-	Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.
PPP-P-1892	-	Paint, Varnish, Lacquer, and Related Materials; Packaging, Packing, and Marking of.

MILITARY

MIL-D-16791	-	Detergents, General Purpose (Liquid, Nonionic).
MIL-H-17672	-	Hydraulic Fluid, Petroleum, Inhibited.
MIL-L-19140	-	Lumber and Plywood, Fire-Retardant Treated.
MIL-L-17331	-	Lubricating Oil, Steam Turbine and Gear, Moderate Service.

(See supplement 1 for list of associated specifications.)

STANDARDS

FEDERAL

FED-STD-141	-	Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing.
FED-STD-313	-	Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities.

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MIL-STD-129	-	Marking for Shipment and Storage.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 366	-	Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality. (DoD adopted)
D 93	-	Standard Test Methods for Flash Point by Pensky-Martens Closed Tester. (DoD adopted)
D 115	-	Standard Test Methods for Varnishes Used for Electrical Insulation.
D 149	-	Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies. (DoD adopted)
D 374	-	Standard Test Methods for Thickness of Solid Electrical Insulation.
D 618	-	Standard Practice for Conditioning Plastics and Electrical Insulating Materials for Testing. (DoD adopted)

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ASTM (Continued)

D 823 - Standard Test Methods for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels. (DoD adopted)

D 1963 - Standard Test Method for Specific Gravity of Drying Oils, Varnishes, Resins, and Related Materials at 25/25 deg. C.

D 2196 - Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer. (DoD adopted)

D 2436 - Standard Specification for Forced-Convection Laboratory Ovens for Electrical Insulation.

D 2519 - Standard Test Method for Bond Strength of Electrical Insulating Varnishes by the Helical Coil Test.

D 3056 - Standard Test Method for Gel Time of Solventless Varnishes.

D 3418 - Standard Test Method for Transition Temperatures of Polymers by Thermal Analysis. (DoD adopted)

D 3850 - Standard Test Method for Rapid Thermal Degradation of Solid Electrical Insulating Materials by Thermogravimetric Method.

D 4880 - Standard Test Method for Salt Water Proofness of Insulating Varnishes Over Enamelled Magnet Wire.

E 537 - Standard Test Method for Assessing the Thermal Stability of Chemicals by Methods of Differential Thermal Analysis.

F 74 - Standard Practice for Determining Hydrolytic Stability of Plastic Encapsulants for Electronic Devices.

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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

RE-2 - Electrical Insulating Varnish.

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street NW, Suite 300, Washington, DC 20037.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

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3.2 Qualification. Varnishes and resins furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.4).

3.3 Material. The varnish or resin shall be suitable for coating electrical equipment using the dip and bake process. If the material is a solvent varnish or a solventless resin, it shall be clear and unpigmented, except for thixotropic compositions which may contain a small quantity of an opaque mineral filler. The cured film of insulation resulting from the dip and bake process shall be smooth, glossy, and free of surface defects (see 4.7.7).

3.3.1 Recovered materials. Unless otherwise specified herein, all material incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used products is allowed under this specification unless otherwise specifically specified.

3.3.2 Purity and uniformity. The packaged components shall be free from al foreign substances, such as grit, dirt, oil, and water. The material shall show no phase separation, gel particles or skin. Ingredient lumps or agglomerates which do not become uniformly part of the compound on mild stirring are also prohibited.

3.3.3 Toxic products and formulations. The product shall have no adverse effect on the health of personnel when used for its intended purpose and applied in approved facilities with the use of approved safety equipment.

3.3.4 Material safety data sheet. The contracting activity shall be provided a material safety data sheet (MSDS) at the time of contract award, The MSDS shall be supplied in accordance with the requirements of FED-STD-313. The MSDS shall be supplied in accordance with the contract for all material covered this specification (see 6.7).

3.3.5 Marking of hazardous material. Hazardous materials, which may cause personal injury, property damage, or environmental deterioration through transportation, use or disposal, shall be marked in accordance with the requirements of public law and regulations. The marking shall include, as applicable: name of product, quantity, warning symbol, signal word designating degree of hazard, affirmative statement of hazards, precautionary measures covering actions to be followed or avoided, instructions in case of contact or exposure, antidotes and notes to physicians, instructions in case of fire, spillage, or leakage, instructions for handling and storage, and disposal instructions. Characteristics and operating hazards which require labeling include: toxic, high toxic, irritant, corrosive, strong sensitizer, combustible liquid, flammable, extremely flammable liquid, dangerously reactive, pressure-generation and explosive.

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3.3.6 Prohibited material. Asbestos and organic silicone shall not be used in the formulation except for silicone in basic silicone varnish systems. Heavy metals such as lead, cadmium, mercury or arsenic shall not be present. Conformance to these requirements shall be verified by using analytical chromatographic or spectroscopic methods.

3.3.7 Unreactive volatiles. For solventless resins only, the product shall contain no unreactive volatile constituents. Conformance to this requirement shall be verified by using vacuum distillation and gas chromatography.

3.3.8 Surface properties. The product (see 6.5.5) shall cure in smooth, thin film. Examination of the cured film on steel panels without magnification shall show no surface defects such as blisters, cracks, pinholes or other irregularities that may trap moisture or particulate matter. Non-adhesion, blistering, or flaking shall not occur when the cured surface is coated with common varnish, or resin top coat.

3.3.9 Material properties. Material properties of varnishes and resins shall be as specified in 3.3.9.1 through 3.3.9.23.

3.3.9.1 Storage life. Storage life shall be as specified (see 3.1 and 4.7.1).

3.3.9.2 Nonvolatiles. Nonvolatiles for solvent varnish shall be as specified (see 3.1 and 4.7.2).

3.3.9.3 Vapor pressure. Vapor pressure shall be as specified (see 3.1).

3.3.9.4 Weight loss. Weight loss on cure shall be as specified (see 3.1).

3.3.9.5 Flash point. Flash point shall be as specified (see 3.1 and 4.7.3).

3.3.9.6 Gel time. Gel time for solventless varnishes/resin shall be as specified (see 3.1 and 4.7.4)

3.3.9.7 Drying time. Drying time shall be as specified (see 3.1 and 4.7.5).

3.3.9.8 Viscosity. Viscosity shall be as specified (see 3.1 and 4.7.6).

3.3.9.9 Build. Build shall be as specified (see 3.1 and 4.7.7).

3.3.9.10 Drainage. Drainage shall be as specified (see 3.1 and 4.7.8).

3.3.9.11 Specific gravity. Specific gravity shall be as specified (see 3.1 and 4.7.9).

3.3.9.12 Dielectric strength. Dielectric strength shall be as specified (see 3.1 and 4.7.10).

3.3.9.13 Dissipation factor. Dissipation factor shall be as specified (see 3.1).

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3.3.9.14 Dielectric constant. Dielectric constant shall be as specified (see 3.1).

3.3.9.15 Hardness. Hardness shall be as specified (see 3.1).

3.3.9.16 Bond strength. Bond strength shall be as specified (see 3.1 and 4.7.11).

3.3.9.17 Thermal endurance. Thermal endurance shall be as specified (see 3.1 and 4.7.12).

3.3.9.18 Salt water proofness. Salt water proofness shall be as specified (see 3.1 and 4.7.13).

3.3.9.19 Hydrolytic stability. Hydrolytic stability shall be as specified (see 3.1 and 4.7.14).

3.3.9.20 Chemical resistance. Chemical resistance shall be as specified (see 3.1 and 4.7.15).

3.3.9.21 Varnish mix tolerance. Prior to mixing in the dip tank, varnished within each grade shall be demonstrated to be compatible. Except for thixotropic varnishes, the mixture shall be clear and shall not separate or contain gelatinous material or precipitate (see 4.7.16).

3.3.9.22 Cure time of spot patching and emergency repair resin. The cure time shall be the time required for the resin to yield a specified shore D harness.

3.3.9.23 Cure time. The time required at a predetermined temperature to complete the technical conversion of a liquid varnish to a solid crossed-linked polymer.

3.3.10 Instruction sheet. Instruction sheets describing application of the varnish or resin using the dip process for electrical equipment shall be provided.

3.3.10.1 Instructions for solvent varnishes. Instruction sheet for solvent varnishes shall include the following:

(a) Explicit data and working curves for solvent adjustment, as required, to assure the user of a film build of 0.0009 to 0.003 inch. This may be any combination of viscosity, specific gravity or percent solvent addition.
(b) The preheat temperature to use for the electrical equipment to be varnished in order to stress relieve wire enamel and remove residual moisture.
(c) The recommended temperature of the electrical equipment before dipping into varnish.
(d) The time cycle for submerging electrical equipment in the varnish and the drainage time over the varnish tank.
(e) The temperature range to preheat the oven if other than a simple baking temperature.

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(f) The specific temperatures to bake and post-cure varnish. This may involve more than one temperature level for optimizing smooth varnish surface.
(g) Allowance in time-temperature cycles for multiple dips and bakes (that is, less baking for first coat and longer bake for final coat).

3.3.10.2 Instructions for solventless resins. Instruction sheet for solventless resins shall include the following:

(a) Maximum storage life of uncatalyzed resin and catalyzed resin at various temperatures and recommended conditions for storing catalyzed and uncatalyzed resin.
(b) Recommended catalyst (if applicable) and catalyst percentage.
(c) Limiting values, minimum and maximum, for gel time (see ASTM D 3056) of catalyzed resin.
(d) Recommended optimum curing schedule for first and final coats if multiple treatments are involved.
(e) Emergency procedures in case of excessive temperature rise in resin processing equipment.
(f) Adjustments to make to achieve various coating thicknesses.

3.4 Workmanship. The insulating varnish or resin shall be suitable, in every respect, for use on electrical windings and coils or motors, generators an transformers, and on electrical apparatus in general. It shall preserve the initial dielectric strength of the insulation to which it is applied by the exclusion therefrom of moisture, lubricating oil and grease, acids, seawater, an other deleterious substances to which the electrical apparatus may be subjected in service. The varnish or resin shall conform to the qualification requirements as specified herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase 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. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor’s overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

(a) Qualification inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 Qualification inspection. Qualification inspection shall be conducted at a laboratory satisfactory to the Naval Sea Systems Command (NAVSEA). Qualification inspection shall consist of the tests specified in table I and table II. The contractor shall make no changes in the process or product formulation without first notifying the qualifying activity. Requalification may be required depending on the nature of these changes, and shall be at the discretion of the qualifying activity.

TABLE I. Qualification tests for solvent varnishes.

Characteristics	Requirement	Test
Storage life	3.3.9.1	4.7.1
Nonvolatiles	3.3.9.2	4.7.2
Flash point	3.3.9.5	4.7.3
Drying time	3.3.9.7	4.7.5
Viscosity at 20 revolutions per minute (r/min)	3.3.9.8	4.7.6
Build, as received	3.3.9.9	4.7.7
Drainage	3.3.9.10	4.7.8
Specific gravity	3.3.9.11	4.7.9
Dielectric strength:	3.3.9.12	4.7.10
[1] 96/23/50		
96/23/96		
24/23/water		
Dissipation factor:	3.3.9.13	
at 23 deg. C		
at 150 deg. C		
Dielectric constant:	3.3.9.14	
at 23 deg. C		
at 150 deg. C		
Hardness	3.3.9.15	
Bond strength:	3.3.9.16	4.7.11
at 23 deg. C		
at 150 deg. C		
Thermal endurance	3.3.9.17	4.7.12
Salt water proofness	3.3.9.18	4.7.13
Hydrolytic stability	3.3.9.19	4.7.14
Chemical resistance	3.3.9.20	4.7.15
Mix compatibility	3.3.9.21	4.7.16

[1] Indicates 96 hours at 23 deg. C at 50 percent relative humidity (R.H.) (see 4.5.2).

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TABLE II. Qualification tests for solventless resin.

Characteristics	Requirement	Test
Catalyzed storage life	3.3.9.1	4.7.1
Vapor pressure	3.3.9.3	
Weight loss on cure	3.3.9.4	
Flash point	3.3.9.5	4.7.3
Gel time	3.3.9.6	4.7.4
Curing time at 23 deg. C	3.3.9.23	
Viscosity:	3.3.9.8	4.7.6.1
at 2 r/min		
at 20 r/min		
Thixotropic index	3.3.9.8	4.7.6.1
Working life after mixing	3.3.9.8	4.7.6.2
Build	3.3.9.9	4.7.7
Drainage	3.3.9.10	4.7.8
Specific gravity	3.3.9.11	4.7.9
Dielectric strength:	3.3.9.12	4.7.10
96/23/50		
96/23/96		
24/23/water		
Dissipation factor:	3.3.9.13	
at 23 deg. C		
at 150 deg. C		
Dielectric constant:	3.3.9.14	
at 23 deg. C		
at 150 deg. C		
Hardness	3.3.9.15	
Bond strength:	3.3.9.16	4.7.11
at 23 deg. C		
at 150 deg. C		
Thermal endurance	3.3.9.17	4.7.12
Salt water proofness	3.3.9.18	4.7.13
Hydrolytic stability	3.3.9.19	4.7.14
Chemical resistance	3.3.9.20	4.7.15
Mix compatibility	3.3.9.21	4.7.16

4.3.1 Samples for qualification inspection. Qualification inspection samples shall consist of two 1-gallon cans of the varnish or resin and an appropriate amount of catalyst, as required.

4.3.2 Qualification inspection report. A qualification inspection report shall be prepared and shall include the following:

(a) Detailed description of sample preparation and curing schedule used for each test (see 4.6.1.2).
(b) Test results as specified herein.
(c) Material safety data sheet (see 3.3.4).
(d) Manufacturer's instruction sheet (see 3.3.10).
(e) Certification of product composition, including the following:

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(1) The product is of the type specified on the applicable specification sheet.
(2) The material requirements of 3.3.6 and 3.3.7 have been met.

The certification shall be signed by a responsible agent of the manufacturer.

(f) Technical information package, including the following:

(1) Differential scanning calorimetry (DSC): DSC curves shall be measured on the uncured varnish or uncured catalyzed solventless resin, prepared as specified in 4.6.1.1. The test method and report shall be in accordance with ASTM E 537. Sample weight shall be approximately 5 milligrams (mg). The heating rate shall be 10 deg. C per minute from 25 to 250 deg. C in a dry nitrogen stream. The test report shall include two DSC curves on identically prepared specimens, sample weight, and all DSC conditions. No interpretive analysis is required.
(2) Glass transition temperature: Glass transition temperature of a cured specimen shall be determined using DSC. ASTM D 3418 shall be used. DSC conditions shall be identical to those specified in (1) above, except that the sample shall consist of approximately 5 mg of cured resin, cast in accordance with 4.6.1.3. The test report shall include the DSC curve of two identically cured specimens, cure conditions, sample weight, DSC conditions, and the transition temperature taken from the midpoint in the thermogram measured from the extensions of the pretransition and post-transition baselines.
(3) Thermogravimetric analysis (TGA): A TGA shall be performed on two cast specimens, prepared and cured as specified in 4.6.1.3. Sample size shall be approximately 10 mg. The test procedure shall be in accordance with ASTM D 3850. The heating rate shall be 10 deg. C per minute in a dry nitrogen stream over a temperature range of 25 deg. C to a temperature where there is no further weight loss. The test report shall be as specified in ASTM D 3850 and shall include the TGA graphs.
(4) Infrared analysis: An infrared analysis shall be made on the solvent varnish or on the catalyzed solventless resin. The material shall be prepared as specified in 4.6.1.1. The final report shall include the complete infrared scan and details of sample preparation. No interpretive analysis is required.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the inspections and tests specified in tables III and IV, as applicable (see 6.3).

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TABLE III. Quality conformance tests for solvent varnishes.

Characteristics	Requirement	Test
Nonvolatiles	3.3.9.2	4.7.2
Drying time	3.3.9.7	4.7.5
Viscosity at 20 r/min percent change in viscosity from qualification value	3.3.9.8	4.7.6
Build	3.3.9.9	4.7.7
Specific gravity, percent change in specific gravity from qualification value	3.3.9.11	4.7.9
Hardness	3.3.9.15	
Bond strength:	3.3.9.16	4.7.11
at 23 deg. C		
at 150 deg. C		
Thermal endurance	3.3.9.17	4.7.12

TABLE IV. Quality conformance tests for solventless resins.

Characteristics	Requirement	Test
Weight loss on cure	3.3.9.4	
Gel time	3.3.9.6	4.7.4
Curing time at 23 deg. C	3.3.9.6	
Viscosity, percent change from qualification value	3.3.9.8	4.7.6.1
Working life after mixing	3.3.9.8	4.7.6.2
Build	3.3.9.9	4.7.7
Specific gravity, percent change in specific gravity from qualification value	3.3.9.11	4.7.9
Hardness	3.3.9.15	
Bond strength at 23 deg. C	3.3.9.16	4.7.11

4.4.1 Lot. For purposes of quality conformance inspection, a lot shall consist of all varnish or resin from one unchanged process batch or unchanged uniform blend of batches. If the varnish or resin cannot be identified by batch or tank, a lot shall consist of not more than 1,000 gallons blended together and offered for delivery at one time.

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4.4.1.1 Quality conformance inspection sampling. From each lot, a representative sample consisting of two 1-quart containers of the resin and appropriate amount of catalyst shall be selected in accordance with method 1031 of FED-STD-141. The samples shall be made as representative as possible by agitation or circulation of the lot before sampling. The samples shall be subjected to the tests specified in tables III and IV (see 6.6).

4.5 Conditioning, tolerances, designations, and chambers. Conditioning, tolerances, designations, and chambers shall be as specified in 4.5.1 through 4.5.3.2.

4.5.1 Temperature and humidity tolerances. Unless otherwise specified herein, the temperature and R.H. shall be maintained within the tolerances shown in table V.

TABLE V. Tolerances for temperature and R.H.

Temperature		R.H.	
deg. C	Tolerance, plus or minus deg. C	Percent	Tolerance, plus or minus percent
0 to 180	2	50	5
181 to 300	3	95	2
301 to 325	4	-	-
326 to 500	5	-	-

4.5.2 Conditioning designations. Preconditioning, conditioning, curing, a aging conditions shall be designated in accordance with ASTM D 618.

4.5.3 Chambers and ovens. Chambers and ovens shall be as specified in 4.5.3.1 and 4.5.3.2.

4.5.3.1 High humidity chamber. The chamber shall be constructed of non-corroding materials and the R.H. shall be maintained as specified in ASTM F 74 using a saturated salt solution of K_2SO_4.

4.5.3.2 Oven. The oven shall be electrically heated, forced convection type as specified in ASTM D 2436.

4.6 Test specimens. Test specimens shall be as specified in the applicable test methods and in table VI.

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TABLE VI. Standard test specimens for qualification and quality conformance of solvent varnishes and solventless resins.

Property	Test method	Substrate and dimensions (inches)	Resin coats	Number of specimens
Storage life	4.7.1	-	-	-
Vapor pressure		-	-	-
Weight loss on cure		-	-	3
Flash point	4.7.3	-	-	1
Gel point	4.7.4	-	-	3
Viscosity at 2 and 20 r/min	4.7.6.1	-	-	-
Thixotropic index	4.7.6.1	-	-	-
Build	4.7.7	Steel 6 x 3 x 0.032	1	5
Drainage	4.7.8	Steel 6 x 3 x 0.032	1	5
Specific gravity	4.7.9	-	-	1
Dielectric strength: 96/23/50, 96/23/96 and 24/23/water	4.7.10	Steel 6 x 3 x 0.032	2	3
Dissipation factor at 23 and 150 deg. C		-	-	1
Dielectric constant at 23 and 150 deg. C		-	-	1
Hardness		-	-	1
Bond strength at 23 and 150 deg. C	4.7.11	[2] M2 and K2	1	[3] 5
Thermal endurance:				
semi-rigid varnish		[2] M2 and K2	1	[1] -
thixotropic resins		[2] M2 and K2	1	2
Salt water proof	4.7.13	[2] Brass 0.59 x 5.9	2	[1] -
Hydrolytic stability	4.7.14	[2] M2	1	5
Chemical resistance	4.7.15	[2] M2	1	30

[1] As required by the test paragraph.
[2] Size 18 AWG magnet wire, in accordance with J-W-1177.
[3] In accordance with magnet wire type.

4.6.1 Preparation of test specimens. Unless otherwise specified herein, test specimens shall be prepared as specified in 4.6.1.1 through 4.6.1.6.

4.6.1.1 Liquid varnish or resin. Product components shall be brought to laboratory temperature in a closed container at least 24 hours before use. Two-part products shall be brought to temperature, mixed thoroughly with catalyst, and allowed to stand in a closed container for 24 to 48 hours prior to use. Other than solvent or catalyst, no additions shall be made to the as-received varnish or resin. Unless otherwise specified (see 6.2), tests on uncured product shall be performed on the resin-catalyst mix.

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4.6.1.2 Curing of liquid varnish or resin. Instruction sheet shall provide manufacturers recommended curing time and temperature and, if required, the proper quantity of solvent or catalyst to add.

4.6.1.3 Cast specimens. Cast specimens shall be made by preparing the liquid product as specified in 4.6.1.1, pouring into a 2- to 3-inch diameter aluminum weighing dish, and curing as specified in 4.6.1.2 in a preheated oven. Sufficient product shall be used to achieve a casting thickness of 1/8 +/- 1/32 inch. If the resin and exotherm are such that 1/8-inch castings cannot be made without defect, thinner castings are permitted, provided that specimen thickness is reported.

4.6.1.4 Panel specimens. The varnish or catalyzed resin shall be coated and cured onto steel panels of the following type:

Designation	-	ASTM A 366, steel, sheet, carbon, cold-rolled.
Size	-	3 by 6 by 0.032 inches.

4.6.1.4.1 Materials. The liquid varnish or resin shall be prepared as specified in 4.6.1.1, brought to 23 +/- 1 deg. C and poured slowly into a container to prevent entrapment of air. The steel panels specified in 4.6.1.4 shall be degreased before the varnish is applied.

4.6.1.4.2 Apparatus. A device, in accordance with ASTM D 823, that withdraws the steel panel from the liquid product at 4 inches per minute shall be used. A water bath or conditioned room shall maintain the liquid product at 23 +/- 1 deg. C.

4.6.1.4.3 Procedure. The procedure shall be as follows: Lower the test panel slowly into the product. Place the container with the liquid and panel in a constant temperature water bath or in a conditioned room held at 23 +/- 1 deg. C. For non-thixotropic materials to stand in this condition without vibration for 60 minutes or until bubbling stops, whichever comes first. For thixotropic resins, allow to stand 60 minutes. At the end of this interval, move the specimen under the dip coater which had been previously adjusted to withdraw the specimen at a rate of 4 inches per minute. Attach the specimen without disturbing the container or the panel. When the panel has been raised from the resin, stop the dip coater and allow the specimen to drain between 30 and 32 minutes. Laboratory conditions during draining shall be 23 +/- 2 deg. C and 50 +/- 5 percent R.H. Move the container away from the specimen so that it can hang freely without detriment to the coating. Place specimen in a preheated oven and cure in accordance with 4.6.1.2. The specimen shall not be vibrated during draining or curing. For dielectric test specimens, two steel panels may be taped back-to-back so that only one side is coated; the uncoated side provides an electrode surface. The number of cured coats per specimen shall be as defined in the particular test description.

4.6.1.5 Helical coil specimens. Helical coil specimens shall be prepared as specified in 4.6.1.5.1 and 4.6.1.5.2.

4.6.1.5.1 Helical coil specimens for solvent varnishes. Test specimens shall be prepared in accordance with ASTM D 2519.

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4.6.1.5.2 Helical coil specimens for solventless resins. Test specimens shall be prepared in accordance with ASTM D 2519 and as specified in 4.6.1.1 with the following exceptions:

(a) Two coats shall be applied to the test coil for resins having an as-received film build less than 1.0 mil as specified in 4.7.7.
(b) Only one coat shall be applied to the test coil for resins having an as-received film build greater than 1.0 mil as specified in 4.7.7.

4.6.1.6 Twisted wire specimen. Specimens shall be prepared in accordance with ASTM D 4880 using coated magnet wire in accordance with J-W-1177/14 or J-W-1177/15.

4.7 Test procedures.

4.7.1 Storage life. The product shall have a storage life such that critical requirements shall be met after storage in an unopened-sealed container at 23 deg. C for the specified time period (see 3.1 and 5.3).

4.7.2 Nonvolatiles for solvent varnish. The percentage of nonvolatiles in the as-received condition shall be determined in accordance with ASTM D 115. Oven requirements shall be as specified in 4.5.3.2. The varnish shall meet the requirements specified in 3.3.9.2.

4.7.3 Flash point. Flash point of the varnish or catalyzed resin shall be measured in accordance with ASTM D 93. The varnish or resin shall meet the requirements specified in 3.3.9.5.

4.7.4 Gel time of solventless varnishes. The gel time of solventless varnishes shall be measured on three catalyzed resin specimens in accordance with ASTM D 3056 or ANSI/NEMA RE-2. The gel time range at a reported temperature shall be in agreement with the manufacturers specification.

4.7.5 Drying: time for solvent varnishes. When measured in accordance with ASTM D 115, and at the temperature indicated, the drying time shall not exceed the maximum value specified (see 3.1).

4.7.6 Viscosity for solvent and non-thixotropic solventless varnishes. Viscosity shall be measured at 23 +/- 1 deg. C on varnishes prepared as specified in 4.6.1.1. The viscosity shall be determined at a spindle speed of 20 r/min in accordance with ASTM D 115, and shall meet the requirements specified in 3.3.9.8.

4.7.6.1 Viscosity for solventless thixotropic resins. Viscosity shall be measured at 23 +/- 1 deg. C on catalyzed resin prepared as specified in 4.6.1.1. Viscosity shall be determined at spindle speeds of 2 and 20 r/min in accordance with method B of ASTM D 2196. The product shall be placed in a 1-quart container to within 1 inch of the top. Using a water bath, the sample shall be adjusted to 23 +/- 1 deg. C. The required temperature shall be maintained for 90 plus 5 minus 0 minutes before the first measurement is made at 2 r/min. The 20 r/min measurement shall then be made immediately after the 2 r/min measurement. Two specimens shall be tested and the average

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value recorded, provided the deviation of a single measurement from the average is not greater than 10 percent. If a deviation is greater than 10 percent, the viscometer shall be recalibrated and the procedure repeated. A thixotropic index shall be calculated as follows:

$$\text{Thixotropic index} = \frac{\text{Average viscosity at 2 r/min}}{\text{Average viscosity at 20 r/min}}$$

4.7.6.2 Working life for solventless, two-component varnishes. After mixing the two components thoroughly, the working life shall be that time beyond which the varnish can no longer be satisfactorily applied by brush, or beyond which it no longer flows evenly and is too viscous to wet the area to be patched.

4.7.7 Build. Build, or thickness of a single coat of varnish or resin on a steel panel, shall be determined in accordance with ASTM D 115 using five specimens as specified in 4.6.1.4. Thickness measurements shall be made after cure on the 1-inch center width section of a steel strip as specified in table VI, to avoid edge effects. Thickness measurements shall be made with a micrometer in accordance with ASTM D 374, method A. The average of the thickness measured at points 2 and 4 inches from the top of the steel strip, with the average thickness of the steel subtracted and remainder divided by 2, shall be taken as the film build per specimen. The varnish or resin shall meet the requirements specified in 3.3 and 3.3.9.9.

4.7.8 Drainage. Drainage for solvent type varnish shall be measured in accordance with ASTM D 115.

Identical specimens may be used to measure build and drainage. Resin or varnish shall meet the requirements specified in 3.3.9.10.

4.7.9 Specific gravity. Specific gravity shall be measured at 23 deg. C in accordance with ASTM D 115 for solvent varnishes and ASTM D 1963 for solventless varnishes. Individual values are required for the resin and catalyst for a two-part system. Specific gravity shall be as specified in 3.3.9.11.

4.7.10 Dielectric strength. The test specimens shall be prepared by placing two steel panels together and sealing the edges so that a coating is obtained on one side of each panel only. The double panels shall be baked in an oven in accordance with the manufacturer's instructions (see 3.3.10). After baking and cooling they shall be separated into single panels coated on one side only. Three test panels shall be subjected to each of the following conditions after cure (see ASTM D 618):

96/23/50
96/23/96
24/23/distilled water

Breakdown voltage measurements shall be made using an electrode set 1/4 inch in diameter with edges rounded to a 1/32-inch radius. Circular gaskets shall be placed over the end of each electrode to prevent flashover. After placing the test specimens between the electrodes connected to a test apparatus,

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voltage shall be increased from zero to breakdown at a rate of 500 volts per second in accordance with ASTM D 149. A minimum of 5 voltage breakdown determinations shall be made per panel. Thickness measurements shall be made using a micrometer in accordance with ASTM D 374 near the breakdown point. The average thickness of the uncoated panel shall also be measured. The differences in these measurements shall be used to calculate breakdown volts per mil. Dielectric strength of the varnish or resin shall be as specified in 3.3.9.12.

4.7.11 Bond strength. The bond strength test shall be conducted in accordance with ASTM D 2519 and ANSI/NEMA, RE-2.

4.7.12 Thermal endurance. Thermal endurance shall be tested as specified in 4.7.12.1 and shall meet the requirements specified in 3.3.9.17.

4.7.12.1 Thermal endurance, two-component varnishes. After thoroughly mixing the two components and curing the material according to the manufacturer's instructions, the weight loss shall be measured after exposure to 150 deg. C for 5 days. This loss shall not exceed the value specified (see 3.1).

4.7.13 Salt water proofness. Nine test specimens, prepared as specified in 4.6.1.6, shall be subjected to a condition of 24/23/50 plus 100/23/salt water. The specimen shall be suspended, rounded end down in salt water (3-1/2 percent sodium chloride by weight) to a depth as specified in ASTM D 4880. Direct current (dc) voltage (120 volts) shall be applied with the twist as a cathode and a nichrome wire suspended in the solution as an anode. The electrodes shall be connected to the power supply with one lead in series with a standard 7.5-watt incandescent lamp to indicate breakdown of the film. Breakdown shall be reported in number of hours to failure. The test shall be discontinued after the sample passes 100 hours without failure. Data obtained in the salt water proof test shall be interpreted as follows:

No more than six of nine specimens fail - Pass.

Seven or more of nine specimens fail - Retest (nine additional specimens shall be prepared for retest).

On retest, a total of no more than 12 of 18 specimens fail - Pass.

On retest, a total of 13 or more of 18 specimens fail - Reject.

The specimens shall meet the requirements specified in 3.3.9.18.

4.7.14 Hydrolytic stability. Moisture resistance shall be determined by measuring the percent change in helical bond strength after conditioning for 200 hours at 97 deg. C and 95 percent R.H. in the humidity chamber specified in 4.5.3.1. Helical bond specimens, five per test condition, shall be tested at 23 deg. C, as specified in 4.7.11, after the following conditioning:

96/23/50
200/97/95.

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After humidity aging, specimens shall be allowed to equilibrate at 23 +/- 2 deg. C and 50 +/- 5 percent R.H. for a minimum of 1 hour and a maximum of 2 hours before testing. Procedures given in ASTM F 74 shall apply, except that the determination of aging time shall not apply. Specimens shall meet the requirements specified in 3.3.9.19.

4.7.15 Chemical resistance. Chemical resistance shall be measured by the change in helical bond strength after 168 hours immersion in various media at 23 deg. C. Helical bond specimens, five per test condition, shall be tested at 23 deg. C, as specified in 4.7.11, after exposure to 96/23/50 and after 168 hours immersion in the following liquids at 23 deg. C:

(a) Hydraulic fluid in accordance with MIL-H-17672.
(b) Lubricating oil in accordance with MIL-L-17331.
(c) Cleaning fluid in accordance with P-D-680, type I (1, 1, 2-trichloro 1, 2, 2-trifluoroethane).
(d) Distilled water.
(e) Detergent solution in accordance with MIL-D-16791, general purpose non-ionic detergent, a solution using 1 pound of detergent with 2-1/4 gallons of water.

The immersed specimens shall be tested within 3 minutes after removal from the immersion medium. The specimens shall show no sign of varnish or resin softening or tackiness, as determined by gently wiping the surface of the helical coil specimen with cotton prior to physical testing. Cotton fibers shall not be retained on the surface of the specimen. The varnish and resin shall meet the requirements specified in 3.3.9.20.

4.7.16 Varnish, resin, mix compatibility test. The compatibility of the replacement varnish or resin with the in-use tank varnish shall be tested with 5 mix ratios in accordance with ASTM D 115. With both materials at 23 deg. C, while stirring steadily, the replacement varnish shall be slowly added to 50 milliliters (mL) of the tank varnish until mixtures of 1:9, 1:3, 1:1, 3:1, and 9:1 are obtained. These mixes shall be examined for curdling, precipitation or separation and shall be examined again after standing for 24 hours and the appearance recorded. A sample of each thoroughly stirred mixture shall then be placed in a flat-bottomed, aluminum weighing dish, approximately 2-3/4 inches in diameter, and three-fourths full. These samples shall be cured in an oven as specified in 4.5.3.2. After curing, the sample shall be cooled to room temperature and examined for cloudy or murky appearance. The resins and varnishes shall meet the requirements specified in 3.3.9.21.

4.8 Inspection of packaging. Sample packages and packs, and the inspection of the preservation, packing and marking for shipment, stowage and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

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5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 General.

5.1.1 Navy fire-retardant requirements.

(a) Lumber and plywood. When specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container construction members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B	-	Type II - weather resistant. Category 1 - general use.
Level C	-	Type I - non-weather resistant. Category 1 - general use.

(b) Fiberboard. Unless otherwise specified (see 6.2), fiberboard used in the construction of class-domestic, non-weather resistant fiberboard and cleated fiberboard boxes including interior packaging forms shall meet the flamespread and the specific optic density requirements of PPP-F-320.

5.2 Packaging, packing, and marking. Packaging, packing, and marking for shipment shall be in accordance with PPP-P-1892 and as specified in 5.3. Packaging shall be level A, B, or C as specified (see 6.2). Packing shall be level A, B, or C as specified (see 6.2). Packaging shall be in 1-gallon cans, 5-gallon pails, or 55-gallon drums as specified (see 6.2). One-gallon cans shall be for grade CA or PK only, other grades shall be supplied in 5-gallon pails or 55-gallon drums.

5.3 Marking. In addition to the markings required by PPP-P-1892 (see 6.2), each unit container, intermediate and shipping container shall contain the following markings:

(a) Specification number, which shall include grade, class, and composition (I through IV).
(b) Shelf life, storage conditions, and date of manufacture.
(c) "CAUTION: This varnish may not be compatible with varnish in the dip tank. Check mixing before use".

5.3.1 Marking for drums and 5-gallon pails. The markings required shall be stenciled on the top and on the sides of these containers in accordance with MIL-STD-129 requirements for visibility, size, and durability.

5.4 Material safety data sheet. A copy of the material safety data sheet shall be attached to the shipping document for each destination (see 3.3.4).

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6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The insulating products covered by this specification ar intended for impregnation or coating of all types of electrical coils and windings. They are rated for continuous operation at the maximum operating temperature specified for each class. Products may also be used at temperatures lower than the thermal class. Products covered by this specification are intended for use in the dip process except for brush applied patching materials and coatings applied over identification markings. The primary purpose of the varnish is to protect the coils from the operating environment.

6.1.1 Grade CA varnish. Grade CA varnishes are clear, air-drying varnishes which are used for spot patching and emergency repairs where baking facilities ar not available. This category includes certain coatings such as lacquers which ar used as environmental protection for identification markings.

6.1.2 Grade CB varnish. Grade CB varnishes are clear, flexible, baking varnishes which are for application on stationary coils and windings and satisfy the requirements of ASTM D 1932.

6.1.3 Grade CBH varnish/resin. Grade CBH varnishes are clear, semi-rigid, baking varnishes/resin which have higher bond strengths at elevated temperatures than the CB grades. They are not intended to satisfy the requirements of ASTM D 1932 as required for CB grade (see 6.1.2). They are primarily used for rotating windings such as armatures, rotors, and similar constructions.

6.1.4 Grade CBS varnish/resin. Grade CBS varnishes/resin are clear, silicone, baking varnishes/resin primarily used for insulating equipment operating at temperatures in excess of 180 deg. C. These varnishes can usually satisfy the requirements of ASTM D 1932. They do not have high bond strengths at their designated classes of 200 and 220 deg. C, and are, therefore, used for stationary windings which operate continuously at these temperatures.

6.1.5 Grade SF varnish/resin. Grade SF varnishes/resin are clear, flexible solventless, baking varnishes which are used for impregnating and coating stationary coils and windings. These varnishes meet the requirements of ASTM D 1932.

6.1.6 Grade SFT varnish/resin. Grade SFT varnishes/resin are clear, flexible, solventless, thixotropic, baking varnishes/resin which are similar to grade SF except they yield heavier coatings per varnish/resin. Since they normally contain powdered mineral fillers to obtain thixotropy, heavy coatings of these materials are usually translucent.

6.1.7 Grade SH varnish. Grade SH varnishes/resin are clear, solventless, semi-rigid, baking varnishes/resin which have higher bond strengths than grade SF and are not intended to meet the requirements of ASTM D 1932. These materials ar used on rotary windings.

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6.1.8 Grade SHT varnish/resin. Grade SHT varnishes/resin are clear, solventless, semi-rigid, thixotropic, baking varnishes/resin used on rotary windings because of high elevated temperature bond strengths. Since they normally contain powdered mineral fillers to obtain thixotropy, heavy coatings are usually translucent.

6.1.9 Grade SS varnish/resin. Grade SS varnishes/resin are clear, solventless, silicone, baking varnishes/resin used primarily for high temperature impregnation and coating applications.

6.1.10 Grade WB varnish/resin. Grade WB varnishes/resin are clear, flexible, baking varnishes/resin which are for application on stationary coils and windings and satisfy the requirements of ASTM D 1932.

6.1.11 Grade WBH varnish/resin. Grade WBH varnishes/resin are clear, semirigid, baking varnishes/resin which offer high bond strengths at elevated temperatures and are not intended to satisfy the requirements of ASTM D 1932. They are primarily used for rotation windings such as armatures, rotors, and similar constructions.

6.1.12 Grade PK varnish/resin. Grade PK varnishes/resin are clear, room temperature cure varnishes/resin, used for spot patching and emergency repairs where baking facilities are not available. The final properties can be improved through the careful application of local heat, for example, by heat gun or heat lamp.

6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number, and date of this specification.
(b) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
(c) Title, number, and date of the applicable specification sheet and the grade, class, and composition of the material (see 1.2).
(d) Tests on uncured products, if other than as specified (see 4.6.1.1).
(e) When fire-retardant treatment is not required (see 5.1.1).
(f) Level of packaging and packing required (see 5.2).
(g) Size of can, pail, or drum required (see 5.2).
(h) Special marking required (see 5.3).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

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Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.4	DI-NDTI-80809	Test/inspection reports	----

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 24092 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 05Q42, Department of the Navy, 2531 National Center Bldg 3, Washington, DC 20362-5160 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests must be made in accordance with "Provisions Governing Qualification SD-6" (see 6.4.1).

6.4.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.5 Definitions.

6.5.1 Electrical insulating solvent varnish. Electrical insulating solvent varnish is a mixture of an organic film-forming material and a suitable solvent capable of forming a smooth coating after solvent evaporation and generally yielding optimum insulation properties after baking at elevated temperatures.

6.5.2 Electrical insulating solventless resin. Electrical insulating solventless resin is a polymeric liquid containing a catalyst or hardener for conversion to a solid insulating material. When properly cured or polymerized, normally by baking at elevated temperatures, the solid material provides a dielectric and environment barrier as well as mechanical bonding.

6.5.3 Dip processing or treatment. Dip processing or treatment is the process of submerging electrical equipment into a tank of solvent varnish or solventless resin followed by drainage of excess material back into the process tank. The equipment is usually held for a brief period at room temperature then placed in an oven for baking at temperatures between 38 and 163 deg. C from several hours to as long as 20 hours, depending on the manufacturer's recommendations.

6.5.4 Flexible varnish. Flexible varnishes are varnishes having bond strengths between 1 and 4 pounds at 150 deg. C, as defined by ASTM D 2519, and satisfying the requirements of ASTM D 1932 at their temperature class.

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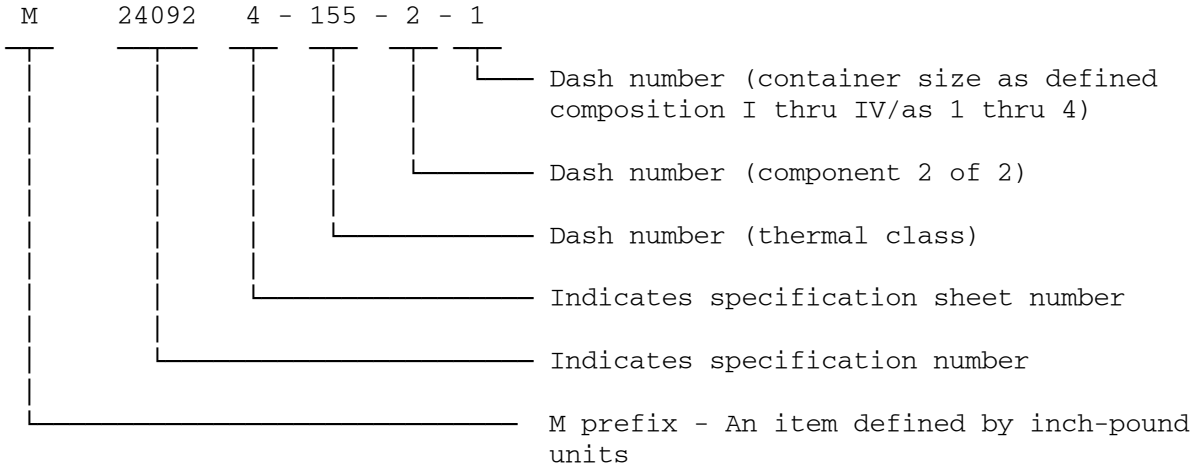
6.5.5 Product. Product, as used herein, designates a distinct varnish or resin and catalyst system, either one- or two-part, manufactured from a specific formula in one or more plants. Changes in varnish, resin or catalyst composition, composition percentages or manufacturing processes requires requalification of the product. Changes in raw material supplier requires notification of the qualifying activity.

6.5.6 Semi-rigid varnishes. Semi-rigid varnishes are varnishes defined by ASTM D 2519 as having bond strengths greater than 4 pounds at 150 deg. C.

6.6 Quality conformance lot rejection. If any sample (see 4.4.1.1) is found to be not in conformance to the requirements of this specification, this should be cause for the rejection of the lot represented by the sample. The contractor has the option of correcting the discrepancy, retesting, and resubmitting a conforming lot or submitting a new lot which should be inspected and tested as specified herein.

6.7 Materials Safety Data Sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313.

6.8 Part or Identifying Number (PIN). The PIN to be used for insulating varnish/resin acquired to this specification is created as follows:



6.9 International interest. Certain provisions of this specification are the subject of international standardization agreement ABC-NAVY-STD-17. When amendment, revision, or cancellation of this specification is proposed which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels including departmental standardization offices to change the agreement or make other appropriate accommodations.

6.10 Conditions for use of level B preservation. When level B preservation is specified (see 5.2), this level of protection should be reserved for the acquisition of varnish and resin for resupply worldwide under known favorable handling, transportation, and storage conditions.

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6.11 Subject term (key word) listings.

Diluent
Monomer
Silicone
Solvent
Thixotropic

6.12 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Army - ER
Navy - SH
Air Force - 11

Review activities:
Army - MI, AR
Navy - EC, YD, OS
Air Force - 99
DLA - GS, DS

User activities:
Army - ME
Navy - MC, AS

Preparing activity:
Navy - SH
(Project 5970-1073)