

INCH-POUND

J-W-1177B

June 10, 1988

SUPERSEDING

J-W-1177A/GEN

September 27, 1976

(See 6.6)

## FEDERAL SPECIFICATION

## WIRE, MAGNET, ELECTRICAL, GENERAL SPECIFICATION

This specification is 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 electrical magnet wire of various classes and types used for fabricating armature coils, field coils, solenoid coils, transformer coils, and other such windings for use in electrical and electronic equipment.

1.1.1 Federal specification coverage. Federal specifications do not include all types, classes, and styles of the commodity indicated by the titles of the specifications, but are intended to cover only those used by the Federal Government.

1.2 Classification. Electrical magnet wire shall be of the following classes, types, shapes, and sizes as specified (see 6.2.1).

1.2.1 Classes and types. The class of the magnet wire indicates the thermal evaluation of the material (see 4.7.15). The class and type designations for the various magnet wire products covered by this specification are listed in the applicable specification sheets.

1.2.2 Shapes. The wire shall be round, square, or rectangular as specified on the applicable specification sheet. For the purpose of this specification, square and rectangular wire are hereinafter referred to as rectangular wire, and the smaller dimension as the thickness dimension.

1.2.3 Sizes. Wire sizes shall be specified in bare-wire dimensions; that is, in specifying wire sizes (and in referring to them herein), the effect of the addition of the insulation in increasing the dimensions of the bare wire is disregarded. For round wire, American Wire Gauge (AWG) sizes shall be used; and for rectangular wire, dimension in inches.

AMSC N/A

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1.2.3.1 Intermediate sizes. Wire sizes between AWG sizes or having dimensions not listed in the applicable specification sheets may be specified. These products shall meet the dimensional requirements defined in 3.4.

1.3 Part number. Part number shall be of the following form as specified (see 6.2.1).

F1177/XX (see 1.3.1) 02 (see 1.3.2) C (see 1.3.3) 021 (see 1.3.4) R (see 1.3.5)

1.3.1 Federal specification number. The federal specification sheet number designation consists of a prefix F which indicates a federal specification item, the specification number, and the specification sheet.

1.3.2 Class and type. The type of insulation consists of a two digit code. The type will be defined on the specification sheet.

00 - Type SU	Class (Temp rating)	105 degrees Celsius (°C)
01 - Type SN	Class (Temp rating)	105°C
02 - Type T	Class (Temp rating)	105°C
03 - Type TN	Class (Temp rating)	105°C
04 - Type TB	Class (Temp rating)	105°C
05 - Type SUN	Class (Temp rating)	105°C

1.3.3 Conductor code. A single alpha character shall indicate the conductor material.

C - Copper
A - Aluminum
N - Nickel-coated copper
S - Silver-coated copper

1.3.4 Conductor size. A three digit code shall indicate the AWG size of a round conductor and the dimensions in inches of a rectangular wire.

1.3.5 Shape. A single alpha character shall indicate the wire shape.

O - Round
S - Square
R - Rectangular

## 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue 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:

QQ-W-343	- Wire, Electrical, Copper (Uninsulated).
PPP-B-636	- Boxes, Shipping, Fiberboard.
PPP-F-320	- Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.
PPP-L-1607	- Lagging, Wood, Wirebound.

(See supplement 1 for list of associated specifications.)

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Federal Standards:

FED-STD-123 - Marking for Shipment (Civil Agencies).

NATIONAL BUREAU OF STANDARDS (NBS)

Handbook 100 - Copper Wire Tables.

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

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and Commercial Item Descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Copies of listed federal and military standards, specifications, Commercial Item Descriptions (CIDs), handbooks and associated documents listed in the Department of Defense Index of Specifications and Standards (DoDISS), should be obtained from the DoD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Copies of industry association documents should be obtained from the sponsor. Copies of all other listed documents should be obtained from the contracting activity or as directed by the contracting officer.

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

MIL-P-116	- Preservation, Methods of.
MIL-Y-1140	- Yarn, Cord, Sleeving, Cloth and Tape-Glass.
MIL-L-19140	- Lumber and Plywood, Fire-Retardant Treated.
MIL-I-24092	- Insulating Varnish, Electrical, Impregnating, Solvent Containing.

Military Standards:

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-2073-1	- DoD Materiel Procedures for Development and Application of Packaging Requirements.

(Copies of military specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

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.

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## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- B 3 - Standard Specification for Soft or Annealed Copper Wire. (DoD adopted)
- B 48 - Standard Specification for Soft Rectangular and Square Bare Copper Wire for Electrical Connectors.
- B 193 - Standard Test Method for Resistivity of Electrical Conductor Materials. (DoD adopted)
- B 298 - Standard Specification for Silver-Coated Soft or Annealed Copper Wire. (DoD adopted)
- B 355 - Standard Specification for Nickel-Coated Soft or Annealed Copper Wire. (DoD adopted)
- D 2307 - Standard Test Method for Thermal Endurance of Film-Insulated Round Magnet Wire.
- D 3951 - Standard Practice for Commercial Packaging. (DoD adopted)
- E 8 - Standard Test Methods of Tension Testing of Metallic Materials. (DoD adopted)

(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)

MW 1000 - Magnet Wire.

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

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede 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 sheets. In the event of any conflict between the requirements of this specification and the specification sheets, the latter shall govern.

3.2 Qualification. Classes 105, 130, 155, 180, 200, and 220 magnet wire, furnished under this specification shall be a product which is qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.5 and 6.3).

3.3 Materials and shapes. The materials and shapes for the magnet wire shall be in accordance with NEMA MW 1000 and as specified herein; however, when a definite material is not specified, a material shall be used which will enable the wire to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product. The material shall be new. There shall be no used, reclaimed, repaired or salvaged materials.

3.3.1 Conductors. Unless otherwise specified (see 6.2.1), conductors shall be of copper.

3.3.1.1 Copper. Copper wire shall be as specified in 3.3.1.1.1 through 3.3.1.3.

3.3.1.1.1 Round wire. The bare copper wire, after insulating, shall conform to type S of QQ-W-343, where applicable. Splices shall be of the butt type. Annealing may be done before, during or after insulating.

3.3.1.1.2 Rectangular wire. Conductors for rectangular wire shall conform to ASTM B 48; however, in all film types and glass insulated wire, the copper conductors may be medium-hard drawn, and annealed during or after insulating.

3.3.1.2 Silver-coated wire. When specified (see 6.2.1), silver-coated copper wire shall conform to ASTM B 298. The coating thickness shall be not less than 40 microinches.

3.3.1.3 Nickel-coated wire. When specified (see 6.2.1), nickel-coated copper wire shall conform to ASTM B 355. The coating thickness shall be not less than 50 microinches.

3.3.1.4 Aluminum wire. Film-coated aluminum round wire, sizes 10 through 14 AWG shall have a yield strength not less than 7,000 pounds per square inch ( $\text{lb/in}^2$ ) and a tensile strength not less than 13,000  $\text{lb/in}^2$ . Sizes 15 through 25 AWG shall have a yield strength not less than 8,000  $\text{lb/in}^2$  and a tensile strength not less than 13,000  $\text{lb/in}^2$ . Larger round sizes, all rectangular film-coated and all fibrous-covered wire shall have a yield strength not less than 5,000  $\text{lb/in}^2$  and shall have a tensile strength not less than 9,000  $\text{lb/in}^2$ . The yield strength shall be determined in accordance with the 0.2 percent offset method as specified in ASTM E 8.

3.3.1.4.1 Aluminum wire sizes and requirements. Aluminum wire sizes and property requirements that are not defined in this specification shall be in accordance with NEMA MW 1000 for the equivalent magnet wire product.

3.3.1.5 Joints, copper aluminum conductors. Magnet wire shall be furnished in length and with necessary joints as specified in NEMA MW 1000.

3.3.2 Insulation. Insulation shall be as specified in 3.3.2.1 through 3.3.2.2.

3.3.2.1 Insulating materials. Insulating materials shall be homogeneous, free from blisters, wrinkles, bumps or impurities or defects which would deleteriously affect mechanical or electrical properties of the finished wire.

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3.3.2.1.1 Glass fiber. The glass fiber shall be continuous-filament glass yarn conforming to MIL-Y-1140.

3.3.2.1.2 Glass and polyester fiber. The fiber covering shall consist of a combination of polyester and glass fibers. The glass fiber shall be a continuous-filament glass yarn conforming to MIL-Y-1140. The polyester fiber shall be a high-grade yarn resulting from the linear polymerization of ethylene glycol and terephthalic acid. The maximum content by weight of polyester fiber in the yarn shall not exceed 50 percent.

3.3.2.1.3 Application of fibrous covering. The fibrous covering shall be wrapped firmly, closely, evenly and continuously around the wire. When more than one layer of fiber is applied, adjacent layers shall be wound in opposite directions. The polyester-glass fiber covering shall be fused. If a tracer is specified (see 6.2.1), one or more ends of glass yarn shall be black or green, and the dye or pigment used for this purpose shall be sufficiently stable so as to retain its color identity after a varnish treatment and subsequent baking.

3.3.2.1.4 Film insulation. Film insulation shall be such that the magnet wire meets the requirements specified for the applicable type and class of wire.

3.3.2.1.5 Varnish. Varnish used in treating glass and glass-and-polyester-fiber magnet wire shall conform to MIL-I-24092, grade CB, or an alternate selected on the basis of service experience or equivalent test data. The varnish used shall be identified on the qualification test report (see 6.3).

3.3.2.2 Crack in insulation. The insulation shall be free from cracks. A crack in the film coating shall be defined as an opening in the coating which exposes the bare conductors to view. Wire sizes AWG 30 and larger shall be examined with normal vision defined as 20/20, after correction with eyeglasses, if necessary. Sizes 30 to 44 AWG, inclusive shall be examined under 6X to 10X magnification and sizes 45 and finer shall be examined under 10X to 15X magnification.

3.4 Increase in bare-wire dimensions. The maximum increase in dimensions due to insulation specified herein may be exceeded provided the overall diameter of the finished wire does not exceed the computed maximum overall dimensions of the finished wire determined by adding the maximum specified increase due to insulation and the maximum specified bare-wire dimensions.

3.4.1 Intermediate sizes. Intermediate sizes shall be as specified in 3.4.1.1 and 3.4.1.2.

3.4.1.1 Round wire. For wire sizes between AWG sizes, the minimum increase in dimension due to the film coating or fibrous covering shall be the same as for the next larger AWG size. Nominal bare wire dimensions shall be as specified in the ordering information with tolerances interpolated in accordance with NEMA MW 1000 bare wire tables. The maximum overall dimensions shall also be interpolated. Test values shall be the same as for the next smaller AWG sizes.



3.4.1.2 Rectangular and square wire. The minimum increase in dimensions due to the insulation for rectangular wire having dimensions not shown in the applicable specification sheets shall be the same as that specified for the next larger thickness or width. The bare-wire dimensions shall be as specified in the ordering information with tolerances interpolated using the specification sheet data. The maximum overall dimensions shall be similarly interpolated.

3.5 Workmanship. Varnish or resin used shall be cured, free from bubbles, soft spots and shall be evenly applied. No paraffin or other deleterious coating shall be applied to types Dg and Dg2 wire. The wire shall be free from dirt, grease, moisture, dust, and metallic particles in insulation.

#### 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 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 assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contractor. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Test equipment and inspection facilities. Test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. The contractor shall establish calibration of inspection equipment to the satisfaction of the Government.

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

- (a) Component-materials inspection (see 4.3).
- (b) Qualification inspection (see 4.5).
- (c) Quality conformance (see 4.6).

4.3 Component-materials inspection. Component-materials inspection shall consist of verification that the component materials listed in table I used in fabricating the magnet wire are in accordance with the applicable referenced documents or requirements prior to such fabrication. Component materials shall meet all the requirements of the applicable referenced documents. If no applicable document is cited in table I, the material may be verified, if necessary, by standard analytical and spectroscopic methods.

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TABLE I. Component-materials inspection.

Component materials <sup>1/</sup>	Requirement	Applicable documents
Conductors:		
Copper - - - - -	3.3.1.1	
Round, AWG size 50 and larger in diameter - - - - -	3.3.1.1.1	<sup>2/</sup> QQ-W-343
Rectangular - - - - -	3.3.1.1.2	ASTM B 48
Silver-coated copper - - - - -	3.3.1.2	ASTM B 298
Nickel-coated copper - - - - -	3.3.1.3	ASTM B 355
Aluminum, rectangular, round - -	3.3.1.4	
Glass fiber - - - - -	3.3.2.1.1	MIL-Y-1140
Glass and polyester fiber - - - - -	3.3.2.1.2	- - -
Varnish - - - - -	3.3.2.1.5	MIL-I-24092

<sup>1/</sup> Testing may be performed either before or after insulating.

<sup>2/</sup> Samples shall be selected on the basis of 10 percent of any lot of spools and reels up to and including 100, and one additional spool or reel for every 24 spools or reels over 100.

**4.4 Inspection conditions.** Unless otherwise specified on the applicable specification sheet, all tests shall be made at room temperature, which shall be 20 to 45°C (68 to 113 degrees Fahrenheit (°F)). In case of not meeting requirements arising out of inspection made under these inspection conditions, the wire samples shall be dried for 48 hours at 105 ± 3°C, conditioned for 4 hours at 23 ± 5°C and 50 ± 5 percent relative humidity, and reinspected after such conditioning. Temperatures shall be controlled within plus or minus 2°C, or 2 percent of that specified, whichever is larger, and relative humidities within plus or minus 5 percent of that specified.

**4.5 Qualification inspection.** Qualification inspection shall be conducted at a laboratory acceptable to the Command or agency concerned. Qualification inspection shall consist of the tests specified on the applicable specification sheet (see 3.1).

**4.5.1 Qualification specimen.** The contractors requesting qualified products listing shall manufacture and be responsible for testing at least one specimen of wire for each class and type for which qualification is sought. The specimen of wire subjected to qualification testing of round film-coated wire shall be AWG no. 18 heavy film build, unless otherwise specified in 4.7, and shall be the basis for the qualification listing of all sizes and film thicknesses shown on the applicable specification sheet. The size of wire for qualification testing of film insulated rectangular wire shall be as agreed upon between the contractor and Naval Sea Systems Command (NAVSEA) and have a heavy film build and shall be the basis for qualification listing of all sizes and thicknesses of film listed on the applicable specification sheet. The specimen of wire for qualification testing of fibrous-covered round or rectangular wire shall be as agreed upon between the contractor and NAVSEA and have an underlying varnish covering and shall be the basis for qualification listing of all sizes and types of insulation combinations listed on the applicable specification sheet.



4.6 Quality conformance. Quality conformance shall be as specified in 4.6.1 through 4.6.2.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of component-materials inspection of 4.3 and of groups A, B, and C inspection of 4.6.1.2, 4.6.1.3 and 4.6.1.4.

4.6.1.1 Sampling. Sampling for quality conformance shall be as specified in 4.6.1.1.1 through 4.6.1.1.8.

4.6.1.1.1 Inspection lot. An inspection lot shall consist of all the magnet wire of the same class, type, shape, and size or size range, manufactured under essentially the same conditions, and offered for inspection at one time. A range of sizes may be consolidated into one inspection lot, provided that the ratio of the largest conductor cross-section to the smallest conductor cross-section does not exceed five.

4.6.1.1.2 Unit of product. The unit of product shall be a spool, reel, container or other package of magnet wire of any length.

4.6.1.1.3 Lot size. The lot size shall be the number of units of product in an inspection lot.

4.6.1.1.4 Sample. A sample shall be one or more sample units selected from an inspection lot in accordance with the sampling plan for the lot size determined as specified in 4.6.1.1.3.

4.6.1.1.5 Sample unit. A sample unit shall be a unit of product selected in an unbiased manner and shall be part of a sample from which specimens are taken.

4.6.1.1.6 Specimen. A specimen shall be an individual piece of wire taken from a sample unit and subjected to inspection.

4.6.1.1.7 Defective unit. Failure in any one test shall constitute a defect; however, if the sample unit fails more than one test in any test group, it shall be counted as only one defective unit.

4.6.1.1.8 Rejected lots. If an inspection lot is rejected, the contractor may withdraw the lot, rework it to correct the defects, or screen out the defective units and again reinspect it, as applicable. Such lots shall be kept separate from new lots, and shall be clearly identified as reinspected lots. Such lots shall be reinspected using tightened inspection.

4.6.1.2 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table II and made on the same set of samples. The appropriate tests for each product shall be as specified on the applicable specification sheets.

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TABLE II. Group A inspection.

Examination or test	Method	AQL (percent defective)
Visual and dimensional	4.7.1	1.5
Increase in bare dimensions	4.7.1	1.5
Adhesion and flexibility	4.7.2	4.0
Elongation	4.7.5	4.0
Springback	4.7.7	4.0

4.6.1.2.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for ordinary inspection. The inspection level shall be I when the specified acceptable quality level (AQL) is 4.0. The AQL shall be as specified in table II. Defects shall be as defined in MIL-STD-105 and in table III.

TABLE III. Classification of defects.

Categories	Defects
Critical:	None defined.
101	Type and size not as specified.
<u>Major:</u>	
201	Material nonconforming; evidence of unauthorized material used.
202	Material not new; evidence of used, reclaimed, repaired, or salvaged parts.
203	Material of conductors nonconforming; not in accordance with specifications.
204	Insulation not homogeneous; has blisters, wrinkles, cracks, bumps.
205	Fiber or filament insulation wrapping uneven; not firm and continuous.
206	Application method of synthetic resin not as specified (types T, T2, T3, and T4, synthetic-resin insulated).
207	Increase in diameter of bare round wire, due to addition of synthetic-resin insulation, is not within specified limits (types T, T2, T3, and T4).
208	Increase in dimensions of bare rectangular wire, due to addition of synthetic-resin insulation, is not within specified limits (types T, T2, and T4).
209	Glass not in accordance with specification (types GX and G2X, glass insulated).

TABLE III. Classification of defects. - Continued

Categories	Defects
<u>Major:</u>	
210	Glass wrap or wraps not completely coated and filled with specified varnish or resin (types GX and G2X).
211	Varnish or resin used is not cured; has bubbles, soft spots, uneven surface (types GX and G2X).
212	Increase in dimensions of bare round and rectangular wire, due to addition of glass insulation, single or double, is not within specified limits (types GX and G2X).
213	Glass fiber not as specified (types Dg and Dg2, glass-and-polyester-fiber insulated).
214	Polyester fiber in insulation greater than maximum percent allowed (types Dg and Dg2).
215	Varnish or bonding material used in insulation is not as specified; wrap or wraps not thoroughly coated and filled with varnish or bonding material (types Dg and Dg2).
216	Varnish or bonding material is rough, uneven, has bare spots, soft spots (types Dg and Dg2).
217	Paraffin or other deleterious coating applied to insulated wire (types Dg and Dg2).
218	Increase in dimensions of bare round and rectangular wire, due to addition of single or double insulation, is not within specified limits (types Dg and Dg2).
219	Combination insulations: size limits not as specified.
220	Combination insulations: increase in dimensions of bare wire is not within specified limits.
221	Wire splices are not butt type; construction of splices is such that diameter, configuration, resistivity, flexibility, and mechanical strength are adversely affected.
222	Manufacture of magnet wire such that it is not free of dirt, grease, moisture, dust, metallic particles in insulation.
223	Round or rectangular magnet wire not wound on spools or reels; maximum weight or wire per spool or reel nonconforming.
<u>Minor:</u>	None defined.

4.6.1.2.2 Disposition of sample units. Sample units which have passed group A inspection may be delivered on the contract, if the lot is accepted.

4.6.1.3 Group B inspection. Group B inspection shall consist of the tests specified in table IV.

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TABLE IV. Group B inspection.

Test	Method
Heat shock	4.7.4
Dielectric strength	4.7.9
Continuity	
High voltage	4.7.11
Low voltage	4.7.10
Completeness of cure	4.7.16
Solderability	4.7.17
Helical coil bond	4.7.13

4.6.1.3.1 Sampling plan. The sampling plan shall be in accordance with MIL-STD-105 for small-sample inspection. Unless otherwise specified herein, normal inspection shall be used at the start of the contract. The AQL shall be 6.5 (percent defective), and the inspection level shall be S4 for normal and tightened inspection, and S3 for reduced inspection.

4.6.1.3.2 Disposition of sample units. Sample units which have passed group B inspection may be delivered on the contract, if the lot is accepted.

4.6.1.4 Group C inspection. Group C inspection shall consist of the tests specified in table V. Shipment shall not be held up pending results of the inspection.

TABLE V. Group C inspection.

Test	Method
Scrape resistance	4.7.6
Thermoplastic flow	4.7.8
Solubility	4.7.12
Dielectric strength at	4.7.14
rated temperature	
Thermal evaluation	4.7.15

4.6.1.4.1 Sampling plan. Three sample units of magnet wire shall be selected from the first lot and thence from each 3-month production or 5,000 units, whichever is less.

4.6.1.4.2 Nonconformance. If a sample fails to pass group C inspection, the contractor shall take corrective action on the materials or process, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, and so forth, and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action, acceptable to the Government, has been taken. After the corrective action has been taken, group C inspection shall be repeated on

additional sample units (all inspection, or the inspection which the original sample failed, at the option of the Government). Groups A and B inspection may be reinstituted; however, final acceptance shall be withheld until the group C reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and the corrective action taken shall be furnished to the contracting activity.

4.6.1.4.3 Disposition of sample units. Sample units which have passed group C inspection may be delivered on the contract, if the lot is accepted.

4.6.2 Retests. Unless otherwise specified in 4.7 or in the applicable specification sheets, the test or tests under which a wire may have failed shall be repeated twice, and the wire shall be regarded as meeting the requirements of this specification if the results of both additional tests are satisfactory.

4.7 Test methods. Test methods shall be as specified in 4.7.1 through 4.7.17.

4.7.1 Visual and dimensional examination. Each of the finished samples of magnet wire selected in accordance with 4.6.1.2 shall be visually and dimensionally examined to verify that materials and construction conform to this specification.

4.7.1.1 Materials and construction. Examination shall be made of conductors, insulation coverings and processing to determine that the magnet wire conforms to this specification.

4.7.1.2 Dimensions. Bare wire diameter, diameter of insulation thickness and overall wire diameter shall be measured by the methods specified in NEMA MW 1000 for the specific type and size of wire.

4.7.2 Adhesion and flexibility. Adhesion and flexibility shall be as specified in 4.7.2.1.

4.7.2.1 Film-coated round and rectangular wire. A specimen shall be tested and examined for adherence and flexibility as specified in NEMA MW 1000 for the specific type and size of wire.

4.7.2.2 Fibrous-covered round wire. Fibrous-covered round wire shall be tested as specified in 4.7.2.2.1 and 4.7.2.2.2.

4.7.2.2.1 Mandrel test. When required by the applicable specification sheet, the specimen shall be wound on a mandrel and examined with normal vision for cracks in the covering. The examination and test procedure shall be as specified in NEMA MW 1000.

4.7.2.2.2 Elongation test. When required by the applicable specification sheet, a specimen shall be elongated in accordance with NEMA MW 1000. The specimen shall be examined with normal vision.

4.7.2.3 Fibrous-covered rectangular wire. Fibrous-covered rectangular wire shall be tested as specified in 4.7.2.3.1 and 4.7.2.3.2.

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4.7.2.3.1 Without underlying film coating. The specimen shall be wound on a mandrel and tested dielectrically according to the methods specified in NEMA MW 1000.

4.7.2.3.2 With underlying film coating. The specimen shall be elongated and examined according to the methods specified in NEMA MW 1000.

4.7.3 Bend test. When required by the specification sheet, a bend test shall be performed on film-covered rectangular wire. The bend test shall be performed in accordance with NEMA MW 1000.

4.7.4 Heat shock. Heat shock of film-coated round and rectangular wire shall be determined using the heat shock test method specified in NEMA MW 1000. Heat shock temperatures and the percent elongation of rectangular wire shall be as required by the applicable specification sheets.

4.7.5 Elongation. Elongation shall be determined by the procedure specified in NEMA MW 1000 for the specific type of wire.

4.7.6 Scrape resistance. Scrape resistance shall be determined on film-coated round magnet wire by the procedure specified in NEMA MW 1000.

4.7.7 Springback. Springback measurements shall be made on film-coated round wire by the method specified in NEMA MW 1000.

4.7.8 Thermoplastic flow. Thermoplastic flow shall be determined on film-coated round magnet wire by the method specified in NEMA MW 1000. To provide a value for film-coated rectangular wire, heavy build film-coated 18 AWG wire shall be tested.

4.7.9 Dielectric strength. Dielectric strength measurement shall be in accordance with the methods specified in NEMA MW 1000 for the specific type and size of magnet wire.

4.7.10 Low voltage continuity. Low voltage continuity measurements shall be made in accordance with NEMA MW 1000. Test results may depend on the material used for the conductive bath. Correlation of values with mercury shall be determined and included in the qualification test report, if any other bath material is used. (Due caution must be observed with mercury in regard to ventilation and the disposition of contaminated wire. Check appropriate state and local regulations.)

4.7.11 High voltage continuity. High voltage continuity tests shall be as specified in NEMA MW 1000 for the specific type and size of magnet wire.

4.7.12 Solubility. Solubility measurements shall be determined by the method specified in NEMA MW 1000 for the specific type and size of magnet wire. The immersion liquid shall be as specified in the applicable specification sheet.

4.7.13 Helical bond strength. Helical bond strength shall be as specified in 4.7.13.1 through 4.7.14.



4.7.13.1 Heat bonding. Bond strength shall be measured after heat activating the adhesive. The time and temperature required for heat bonding shall be as specified in the applicable specification sheets. Specimen preparation and test procedures shall be as specified in NEMA MW 1000 for the specific size of magnet wire, except where indicated in the applicable specification sheets.

4.7.13.2 Solvent bonding. Bond strength shall be measured after solvent activating the adhesive. The solvent shall be as specified in the applicable specification sheets. Specimen preparation and test procedures shall be as specified in NEMA MW 1000 for the specific size of magnet wire.

4.7.14 Dielectric strength at temperature. Dielectric strength at a temperature equal to the thermal class, as specified in the applicable specification sheet, shall be measured according to the methods specified in NEMA MW 1000 for the specific type and size of magnet wire.

4.7.15 Thermal evaluation. Thermal evaluation shall be as specified in 4.7.15.1 and 4.7.15.2.

4.7.15.1 Temperature index for qualification. The temperature index test for qualification shall consist of the dielectric-twist test as specified in ASTM D 2307. Heavy build, size 18 AWG magnet wire shall be used. If size 18 AWG wire is not manufactured for the specific wire type being tested, size 28 AWG magnet wire with heavy build shall be used. Tests shall be made on both unvarnished and varnished specimens. The varnished specimens shall be single dipped. The varnish shall be in accordance with MIL-I-24092 and shall be the same class as the magnet wire. Temperature index shall be based on the extrapolation of the data to at least 20,000 hours for unvarnished, varnished, or bondable wire at the claimed temperature rating.

4.7.15.2 Temperature index for quality conformance. Specimens shall be twisted together as specified for the dielectric strength (twist) test (see 4.7.9) and coated with an insulating varnish in accordance with MIL-I-24092 of the types used to impregnate coils for an insulation system of the same class in which the wire is rated to operate. The varnish shall then be dried to a nontacky finish at a temperature below that which will have any appreciable effect on the insulation under test. The dried, coated specimens shall then be conditioned for 168 hours in a circulating air oven at the temperature specified on the applicable specification sheet. The minimum dielectric breakdown strength shall be not less than the values specified on the applicable specification sheet. At the conclusion of the conditioning, the specimens shall be cooled to room temperature and subjected to the dielectric strength (twist) test specified in 4.7.9.

4.7.15.3 Heat shock test. The magnet wire shall withstand a heat shock test (see 4.7.4) at a temperature at least 20°C higher than the thermal class rating.

4.7.16 Completeness of cure. Completeness of cure shall be determined by one of the following methods, as specified in NEMA MW 1000, for the specific type and size of magnet wire.

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4.7.16.1 Chemical method. Resistance to chemical attack shall be as specified on the applicable specification sheets.

4.7.16.2 Dissipation factor method. Dissipation factor shall be less than the maximum value specified on the applicable specification sheets.

4.7.17 Solderability. Solderability shall be determined by the test method specified in NEMA MW 1000 for the specific type and size of magnet wire. The soldering time and temperature shall be as specified in the applicable specification sheets.

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

## 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. Unless otherwise specified (see 6.2.1), all lumber and plywood, including laminated veneer material used in shipping container, reel, spool, and pallet construction, members, blocking, bracing, lagging, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Level 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 6.2.1), fiberboard used in the construction of class-domestic, non-weather resistant fiberboard, and cleated fiberboard boxes, including interior packaging forms, shall meet the flame spread index and specific optic density requirements specified in PPP-F-320.

5.2 Preservation. Preservation shall be level A, C or commercial as specified (see 6.2.1).

5.2.1 Level A. Magnet wire shall be uniformly and compactly wound on spools or reels. The ends shall be secured to prevent unwinding of the wire. The net weight of a reel of rectangular wire shall be  $200 \pm 20$  pounds. The net weight of a spool or reel of round wire shall be as specified in table VI or table VII.

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TABLE VI. Weights of round wire per spool or reel (AWG 13 and larger and 31 through 46).

Wire (AWG) sizes	Film build <sup>1/</sup>	Net weight, lbs		Minimum flange clearance (inches)	Reel size (inches)
		Nominal	Min		
13 and larger	2	200	175	1-1/2	24
31 - 41	1, 2	8	6	1/4	6
42 - 46	1, 2	1.25	1	3/16	3

<sup>1/</sup> 1 - single, 2 - heavy film thickness.

TABLE VII. Weights of round wire per containerized tapered spool (AWG 14 through 30).

Wire (AWG) sizes	Film build <sup>1/</sup>	Net weight, lbs		Minimum flange clearance (inch)	Reel size (inches)
		Nominal	Min		
14 - 20	1, 2	90	75	1/2	10/11 x 12
14 - 20	3	85	70	1/2	10/11 x 12
21 - 23	1, 2	85	70	1/2	10/11 x 12
21 - 23	3	75	60	1/2	10/11 x 12
24 - 26	1, 2	80	65	1/2	10/11 x 12
24 - 26	3	75	55	1/2	10/11 x 12
27 - 30	1, 2	75	60	1/2	10/11 x 12
27 - 30	3	60	45	1/2	10/11 x 12

<sup>1/</sup> 1 - single, 2 - heavy, 3 - triple film thickness.

5.2.1.1 Spools. Magnet wire (AWG 31 and smaller) on spools in the quantity specified in table VI shall be individually packaged in accordance with method III of MIL-P-116. Each spool of wire shall be wrapped with non-corrosive Kraft paper paper (60-pound base weight) and secured with a pressure-sensitive tape. The paper shall be cut to the inside width of the spool. Each spool of wire shall then be placed in an individual water-resistant folding, set-up or metal edged paperboard or fiberboard box meeting the unit container requirements table I of MIL-STD-2073-1, appendix F at the contractor's option. Box closure shall be in accordance with the applicable box specification or appendix thereto except that the closure of the fiberboard box shall be in accordance with method V. Box selection variety and grade shall be at the contractor's option.

5.2.1.2 Reels. Magnet wire (AWG 13 and larger) on reels in quantities specified in table VI shall be individually unit protected in accordance with method III of MIL-P-116. Each reel of wire shall be overwrapped with a weather-resistant grade of fiberboard conforming to PPP-F-320 and secured with plastic banding around the girth of the reel.

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5.2.1.3 Containerized tapered spool. Magnet wire (AWG 14 through 30) in quantities specified in table VII shall be uniformly and compactly wound on tapered spools having flange diameters of approximately 10 inches and 11 inches with a transverse of 12 inches. Each spool of wire shall then be placed in a snug fitting fiberboard box conforming to PPP-B-636, class weather-resistant, and constructed so that the wire can be dereeled without removal of the spool from the box.

5.2.2 Level C. Magnet wire preservation shall be as specified under level A, except that the paperboard boxes shall be of the non-weather resistant type and the fiberboard boxes shall be of the domestic or domestic-fire retardant class (see 5.1.1(b)). Fiberboard boxes shall be closed in accordance with method I using pressure sensitive tape.

5.2.3 Commercial. Commercial packaging (cleaning, preservation, cushioning and unit pack) shall be in accordance with ASTM D 3951. Unit pack quantity shall be as specified for level A.

5.3 Packing. Packing shall be level A, B, C or commercial as specified (see 6.2.1).

5.3.1 General requirements for levels A, B, and C. Containers selected (see 5.3.2) shall be of minimum weight and cube consistent with the protection required, of uniform size, and contain identical quantities of identical magnet wire.

5.3.2 Levels A, B, and C containers.

5.3.2.1 Spools. Spools of wire (except weights greater than 50 pounds), preserved as specified (see 5.2), shall be packed in exterior shipping containers for the level of packing specified (see 5.3), in accordance with table VII, exterior shipping container requirements, of MIL-STD-2073-1, appendix C, and herein. Unless otherwise specified (see 6.2.1), container selection shall be at the contractor's option. Tapered spools of wire weighing 50 pounds or more shall be palletized in accordance with MIL-STD-2073-1, appendix F.

5.3.2.2 Reels. Reels of wire of 200 pounds (see table VI) shall be completely enclosed with wood lagging in accordance with PPP-L-1607 and appendix thereto.

5.3.2.3 Caseliners, closure and gross weight.

5.3.2.3.1 Caseliners. Unless otherwise specified (see 6.2.1), level A shipping containers containing wire preserved level C or commercial shall be provided with waterproof caseliners in accordance with MIL-STD-2073-1.

5.3.2.3.2 Closure. Container closure, reinforcing, or banding shall be in accordance with the applicable container specification or appendix thereto, except that weather-resistant fiberboard boxes shall be closed in accordance with method V and reinforced with nonmetallic or tape banding, and domestic or fire-retardant fiberboard boxes shall be closed in accordance with method I using pressure sensitive tape.

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5.3.2.3.3 Weight. Wood, plywood, and cleated type containers exceeding 200 pounds gross weight shall be modified by the addition of skids in accordance with MIL-STD-2073-1 and the applicable container specification or appendix thereto.

5.3.3 Commercial. Magnet wire preserved as specified (see 5.2) shall be packed for shipment in accordance with ASTM D 3951 and herein.

5.3.3.1 Container modification. Shipping containers exceeding 200 pounds gross weight shall be provided with a minimum of two, 3- by 4-inch nominal wood skids laid flat, or a skid- or sill-type base which will support the material and facilitate handling by mechanical handling equipment during shipment, storage, and stowage.

5.4 Marking. In addition to any special marking required (see 6.2.1) and herein, interior (unit) packs, shipping containers, palletized unit loads, reels and spools shall be marked for shipment, stowage, and storage as follows:

- (a) Military. Levels A, B, C and commercial packaging (preservation and packing) marking shall be in accordance with MIL-STD-2073-1, appendix F.
- (b) Civilian. Unless otherwise specified (see 6.2.1), marking for civilian acquisitions shall be in accordance with FED-STD-123.

5.4.1 Special marking. Marking shall include date of manufacture and bar coding. Wire shipped to Government facilities shall be uniquely identified as meeting the requirements of this specification. Reels, spools and containers that carry the wire shall be permanently marked with the designation "J-W-1177/(fill in spec sheet number)" in letters and numbers at least 1 inch high and on at least two locations on the package. The markings shall be easily seen from any orientation to the wire package. The method of marking shall be by branding, printing, or other method approved by NAVSEA, that will not degrade visually during normal shipping, storage and handling.

## 6. NOTES

6.1 Intended use. These electrical magnet wires used for coils and other such windings are intended for use in electrical and electronic equipment.

6.1.1 Temperature limitations. An insulation system of a specific thermal class is one that by experience or test can be shown to have suitable thermal endurance when operating at the limiting class temperature specified.

### 6.1.1.1 Insulation.

6.1.1.1.1 105°C. Insulation for 105°C equipment consists of materials or combinations of materials such as cotton, silk, and paper when suitably impregnated or coated or when immersed in dielectric liquid. Other materials or combinations may be included in this class if by experience or accepted tests they can be shown to have comparable thermal life.

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6.1.1.1.2 130°C. Insulation for a 130°C equipment consists of materials or combinations of materials such as mica, glass fiber, and so forth, with bonding substances. Other materials or combinations of materials, not necessarily inorganic, may be included in this class if by experience or accepted tests they can be shown to be capable of operation at 130°C.

6.1.1.1.3 155°C. Insulation for a 155°C equipment consists of materials or combinations of materials such as mica, glass fiber, and so forth, with bonding substances. Other materials or combinations of materials, not necessarily inorganic, may be included in this class if by experience or accepted tests they can be shown to be capable of operation at 155°C.

6.1.1.1.4 180°C. Insulation for 180°C equipment consists of materials or combinations of materials such as silicone elastomer, mica, glass fiber, and so forth, with bonding substances (such as appropriate silicone resins). Other materials or combinations of materials may be included in this class if by experience or accepted tests they can be shown to be capable of operation at 180°C.

6.1.1.1.5 200°C. Insulation for a 200°C equipment consists of materials or combinations of materials which by experience or by accepted tests can be shown to be capable of operation at 200°C.

6.1.1.1.6 220°C. Insulation for a 220°C equipment consists of materials or combinations of materials which by experience or by accepted tests can be shown to be capable of operation at 220°C.

## 6.1.2 Definitions.

6.1.2.1 Impregnated. Insulation is considered to be "impregnated" when a substance provides a bond between components of the structure and also a degree of filling and surface coverage sufficient to give adequate performance under the extremes of temperature, surface contamination (moisture, dirt, and so forth), and mechanical stress expected in service. The impregnant should not flow or deteriorate enough at the operating temperature so as to seriously affect performance in service.

6.1.2.2 Impaired. The electrical and mechanical properties of the insulation should not be impaired by the prolonged application of the limiting insulation temperature permitted for the specific insulation class. The word "impaired" is used in the sense of causing any change which could prevent the insulating material from continuously performing its intended function.

6.1.2.3 Accepted tests. The words "accepted tests" are intended to refer to recognized test procedures established by the IEEE, NEMA, ASTM, or Government for the thermal evaluation of individual materials or simple combinations thereof.

6.1.2.4 Types. The letter codes used for the military magnet wire type designations are specified in the applicable specification sheets.



### 6.1.3 Wire with single or multiple insulation.

#### 6.1.3.1 Film insulated.

6.1.3.1.1 Thickness of insulation. The thickness of insulation for film-insulated wires with the same numeral designator as specified on the applicable specification sheet is the same for all wires no matter what the insulation. Thus, as far as space considerations are concerned, any film-insulated magnet wire can be replaced with any other with the same numeral designator, and coils can be rewound with the desired type of wire for most class equipment without change in dimensions.

6.1.3.1.2 Marine service. For severe marine-service conditions of moisture and steam condensate, and where glass fiber or glass-synthetic fibers are used, a combination insulation should be used such as the following:

<u>Types</u>	<u>Insulation system</u> <u>temperature, °C</u>
BDg, BDg2, BDgV, BDg2V, B2Dg, B2Dg2	155
H2GX, H2G2X	200
LDgH, LDg2H, L2DgH, L2Dg2H	180
M2DgGM	220

6.1.3.2 Self-bonding wire. Film type of magnet wire may be treated with overcoating resins to impart self-bonding characteristics to coils and windings using such wire. The self-bonding resins may be activated by either solvent or heat. Separate qualification inspection approval is not required for the overcoat materials; however, qualification approval provisions apply to the basic wire insulation, and in all cases the properties (including dimension) of the basic insulation should conform to the requirements of this specification. For example, an approved L2 magnet wire may be overcoated so as to meet the dimensions of an L3 magnet wire. In order to be considered as conforming to this specification, the performance requirements for an L2 magnet wire should be met.

6.1.4 Thermal stability. The entire insulation system should withstand the temperatures indicated in 1.2.1. At these maximum or hotspot temperatures, the magnet wire will not be the weakest link in a properly designed system, and a service life of 10 years or more should be expected. These temperatures may be exceeded in specific applications where a shorter life expectancy can be tolerated, for instance, in miniaturized electronic equipments where burned-out parts are quickly replaceable, or in guided missiles which operate once for a short time. Equipment contractors should consult wire manufacturers for recommendations on the relation of life expectancy versus temperatures in excess of those indicated in the applicable specification sheet.

6.1.4.1 Conductor. The conductor normally specified is bare, annealed copper. The copper will oxidize at an increasing rate at temperatures of 200°C and above, and will also pit and become brittle at such temperatures when fluorocarbon-resin insulated. This oxidation will eventually damage the insulating film, and coil failure will result. The oxidation problem is overcome largely by using a silver-coated, or more preferably, a nickel-coated copper or an aluminum conductor.

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## 6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Class, type, shape and size of wire (see 1.2).
- (c) Part number of wire (see 1.3).
- (d) Quantity of wire required, in pounds.
- (e) Conductor, if other than copper (see 3.3.1).
- (f) If silver-coated and nickel-coated wire should conform to ASTMs (see 3.3.1.2 and 3.3.1.3).
- (g) Tracer, if desired on fibrous covered wire (see 3.3.2.1.3).
- (h) When fire-retardant requirements are not required (see 5.1.1).
- (i) When fiberboard need not meet the flame spread index and specific optic density requirements specified in PPP-F-320 (see 5.1.1(b)).
- (j) Levels of preservation and level of packing required (see 5.2 and 5.3).
- (k) When container selection is not at the contractor's option (see 5.3.2.1).
- (l) When caseliners are not required (see 5.3.2.3.1).
- (m) Special marking required (see 5.4).
- (n) Civilian marking if other than specified (see 5.4(b)).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List QPL-1177 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 5523, Department of the Navy, Washington, DC 20362-5101 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.4 Supersession data. The type designations for electrical wires has been revised from previous revisions of this specification. Equivalent requirements between this specification and J-W-1177A are as follows:

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<u>J-W-1177B</u>	<u>J-W-1177A</u>
J-W-1177/1 - Deleted	E
J-W-1177/2 - Type SU	U
J-W-1177/3 - Type SN	N
J-W-1177/7 - Deleted	SA
J-W-1177/8 - Deleted	SAN
J-W-1177/9 - Type SUN	UN
J-W-1177/10 - Type L3 deleted	
J-W-1177/14 - Type K3 added	
J-W-1177/15 - Type M4 added	
J-W-1177/28	
through	
J-W-1177/47 - Added	

#### 6.5 Subject term (key word) listing.

Aluminum wire  
 Armature coils  
 Fibrous-covered wire  
 Field coils  
 Solenoid coils  
 Transformer coils

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

#### MILITARY INTERESTS:

##### Custodians:

Army - CR  
 Navy - SH  
 Air Force - 85

##### Review activities:

Army - AR, ER, MI  
 DLS - IS

##### User activities:

Army - ME  
 Navy - AS, CG, MC, OS

#### CIVIL AGENCY COORDINATING ACTIVITIES:

GSA - FSS, PBO, PCD

INTERIOR - BLM

HHS - FDA

DCGOVT - DCG

NASA - JFK

COMMERCE - NBS

TRANSPORTATION - APM, FAA

##### Preparing activity:

Navy - SH

(Project 6145-1111)

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**NOTE:** This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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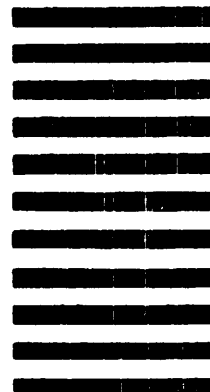
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## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

J-W-1177B

2. DOCUMENT TITLE

WIRE, MAGNET, ELECTRICAL, GENERAL SPECIFICATION

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐

VENDOR

☐

USER

☐

MANUFACTURER

☐

OTHER (Specify): \_\_\_\_\_

b. ADDRESS (Street, City, State, ZIP Code)

## 5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

## 6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)

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