INCH-POUND

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MILITARY SPECIFICATION
WIRE AND CABLE, HOOKUP, ELECTRICAL, INSULATED
GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers single-conductor, synthetic-resin insulated, electrical hookup wire and cable for use, at temperatures from -55°C to +90°C (see 6.4.3), in the internal wiring of electrical and electronic equipment. For the purpose of this specification, single-conductor hookup wire and cable are hereinafter referred to as wire.

1.2 Classification.

1.2.1 Military part number. Part numbers shall be of the following form, as specified (see 6.2.1).

M76	LW*	C	24	7	B	903
Military specification (1.2.1.1)	Type of wire (1.2.1.2)	Conductor material (1.2.1.3)	Conductor size (1.2.1.4)	Stranding (1.2.1.5)	Construction (1.2.1.6)	Color code (1.2.1.7)

* Designates the applicable insulation type

1.2.1.1 Military specification. The military specification designation consists of a prefix M which indicates a military specification item, and the specification number.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, U.S. Army Communications Electronics Command and Fort Monmouth, ATTN: AMSEL-ED-TM, Fort Monmouth, NJ., 07703-5023 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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1.2.1.2 Type of wire. The type of wire is identified by a three-letter or two letter symbol which indicates its application characteristics (see table I).

Note: The letter "P" designates type IP Polyvinyl Chloride (PVC) Insulation, and the letter "R" designates type IS Styrene Butadiene Rubber (SBR) Insulation.

1.2.1.3 Conductor material. The conductor material is identified by the letter "C" for copper or the letter "S" for copper-clad steel (see tables II and III).

1.2.1.4 Conductor size. The conductor size is identified by a one- or two-digit number which indicates the American Wire Gage (AWG) size (see table I).

1.2.1.4.1 When a range of AWG sizes is indicated herein, the sizes embraced are even-numbered. However, in the case of types MWP and MWR wire, AWG size 7 is included, and in the case of types HWP and HWR wire, AWG sizes 1, 0, and 00 are included, when applicable, in addition to the even-numbered sizes.

TABLE I. Type of wire and conductor sizes.

Type of wire	Conductor size range (AWG), inclusive, nominal	Application characteristic	Voltage rating maximum (see 6.4.2) Volts, RMS
LWP	30 to 20	General purpose	300
MWP	24 to 6 1/	General purpose	1,000
HWP	22 to 16	General purpose	2,500
	14 to 00		600
HF	24 to 16	Radio frequency	1,000
LWR	30 to 20	General purpose	300
MWR	24 to 6 1/	General purpose	1,000
HWR	22 to 16	General purpose	2,500
	14 to 00		600

1/ In sizes 10, 8, 7, and 6, the permissible constructions are limited to B, E, and H (see 1.2.1.6).

1.2.1.5 Stranding. Stranding is indicated by a single, double and triple digit number, which indicated the number of strands permitted by table II, irrespective of the number of strands actually used. For solid conductor, the number shall be a single digit number (1).

1.2.1.6 Construction of finished wire. The construction of finished wire (see 6.2.1) is identified by a one-letter symbol which indicates the type of covering over the insulated wire, as follows:

Symbol	Covering over insulated wire
A.....	None.
B.....	Jacket.
C.....	Braid.
D.....	Shield.
E.....	Jacket and shield.
F.....	Braid and shield.
G.....	Shield and outer jacket.
H.....	Jacket, shield, and outer jacket.
I.....	Braid, shield, and outer jacket.

1.2.1.7 Color code identification numbers. The identification numbers assigned to color shall be as specified in Standard MIL-STD-681.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

L-P-390 - Plastic, Molding and Extrusion Material, Polyethylene and Copolymers (Low, Medium and High Density).
QQ-S-571 - Solder: Tin Alloy, Tin-Lead Alloy, and Lead Alloy; Flux-Cored Ribbon and Wire, and Solid Form.
QQ-W-343 - "Wire, Electrical, Copper" "Uninsulated" Under Federal Specifications.

MILITARY

MIL-C-572 - Cords, Yarns and Monofilaments Organic Synthetic Fiber.
MIL-I-3930 - Insulating and Jacketing Compounds, Electrical (for Cables, Cords, and Wires).
MIL-C-12000 - Cable, Cord, and Wire, Electric, Packaging and Packing of.

STANDARDS

FEDERAL

FED TEST METHOD STD NO 228 - Cable and Wire, Insulated; Methods of Testing.
FED TEST METHOD STD NO 406 - Plastics: Methods of Testing.

MILITARY

MIL-STD-104 - Limits for Electrical Insulation Color.
MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-681 - Identification Coding and Application of Bookup Lead Wire Under Military Standards.

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

3. REQUIREMENTS

3.1 Manufacturers. Manufacturers shall use statistical process control in the manufacture of these items. They in turn shall provide objective evidence to the distributor who shall maintain these documents for verification by the DCAS Quality Assurance Representative. Documentation may be in the form of SPC charts on the lot being manufactured. Traceability shall be maintained for verification by the Purchasing activity.

3.2 Materials and component parts. The materials and component parts for the wire shall be as specified herein. When a definite material is not specified, a material which conforms to good commercial practice of wire manufacturers shall be used. Acceptance or approval of any constituent material or component part shall not be construed as a guarantee of the acceptance of the finished product.

3.2.1 Conductors. The conductors shall be stranded or solid, as specified (see 1.2.1.5 and 6.2.1). Solid conductors and the strands comprising the stranded conductors shall be tinned (see 3.3.3). The strands before coating shall be one of the following, as specified (see 6.2.1).

(a) Soft or drawn-and-annealed copper wire conforming to Specification QQ-W-343 for all types and sizes of wire.

(b) Copper-clad steel of 40-percent conductivity for all types and sizes of wire.

The conductors shall be round in shape, uniform in cross section, and free from flaws, scales, and other imperfections. Coated strands, coated solid conductors, and stranded conductors with coated strands, shall meet the applicable constructional requirements specified in table II and III, as well as the applicable requirements for tensile strength and elongation of Specification QQ-W-343, splicing (see 3.3.4) and direct-current (dc) resistance (see 3.11.1).

TABLE II. Stranded-conductor requirements.

Conductor size (AWG) nominal	Constructional requirements					Dc resistance at 20°C, maximum	
	Number of strands, minimum	Strand diameter, nominal (with minimum stranding	Lay of strands, maximum	Diameter over conductor, maximum	Cross-sectional area, calculated, nominal (with minimum stranding)	Copper	Copper-clad steel
		Inch	Inches	Inch	Cir mils	Ohms/ 1,000 ft	Ohms/ 1,000 ft
30	3	0.0063	0.25	0.014	119	93.6	234.0
28	7	0.0050	0.375	0.016	175	70.0	175.0
26	7	0.0063	0.375	0.020	278	49.0	122.5
24	7	0.0080	0.375	0.025	448	28.4	71.0
22	7	0.0100	0.50	0.033	700	19.0	47.5
20	7	0.0126	0.75	0.041	1,111	13.12	32.8
18	16	0.0100	0.75	0.052	1,600	7.89	19.7
16	19	0.0113	1.00	0.065	2,426	4.97	12.3
14	19	0.0142	1.38	0.078	3,831	3.13	7.8
12	19	0.0179	1.60	0.098	6,088	1.92	4.8
10	37	0.0159	2.00	0.122	9,354	1.27	3.8
8	127	0.0113	2.25	0.175	16,217	0.732	1.83
7	127	0.0126	2.50	0.200	20,162	0.59	...
6	127	0.0142	2.50	0.220	25,608	0.454	1.47
4	127	0.0179	2.75	0.277	40,699	0.27	1.13
2	161	0.0201	3.00	0.349	65,046	0.178	0.675
1	259	0.0179	3.75	0.390	82,986	0.141	0.445
0	259	0.0201	4.00	0.441	104,639	0.113	0.2825
00	259	0.0226	4.75	0.493	132,287	0.086	0.2150

1/ 1 CIR mils = 1/1000 inch

TABLE III. Solid-conductor requirements.

Conductor size (AWG)	Conductor diameter, nominal	Cross-sectional area, nominal	Dc resistance at 20°, maximum	
			Copper	Copper-clad steel
	Inch	Cir mils	Ohms/ 1,000 ft	Ohms/ 1,000 ft
30	0.0100	100	112.1	280.2
28	0.0126	159	72.9	182.2
26	0.0159	253	46.0	115.0
24	0.0201	404	28.3	70.7
22	0.0254	640	17.6	44.0
20	0.0320	1,020	11.1	27.8
18	0.0403	1,620	6.92	17.3
16	0.0508	2,580	4.35	10.9
14	0.0641	4,110	2.72	6.8

3.3 Construction (see 4.4.1).

3.3.1 Stranded conductors. For stranded conductors, the minimum number and maximum lay of strands and maximum diameter over conductor shall be as specified in table II. However, a larger number of strands may be used, provided the maximum lay, maximum diameter over conductor, and dc resistance of the conductor are as specified (see tables II and 3.11.1). Nominal strand diameter and calculated cross-sectional area of conductor are furnished for information only. All strands in a stranded conductor shall be of the same nominal diameter.

3.3.1.1 Lay. Unless otherwise specified herein, concentric or bunch stranding may be used for AWG sizes 30 to 10, inclusive. Rope stranding shall be employed for AWG sizes 8 to 00, inclusive. The lay of the strands of bunch-stranded conductors, and of the two outer layers of concentric-stranded conductors, shall not exceed the values shown in table II. In rope-stranded conductors, the lay of the stranded members of the two outer layers of the conductor, and of the strands in the stranded members, shall not exceed the values shown in table II.

3.3.2 Solid conductors. The diameters of solid conductors shall not vary from the nominal values specified in table III by more than the tolerances specified in table IV.

TABLE IV. Permissible Tolerances in diameters of solid conductors and shield wires.

Solid-conductor and shield-wire diameter, nominal	Permissible tolerances	
	Plus	Minus
Inch		
Under 0.0100	0.0003 inch (0.3 mil)	0.0001 inch (0.1 mil)
0.0100 and over	3 percent	1 percent

3.3.3 Coating. To provide ease of soldering, each strand of a stranded conductor, and each solid conductor, shall be coated with either commercially pure tin coating or with a 70-30 tin-lead alloy coating if tin is not available. No bare copper shall be visible to the naked eye (see 4.4.1). If a flux is used, all flux residue shall be removed after coating.

3.3.4 Splices. Splices shall not be made in a stranded conductor as a whole. However, individual strands of stranded conductors, as well as solid conductors, may be spliced, in which case they shall be electro-welded or brazed with silver (Ag) composition solder conforming to Specification QQ-S-571. Splices shall be of the butt type except that splices in strands and solid conductors of AWG size 28 and smaller may be twisted, in which case they shall have a minimum overlap of 1/2 inch. Splices shall be constructed and distributed throughout the conductor that the diameter, configuration, dc resistance, flexibility, and mechanical strength of the completed conductor are not adversely affected (see 4.4.1).

3.3.5 Insulation. The insulation shall be free from splinters, blisters, and other non-homogeneities visible to the normal eye, and shall be capable of being readily stripped from the conductor by standard methods, leaving the conductor clean for soldering. The insulation shall be applied directly over the conductor in such a manner that the conductor is well centered. The minimum insulation wall thickness and the maximum diameter over the insulation, when measured at any cross section (see 4.4.1), shall be as specified in tables V and VI, as applicable.

TABLE V. Type and thickness of insulation.

Type of wire	Type of insulation	Conductor size range (AWG) inclusive, nominal	Insulation wall-thickness	
			Nominal	Minimum
			Mils	Mils
LWP	General purpose	30 to 20	10	8
MWP	General purpose	24 to 10	16	13
		8 to 6	31	28
HWP	General purpose	22 to 16	31	28
		14 to 4	45	42
		2 to 00	60	57
HF	Low loss	24 to 16	16	13
LWR	General purpose	30 to 20	10	8
MWR	General purpose	24 to 10	16	13
		8 to 6	31	28
HWR	General purpose	22 to 16	31	28
		14 to 4	45	42
		2 to 00	60	57

TABLE VI. Maximum diameter over insulation.

Conductor size (AWG), nominal	Type LWP	Type MWP	Type HWP	Type HF	Type LWR	Type MWR	Type HWR
	Inch	Inch	Inch	Inch	Inch	Inch	Inch
30 solid	0.033	...	...	...	0.033	...	...
30 stranded	0.037	...	...	...	0.037	...	...
28 solid	0.037	...	...	...	0.037	...	...
28 stranded	0.039	...	...	...	0.039	...	...
26 solid	0.040	...	...	...	0.040	...	...
26 stranded	0.043	...	...	...	0.043	...	...
24 solid	0.044	0.057	...	0.057	0.044	0.057	...
24 stranded	0.049	0.062	...	0.062	0.049	0.062	...
22 solid	0.049	0.062	0.098	0.062	0.049	0.062	0.098
22 stranded	0.057	0.070	0.106	0.070	0.057	0.070	0.106
20 solid	0.056	0.069	0.105	0.069	0.056	0.069	0.105
20 stranded	0.065	0.078	0.114	0.078	0.065	0.078	0.114
18 solid	...	0.077	0.113	0.077	...	0.077	0.113
18 stranded	...	0.089	0.125	0.089	...	0.089	0.125
16 solid	...	0.088	0.124	0.088	...	0.088	0.124
16 stranded	...	0.102	0.138	0.102	...	0.102	0.138
14 solid	...	0.101	0.166	...	...	0.101	0.166
14 stranded	...	0.115	0.180	...	...	0.115	0.180
12 stranded	...	0.135	0.200	...	...	0.135	0.200
10 stranded	...	0.159	0.224	...	...	0.159	0.224
8 stranded	...	0.242	0.277	...	...	0.242	0.277
7 stranded	...	0.273	...	...	...	0.273	...
6 stranded	...	0.286	0.322	...	...	0.286	0.322
4 stranded	...	...	0.373	...	...	...	0.373
2 stranded	...	...	0.473	...	...	...	0.473
1 stranded	...	...	0.522	...	...	...	0.522
0 stranded	...	...	0.573	...	...	...	0.573
00 stranded	...	...	0.625	...	...	...	0.625

3.3.5:1 Types LWP, MWP, HWP and LWR, MWR, HWR wire. Wire for general purpose applications (types LWP, MWP, HWP and LWR, MWR, HWR) shall be insulated with a tight-fitting, continuous, concentric layer of types IP or IS insulating compound in accordance with Specification MIL-I-3930, or with any other resin having the same physical properties, except for types LWP and LWR wire in AWG sizes 30 to 26, inclusive, for which the insulation shall also conform to the aging-stability requirements specified in 3.11.6.

3.3.5.2 Type HF wire. Wire for radio-frequency applications (type HF) shall be insulated with a tight-fitting, continuous, concentric layer of polyethylene conforming to type II, class L, grade 3 of Specification L-P-390.

Note: Type IP is Polyvinyl Chloride (PVC) and its use must comply with current Department of Defense guidance.

3.4 Jacket. When the construction includes a jacket, a wall of clear, transparent, heat-stabilized polyamide (nylon), or other material specifically approved, shall be extruded over the insulation. The color of the insulation and color coding thereon if used shall be clearly distinguishable through the jacket (see 3.7). When the jacket is color-coded, the finished wire shall conform to this specification. The increase in the overall diameter due to the jacket, when measured at any cross section (see 4.4.1), shall be as specified for the individual type of wire (see 3.9).

3.5 Braid. When the construction includes a braided covering, a closely woven braid either of synthetic yarn conforming to type P of Specification MIL-C-572, or of electrical-grade, untreated, continuous-filament glass yarn, as specified (see 6.2.1), shall be applied over the insulation. Colored carriers used in glass braids shall be composed either of synthetic yarn or of glass yarn conforming, respectively, to the above requirements. If synthetic-yarn carriers are used for color coding in glass braid, the number of such carriers shall not exceed 25 percent of the total number of carriers. Braids shall be saturated and coated with noncorrosive, nontoxic, flexible, transparent, and colorless lacquer or lacquers which, in their finished state, are resistant to moisture, flame, and fungus. The lacquer coating shall be thin, continuous, and smooth. It shall bond the braid sufficiently to prevent fraying under normal conditions of installation. Five to eight percent salicylanilide shall be added to the saturant and coating; the percentages shall be based on the total solids content of the saturant and coating materials. The increase in the overall diameter due to the saturated-and-coated braid shall be as specified for the individual type of wire (see 3.9).

3.6 Shield. When the construction includes a shield, a tight-fitting, closely woven braid of coated (see 3.3.3) soft or drawn-and-annealed copper strands shall be applied over the jacket or braid, or directly over the insulation. The shield shall be applied in such a manner as to provide at least 80-percent coverage over the construction beneath (see 4.4.1). The size of the strands and the increase in the overall diameter due to the shield shall be as specified for the individual type of wire (see 3.9). The strand diameter tolerance and the elongation of the strands prior to braiding shall be as specified (see table IV and Specification QQ-W-343).

3.6.1 Outer jacket. When the construction includes an outer jacket over the shield, this jacket shall be in accordance with 3.4. The increase in the overall diameter due to the outer jacket shall be as specified for the individual type of wire (see 3.9). If specified (see 6.2.1), color coding of the finished outer-jacketed wire shall be accomplished by one of the methods indicated in 3.7, as applicable.

3.7 Color coding. Color coding of hookup wire shall be in accordance with Standard MIL-STD-681 (see 6.2.1). The colors shall be fast to direct sunlight, to heat, and to chemical action of solvents used (see 4.4.10). Colors in the finished wire shall withstand, without changing, fading, or

running, the conditions of all other tests to which they are subjected, except aging stability (see 4.4.8) and elongation after aging (see Specification MIL-I-3930). The colors in the finished wire shall fall within the light and dark limits of the applicable color chips of Standard MIL-STD-104.

3.7.1 Printing or stamping. An alternative to the methods described above is to print or stamp code designations on the wire. When this system is used for constructions having no braids, the insulation shall be white for types LWP, MWP, HWP, LWR and MWR, HWR wire, and clear for type HF wire. When this system is used for constructions incorporating braids, the braid shall be white, and the insulation preferably white or clear. The wire may be coded by the purchaser after delivery or by the manufacturer before delivery, as specified (see 6.2.1).

3.8 Manufacturer's identification marker threads. When manufacturer's identification marker threads are used, they shall be synthetic, conforming to type P of Specification MIL-C-572. They shall be located among the conductor strands, between the conductor and insulation, or between the insulation and braid, as applicable. The thread used shall disintegrate when immersed in molten solder at a temperature between 370°C and 425°C. If the marker thread is located within the conductor strands, no gassing or other damage shall be visible after the hot-solder-dip operation.

3.9 Wire construction. The construction of wire shall be as follows, and as specified (see 1.2.1 and 6.2.1).

First - A conductor conforming to 3.2.1 to 3.3.4, inclusive, as applicable. A separator may be used to prevent the ingress of rubber compound into the strands and to all strippability.

Second - A wall of insulation of the type and thickness specified in table V, and conforming to 3.3.5 to 3.3.5.2, inclusive, as applicable.

Third - When specified (see 6.2.1), a jacket conforming to 3.4 or a synthetic-yarn or glass-yarn braid conforming to 3.5.

Fourth - When specified (see 6.2.1), a shield conforming to 3.6 applied over the jacket or braid or directly over the insulation.

Fifth - When specified (see 6.2.1), an outer jacket conforming to 3.6.1 applied over the shield.

The finished wire shall also meet the requirements for color coding (see 3.7). The diameter shall be no greater than that specified in table VI plus the sum of the applicable increases due to outer covering allowed in table VII.

TABLE VII. Increase in overall diameter of hookup wire due to outer coverings.

Size range	30	28 and 26	24 to 16 incl	14 and 12	10	8 to 6 incl	4 to 00 incl
Increase in overall diameter due to primary jacket	1	1	1	1	1	1	1
Braid, max, inch: Types LMP, MMP, LMR, MMR, MF	0.015	0.015	0.015	0.015	...	...	...
Types HMP and HMR	...	...	0.015	0.020	0.020	0.025	0.025
Shields: strand size (AWG)	40	38	36	36	34	34	34
Max increase, inch	0.015	0.020	0.023	0.023	0.030	0.030	0.030
Outer jacket	1	1	1	1	1	1	1

1/ For wires 0.060 inch and smaller diameter under the jacket, 0.003 inch minimum and 0.006 inch maximum.

For wires 0.061 inch to 0.400 inch, inclusive, diameter under the jacket, 5 percent of the diameter under the jacket minimum, and 10 percent maximum, except that in no case shall the maximum increase be greater than 0.032 inch.

For wires 0.401 inch and larger diameter under the jacket, 0.020 inch minimum and 0.032 inch maximum.

3.10 Spark test. The insulated wire (construction A) and the primary insulated wire prior to shielding in constructions D and G shall withstand, without breakdown, the spark-test voltages specified in table VIII for uncovered insulated wire. Braided or jacketed wire (construction C or B) and braided or jacketed wire prior to shielding in constructions F, E, I, and H shall withstand, without breakdown, the spark-test voltages specified in table VIII for covered insulated wire (see 4.4.2).

TABLE VIII. Spark-test voltages.

Type of wire	Conductor size range (AWG), inclusive, nominal	Uncovered insulated wire	Covered insulated wire
		Volts, rms	Volts, rms
LWP	30 to 20	2,000	3,000
MWP	24 to 10	4,000	5,000
	8 to 6	6,000	7,500
HWP	22 to 20	6,000	7,500
	18 to 16	7,500	10,000
	14 to 00	12,500	15,000
LWR	30 to 20	2,000	3,000
MWR	24 to 10	4,000	5,000
	8 to 6	6,000	7,500
HWR	22 to 20	6,000	7,500
	18 to 16	7,500	10,000
	14 to 00	12,500	15,000
HF	24 to 20	5,000	7,500
	18 and 16	7,500	10,000

3.11 Performance.

3.11.1 Dc resistance. Dc resistance of stranded and of solid conductors, as measured in the finished wire, shall not exceed the values specified in tables II and III, respectively (see 4.4.3).

3.11.2 Voltage withstand. Wire shall withstand for 1 minute, without breakdown, the applicable voltage specified in table IX (see 4.4.4).

3.11.3 Insulation resistance. Insulation resistance of the wire, at or corrected at 15.6°C, shall be as specified in table IX. If the value of insulation resistance is equal to or greater than that specified in table IX, when the measurement is made at a temperature greater than 15.6°C, no correction factor need be employed (see 4.4.5).

3.11.4 Cold bend. When tested at a temperature of -55° ±2°C over mandrels as specified in table IX, the wire shall exhibit no cracking of the insulation or other component parts, and shall withstand for 1 minute, without breakdown, the applicable voltage-withstand voltage specified in table IX (see 4.4.6).

3.11.5 Heat resistance. After being subjected to the test temperature specified in table IX, wire shall exhibit no cracking of the insulation or other component parts, and shall withstand for 1 minute, without breakdown, the applicable voltage-withstand voltage specified in table IX (see 4.4.7). In constructions incorporating braids, no exudation of the insulation through the braid shall occur.

3.11.6 Aging stability (applicable only to type LWP and LWR wire in AWG sizes 30 to 26, incl). After aging at the test temperature specified in table IX, wire shall exhibit no cracking of the insulation and shall withstand for 1 minute, without breakdown, the applicable voltage-withstand voltage specified in table IX (see 4.4.8).

3.11.7 Flammability (not applicable to type LWP and LWR wire in AWG sizes 30 to 26, inclusive nor to type HF wire). Wire shall not burn at a rate exceeding that specified in table IX, and no charred or burning particles shall fall from the wire during this test (see 4.4.9). A self-extinguishing specimen (see 4.4.9.3) shall be considered to have passed the test if no burning particles are released.

3.11.8 Solvent resistance. After immersion in the solvents specified in table IX, wire shall evidence no fading, running of color, or exudation of the insulation through the braid, as applicable, and shall withstand for 1 minute, without breakdown, the applicable voltage-withstand voltage specified in table IX (see 4.4.10). The lacquer in braided wires shall not degrade to such an extent as to inhibit the positive identification of color coding.

3.11.9 Surface resistivity. Wire shall exhibit surface resistivity of not less than that specified in table IX. The wire shall then withstand, without breakdown, the applicable voltage-withstand voltage specified in table IX (see 4.4.11).

3.11.10 Soldering (not applicable to type HF wire). Insulation of the wire shall not recede more than 1/8 inch, shall not flare away from the conductor, and shall not break open over the bent portion of the conductor (see 4.4.12).

3.11.11 Power factor and dielectric constant (applicable only to HF wire). Wire shall evidence a power factor not exceeding 0.005 and a dielectric constant not exceeding 2.50 (see 4.4.13).

3.12 Workmanship. Wire shall be manufactured and processed in such a manner as to meet all the requirements of this specification.

TABLE IX. Performance characteristics of hookup wire and cable.

Performance characteristic	Type LWP	Type MWP	Type HWP	Type LWR	Type MWR	Type HWR	Type HF
	Volts, rms	Volts, rms	Volts, rms	Volts, rms	Volts, rms	Volts, rms	Volts, rms
Voltage-withstand test voltage for conductor size range (AWG), inclusive, nominal:							
30 to 26	1,500	...	...	1,500	...	...	...
24	1,500	3,000	...	1,500	3,000	...	3,000
22	1,500	3,000	6,000	1,500	3,000	6,000	3,000
20	1,500	3,000	6,000	1,500	3,000	6,000	3,000
18 and 16	...	3,000	6,000	...	3,000	6,000	3,000
14 and 12	...	3,000	6,000	...	3,000	6,000	...
10	...	3,000	6,000	...	3,000	6,000	...
8 to 6	...	4,000	6,000	...	4,000	6,000	...
4 to 2	...	...	6,000	...	...	6,000	...
1 to 00	...	...	6,000	...	...	6,000	...
Insulation resistance (minimum megohms - 1,000 feet at 15.6°C) for conductor size (AWG), nominal:							
30	330	...	...	330	...	...	...
28	300	...	...	300	...	...	...
26	255	...	...	255	...	...	...
24	215	310	...	215	310	...	9,300
22	175	255	430	175	255	430	7,600
20	145	215	375	145	215	375	6,400
18	...	175	320	...	175	320	5,300
16	...	145	275	...	145	275	4,400
14	...	130	235	...	130	235	...
12	...	105	275	...	105	275	...
10	...	85	230	...	85	230	...
8	...	120	170	...	120	170	...
7	...	120	...	...	120	...	...
6	...	100	140	...	100	140	...
4	...	...	115	...	...	115	...
2	...	...	125	...	...	125	...
1	...	...	110	...	...	110	...
0	...	...	100	...	...	100	...
00	...	...	90	...	...	90	...

TABLE IX. Performance characteristics of hookup wire and cable. - Continued

Performance characteristic	Type LWP		Type HWP		Type IWP		Type HP	
	Constructions A,B,D. C,E F	Constructions H I,G	Constructions A,B,D. C,E F	Constructions H I,G	Constructions A,B,D. C,E,F	Constructions H I,G	Constructions A,B,D. C,E,F	Constructions H I,G
Cold bend:	-55° ±2°C		-55° ±2°C		-55° ±2°C		-55° ±2°C	
Test temperature								
Test mandrel diameter (inches) for wire size range (AWG), inclusive, nominal:								
30 to 26	1/2	1	...	...	...	...	...	...
24	1	2	1	2	...	...	1	2
22 and 20	1	2	1	2	1	2	1	2
18 and 16	...	...	1	2	1	2	1	2
14 to 10	...	...	2	3	2	...	...	...
8 to 6	...	...	3	6	3	6	...	...
4 to 00	...	...	...	...	3	6	...	...
Heat-resistance test temperature	120° ±2°C						100° ±1°C	
Aging stability:	AWG sizes 30 to 26, incl							
Air-oven temperature	100° ±1°C		...		...		...	
Cold-bend temperature	-55° ±2°C		...		...		...	
Flammability, maximum	AWG sizes 24 to 20, incl: 1 inch/minute		All sizes 1 inch/minute		All sizes 1 inch/minute		...	
Solvent resistance	Resistant to salt water, aviation-grade gasoline, motor oil, ethylene glycol, alcohol.							
Surface resistivity, minimum:	Construction B	Construction Other	Construction B	Construction Other	Construction B	Construction Other	Construction B	Construction Other
Surface resistivity	100 meg	10 meg	100 meg	10 meg	100 meg	10 meg	100 meg	10 meg
Voltage-withstand voltage:								
AWG sizes 30 to 26, incl	1,000 volts rms		...		...		...	
All others	2,500 volts rms		2,500 volts rms		2,500 volts rms		2,500 volts rms	
	(Conditioned at 65° ±1°C and 90-95 percent RH for 96 hours prior to measurements.)							
Soldering	Insulation does not recede more than 1/8 inch, flare away from conductor, or break open over the bent portion of conductor.						...	
Power factor, maximum	...		...		...		0.005	
Dielectric constant, maximum	...		...		...		2.500	

TABLE IX. Performance characteristics of hookup wire and cable.

Performance characteristic	Type LWR		Type MWR		Type HWR	
	Constructions A,B,D. C,E F	Constructions H I,G	Constructions A,B,D. C,E F	Constructions H I,G	Constructions A,B,D. C,E,F	Constructions H I,G
Cold bend:						
Test temperature	-55° ±2°C		-55° ±2°C		-55° ±2°C	
Test mandrel diameter (inches) for wire size range (AWG), inclusive, nominal:						
30 to 26	1/2	1	...	...	...	...
24	1	2	1	2	...	...
22 and 20	1	2	1	2	1	2
18 and 16	...	...	1	2	1	2
14 to 10	...	...	2	3	2	...
8 to 6	...	...	3	6	3	6
4 to 00	...	...	...	...	3	6
Heat-resistance test temperature	120° ±2°C					
Aging stability:	AWG sizes 30 to 26, incl					
Air-oven temperature	100° ±1°C		...		...	
Cold-bend temperature	-55° ±2°C		...		...	
Flammability, maximum	AWG sizes 24 to 20, incl: 1 inch/minute		All sizes 1 inch/minute		All sizes 1 inch/minute	
Solvent resistance	Resistant to salt water, aviation-grade gasoline, motor oil, ethylene glycol, alcohol.					
Surface resistivity, minimum:	Construction B	Construction Other	Construction B	Construction Other	Construction B	Construction Other
Surface resistivity	100 meg	10 meg	100 meg	10 meg	100 meg	10 meg
Voltage-withstand voltage:						
AWG sizes 30 to 26, incl	1,000 volts rms		...		...	
All others	2,500 volts rms		2,500 volts rms		2,500 volts rms	
	(Conditioned at 65° ±1°C and 90-95 percent RH for 96 hours prior to measurements.)					
Soldering	Insulation does not recede more than 1/8 inch, flare away from conductor, or break open over the bent portion of conductor.					
Power factor, maximum	...		...		...	
Dielectric constant, maximum	...		...		...	

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 this 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, of 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.

4.2 Inspection conditions. Unless otherwise specified herein, all inspection shall be made at the conditions specified in FED-STD-228.

4.2.1 Supplier. Unless otherwise specified herein, the supplier is responsible for the performance of all inspection requirements prior to submission for Government inspection and acceptance. Unless otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government, as specified in the contract or order.

4.2.2. 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 supplier shall establish calibration of test equipment to the satisfaction of the Government.

4.2.3 Government. Acceptance of the wire shall be based upon verification by the Government of the supplier's compliance with the requirements and the sampling and inspection procedures of this specification. The Government may, at its option, repeat any or all of the inspections specified herein.

4.3 Acceptance inspection. Acceptance inspection shall consist of basic-materials inspection and groups A, B, and C.

4.3.1 Resubmitted lots. If an inspection lot (see 6.3.2) is rejected, the manufacturer may rework the lot or screen out defectives and resubmit it for acceptance inspection. Resubmitted lots shall be kept separate from new lots. The resubmitted lot shall be inspected, using tightened inspection.

4.3.2 Basic-materials inspection. Basic-materials inspection shall consist of verification that the component materials listed in table X, prior to fabrication of the wire, are in accordance with the applicable requirements or referenced specifications.

TABLE X. Basic-materials inspection.

Material	Requirement paragraph	Applicable specification
Copper strands	3.2.1(a)	QQ-W-343
Copper-clad steel strands	3.2.1(b)	...
Solder	3.3.4	QQ-S-571
Insulation		
For types LWP, MWP, HWP	3.3.5.1	MIL-I-3930
and LWR, MWR, HWR	3.3.5.1	MIL-I-3930
For type HF	3.3.5.2	L-P-390
Jacket	3.4	...
Braid	3.5	MIL-C-572
Shield	3.6	QQ-W-343
Outer jacket	3.6.1	...
Manufacturer's identification marker threads	3.8	MIL-C-572

4.3.3 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table XI. Statistical sampling shall be in accordance with MIL-STD-105, level S-2. Major and minor defects shall be as defined in MIL-STD-105. 100% conformance is required or the entire lot shall be rejected.

TABLE XI. Group A inspection.

Examination or test	Requirement paragraph	Method paragraph
Visual and dimensional examination.....	(See table XV)	4.4.1
DC resistance	3.11.1	4.4.3
Voltage withstand	3.11.2	4.4.4
Insulation resistance.	3.11.3	4.4.5

4.3.4 Group B inspection. Group B inspection shall consist of the tests specified in table XII.

TABLE XII. Group B inspection.

Test	Type of wire and sizes (AWG), nominal	Requirement paragraph	Method paragraph
Physical properties of insulation 1/	LWP, LWR in sizes 24 to 20, incl; MWP, MWR and HWP, HWR in all sizes.	3.3.5.1	(See Spec MIL-I-3930)
Cold bend	All	3.11.4	4.4.6
Heat resistance	All	3.11.5	4.4.7
Aging stability 2/	LWP, LWR in sizes 30 to 26 incl.	3.11.6	4.4.8
Flammability 3/	LWP, LWR in sizes 24 to 20, incl; MWP, MWR and HWP, HWR in all sizes.	3.11.7	4.4.9

1/ To be performed on specimens of insulation removed from finished wire, unless otherwise specified.

2/ To be performed on insulated wire (construction A). If insulated wire (construction A) is part of more comprehensive constructions, it shall be removed therefrom. However, if removing insulated wire from jacketed constructions is excessively difficult, the construction prior to the jacketing operation may be used, at the discretion of the Government.

3/ To be performed on finished wire. Before testing constructions D, E, and F, the shield shall be removed.

4.3.4.1 Sampling procedure. The sampling procedure shall be in accordance with MIL-STD-105, level S-2.

4.3.5 Group C inspection. Group C inspection shall consist of the tests specified in table XIII.

TABLE XIII. Group C inspection.

Test	Type of wire and sizes (AWG), nominal	Requirement paragraph	Method paragraph
Solvent resistance 1/	All	3.11.8	4.4.10
Surface resistivity 1/		3.11.9	4.4.11
Soldering 2/	LWP, MWP, HWP and LWR, MWR, HWR in all sizes.	3.11.10	4.4.12
Power factor and dielectric constant 2/	HF in all sizes	3.11.11	4.4.13

1/ To be performed on finished wire. Before testing constructions D, E, and F, the shield shall be removed.

2/ To be performed on insulated wire (construction A). If insulated wire (construction A) is part of more comprehensive constructions, it shall be removed therefrom. However, if removing insulated wire from jacketed constructions is excessively difficult, the construction prior to the jacketing operation may be used, at the discretion of the Government.

4.3.5.1 Sampling procedure. Units of product (see 6.3.3) shall be selected from the first production lot and thence from each month's production thereafter, in accordance with table XIV, and one specimen (see 6.3.4) shall be cut from each unit for each group C test. When a test has more than one part and each part requires separate specimens, an additional specimen shall be cut from each unit for each additional part of the test.

TABLE XIV. Sampling procedure for group C inspection.

Monthly production	Sample size	Acceptance number
Under 66	2	0
66 to 180, incl	3	0
181 to 500, incl	5	0
501 to 800, incl	7	0
801 to 1,300 incl	10	0
1,301 and over	15	0

4.3.5.2 Noncompliance. If a sample fails to pass group C inspection, the manufacturer shall take corrective action on the process and on all units of product which can be corrected and which were manufactured under the same conditions, and with the same materials, processes, etc., and which are considered subject to the same failure. Acceptance inspection shall be discontinued until corrective action has been taken. After the corrective action has been taken, specimens from units of product which have been corrected shall be subjected to group C inspection (all inspections or the inspections which the 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 inspection has shown that the corrective action was successful.

4.4 Methods of examination and test. The specimens shall be of the types, constructions, materials, components, and lengths specified herein. However, if the lengths are not specified, they shall be determined by the special conditions of the testing.

4.4.1 Visual and dimensional examination. Wire shall be examined to verify that the requirements listed in table XV are in accordance with this specification. When applicable, the examinations and measurements shall be made on convenient lengths of specimens cut from the sample units, after unwinding not less than 10 feet from the outside end of the spool or reel. At least one sample unit of each construction and type in the lot shall be selected. Overall diameter shall be determined by using the applicable portions of method 1011, thickness of insulation and jacket by using method 1018, and shield coverage by using method 8121, of FED-STD-228.

TABLE XV. Visual and dimensional examination.

Requirements	Requirement paragraph
Construction:	
Stranded conductor	3.3.1
Number of strands	3.3.1
Diameter over conductor	3.3.1
Lay	3.3.1.1
Coating of strands	3.3.3
Splices	3.3.4
Solid conductor:	
Construction	3.3.2
Diameter	3.3.2
Coating	3.3.3
Insulation:	3.3.5
Wall thickness	3.3.5
Diameter over insulation	3.3.5
Jacket:	3.4
Diameter over jacket	3.9
Braid:	3.5
Diameter over braid	3.9
Shield:	
Percent coverage	3.6
Stranding	3.9
Diameter over shield	3.9
Outer jacket:	3.6.1
Diameter over outer jacket	3.9
Color coding	3.7
Manufacturer's identification marker threads (if used)	3.8
Workmanship	3.12

4.4.2 Spark test (to be performed during manufacture). All production lengths of wire (before shielding, when a shield is employed) shall be passed through an electrode that makes intimate contact with their surfaces, as described in method 6211 of FED-STD-228 (see 3.10).

4.4.3 Dc resistance. Dc resistance of the stranded or solid conductors in the finished wire shall be determined in accordance with method 6021.1 of FED-STD-228. (see 3.11.1). When dc resistance of the strand is being determined, a length of finished wire shall be stripped of insulation, unstranded, and the average length of the strands determined. The dc resistance of a single strand shall be determined as follows:

$$Rs = R \times \frac{Ls}{Lc} xn \qquad Rs = Rx \frac{Ls}{Lc} xn$$

Where:

Rs = dc resistance of a strand.

R = dc resistance of stranded conductor.

Lc = length of conductor.

Ls = average length of strand in Lc.

n = number of strands.

4.4.4 Voltage withstand (see 3.11.2). The finished wire shall be tested in accordance with method 6111 of FED-STD-228, except that:

(a) The test shall be performed on finished wire only.

(b) The immersion period shall be at least 12 hours.

(c) The stirrer need not be used.

(d) Specimens shall be at least 5 feet long.

(e) The test voltage (see table IX) shall be applied for a period of 60 $^{+5}_{-0}$ seconds from the time it is reached.

4.4.5 Insulation resistance (see 3.11.3). Insulation resistance of the finished wire shall be determined in accordance with method 6031 of FED-STD-228 except that:

(a) The test shall be performed on specimens of the finished wire which have passed the voltage-withstand test, as soon thereafter as practicable.

(b) The test voltage shall be not less than 100 volts nor more than 500 volts dc.

(c) The polarity of the wire shall be maintained negative with respect to the water, or the shield if the construction includes a shield. The test may be terminated in less than 1 minute if the instrument has ceased fluctuating and the reading indicates that a steady insulation-resistance value has been obtained. A guard circuit may be used.

(d) If the measurement is made at a temperature lower than 15.6°C, the manufacturer shall correct the measured value to the resistance at 15.6°C. The manufacturer shall demonstrate that the correction factor is accurate for his compound.

4.4.6 Cold bend. Specimens of the finished wire at least 5 feet long shall be prepared for testing by skinning approximately 1 inch at each end to the bare conductor. Specimens of the wire shall then be placed in a cold chamber mantained at -55° ±2°C. The lower ends of all specimens shall be weighted and their upper ends shall be attached to mandrels; mandrel diameters shall be as specified in table IX. The specimens shall then be conditioned for a period of 4 hours. At the end of this period, and while still at the above-specified temperature, the specimens shall be wrapped around the mandrels at a uniform rate of 15 ±3 revolutions per minute for a minimum of six complete turns. The weights attached to the lower ends of the specimens shall be sufficient to keep them taut during the bending operations so that close turns of the specimens upon the mandrels will be obtained. A suitable traversing mechanism may be used in lieu of weights. The specimens shall then be removed from the mandrels and, without straightening, immersed for 1 hour in tapwater at not more than 30°C, with approximately 6 inches of each end of each specimen protruding above the water. The specimens shall then be subjected to the applicable voltage-withstand voltage specified in table IX, in the manner specified in 4.4.4 (see 3.11.4).

4.4.7 Heat resistance. Specimens of the finished wire at least 5 feet long shall be prepared for testing by skinning approximately 1 inch at each end to the bare conductor. The specimens shall then be wound tightly around a mandrel three times their outside diameter for five close turns, exclusive of the bared portion. The ends of the specimens shall be securely taped to the mandrel. The specimens and mandrels shall then be placed for 24 hours in an oven mantained at 120° ±2°C; however, for type HF wire, the oven temperature shall be maintained at 100° ±1°C. At the end of this period, the specimens and mandrels shall be removed and allowed to return to room temperature. The coiled sections of the specimens shall then be immersed for 1 hour in tapwater at not more than 30°C, with approximately 6 inches of each end protruding above the water. The specimens shall then be subjected to the applicable voltage-withstand voltage specified in table IX, in the manner specified in 4.4.4 (see 3.11.5).

4.4.8 Aging stability (applicable only to types LWP and LWR wire in AWG sizes 30 to 26, inclusive). Specimens of the finished wire shall be prepared for testing by skinning approximately 1 inch at each end to the bare conductor. The specimens shall then be aged in an air oven. They shall be suspended

vertically without touching one another or the walls of the oven. Heated air at atmospheric pressure shall be circulated so as to maintain a uniform temperature of 100° ±1°C, in the oven, using baffles to avoid local overheating or dead spots. The source of heat shall be located in the air supply outside the oven proper, and the supply shall be controlled by upper and lower vents to provide a continuous change of air approximately once per hour during the test. The specimens shall be conditioned for a period of 96 hours. After the conditioning period, they shall be cooled to room temperature for at least 1 hour, and then subjected to a cold-bend test in accordance with 4.4.6, except that a 3/4-inch mandrel shall be employed (see 3.11.6).

4.4.9 Flammability (not applicable to type LWP or LWR wire in AWG sizes 30 to 26, inclusive nor to type HF wire).

4.4.9.1 Specimens. Specimens of the finished wire shall be supported in a horizontal position in the center of the test chamber. They shall be supported at the ends and shall be under sufficient tension to prevent sagging. Each specimen shall be marked off with fine thread (or by other suitable means) at eight points located as follows:

(a) An ignition point placed a convenient distance from one end of the specimen.

(b) A test-starting point located 5 inches from the ignition point.

(c) Six additional markers, spaced 1 inch apart, beginning at the test-starting point.

4.4.9.2 Apparatus. The test chamber shall be of metal and shall measure 18 inches high by 18 inches wide by 12 inches deep. It shall have a sliding glass front which can be lowered to within 1/2 inch of the bottom of the chamber. Its top shall contain a slot 3/8 inch wide, running the width of the chamber and so centered that it is directly above the specimen. A bunsen burner, having a 1/4-inch inlet, a nominal bore of 3/8 inch, and a length of approximately 4 inches from its top to its primary inlet, shall be used. The burner shall be adjusted to produce a 2-inch flame with an inner cone one-third of the flame height.

4.4.9.3 Procedure. The burner shall be fed with ordinary illuminating gas at normal pressure. The glass front of the chamber shall be raised sufficiently to permit application of the flame to the wire. The portion of the flame midway between its tip and the tip of the inner cone shall be applied continuously to the ignition-point marker for a period of 30 seconds. If, after removal of the test flame, the specimen continues to burn until the leading edge of the flame reaches the 5-inch marker, the time consumed in traversing each subsequent 1-inch section (to a maximum of 6 inches) shall be measured by means of a stopwatch or other timing device. If, after removal of the test flame, the specimen does not continue to burn until the leading edge of the flame reaches the 5-inch marker, the specimen shall be considered self-extinguishing (see 3.11.7).

4.4.10 Solvent resistance. Five specimens of the finished wire, each at least 2 feet long, shall be prepared for testing by skinning approximately 1 inch at each end to the bare conductor. The center 1-foot section of each specimen shall be immersed for 24 hours at 23° ±2°C, in one of the following solvents; a different solvent shall be used for each specimen.

(a) Saturated solution of salt water.

(b) Aviation-grade gasoline.

(c) Motor oil (SAE No. 20 or 30, oxidation inhibited).

(d) Ethylene glycol.

(e) Alcohol (commercial methyl or ethyl).

At the end of the immersion period, the specimens shall be removed from the solvents and wiped clean with a dry cloth. The center 1-foot sections shall be given careful visual examination and, within 15 minutes after removal from the solvents, shall then be immersed for 1 hour in tapwater at not over 30°C. The specimens shall then be subjected to the applicable voltage-withstand voltage specified in table IX, in the manner specified in 4.4.4 (see 3.11.8).

4.4.11 Surface resitivity.

4.4.11.1 Specimens. Specimens of the finished wire, each 6 inches long, shall be prepared for testing by skinning approximately 1 inch at one end to the bare conductor. The coverings, if any, shall be cut evenly so that no loose ends protrude. Two metal-foil (or similar) electrodes, approximately 1/4 inch wide, shall be wrapped snugly around the axis of each specimen in such a manner as to provide a 1-inch space between the bare conductor and the first electrode and also between the first and second electrodes. This test shall apply only to finished wire; when the outermost covering is a shield, it shall be removed and the construction beneath shall be tested.

4.4.11.2 Conditioning. The specimens shall be conditioned for a period of 96 hours at a temperature of 65° ±1°C, and a relative humidity of 90 to 95 percent. At the end of this period, while the specimens are still in the chamber at the conditioning temperature and humidity, the tests specified in 4.4.11.3 shall be performed by the use of suitable leads tied to the electrodes and bare conductors.

4.4.11.3 Procedure. After conditioning of the specimens, the resistance shall be measured, first between the bare conductor and the first electrode, and then between the first and second electrodes, utilizing the applicable procedure specified in 4.4.5. No temperature correction shall be employed. The resistivity in both instances shall be computed as follows:

$$r = 3.14\ dR.$$

Where:

r = resistivity.
d = diameter of specimen.
R = measured resistance.

Next, a voltage of 2,500 volts root mean square (rms) (1,000 volts for type LWP and LWR wire in AWG sizes 30 to 26, incl.) shall be applied in accordance with the applicable procedures of 4.4.4 between the bare conductor and the first electrode, and then between the first and second electrodes (see 3.11.9).

4.4.12 Soldering (not applicable to type HF wire). Specimens of the insulated wire, each 6 inches long, shall be prepared for testing by skinning 1/2 inch at one end to the bare conductor. The specimens shall then be given a 90° bend over mandrels of their own diameter, the center of the bend being at a point 1 inch from the skinned end. The skinned ends shall then be immersed for 5 seconds, to within 1/8 inch of the insulation, in a pot of molten 60-40 tin-lead solder maintained at approximately 320°C (see 3.11.10).

4.4.13 Power factor and dielectric constant (applicable only to type HF wire). Specimens of the insulated wire shall be of such length that the capacitance of each, when measured, will be not less than 100 Picofarads. Specimens shall be prepared for testing by skinning approximately 1 inch at each end to the bare conductor. Power factor and capacitance shall be measured between the conductor and the outer surface of insulation by immersing all of the specimen, except the ends, in mercury; an alternate method is to use suitable wrap-around electrodes. Determinations shall be made using the apparatus and procedure described in method 4021 of FED-STD-406 (see 3.11.11).

5. PREPARATION FOR DELIVERY

5.1 Bookup wire and cable shall be prepared for delivery in accordance with Specification MIL-C-12000, for the specified levels of packaging and packing, and applicable marking (see 6.2.1).

6. NOTES

6.1 Intended use. Wire covered by this specification are intended for use in the internal wiring of electrical and electronic equipment.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.

(b) Complete military part number (see 1.2.1).

(c) Whether braid, if required, is to be of synthetic yarn or glass yarn (see 3.5 and 3.9).

(d) Color-coding method to be used (see 3.7).

(e) Lengths required (see section 5).

(f) That the cost of the spools or reels shall be included in the tender price, and that the spools or reels shall remain the property of the Government.

(g) Levels of packaging and packing, and applicable marking (see section 5).

6.2.2 Indirect shipments. The packaging, packing, and marking specified in section 5 apply only to direct purchases by or direct shipments to the Government and are not intended to apply to contracts or orders between the manufacturer and prime contractor.

6.3 Definitions.

6.3.1 Finished wire. Finished wire is wire on which all manufacturing operations have been completed and which is ready to be submitted for inspection.

6.3.2 Inspection lot. An inspection lot is finished wire of any one type or construction, within the size ranges listed below, produced under substantially the same conditions and offered for inspection at one time.

Wire size range (AWG), inclusive, nominal
30 to 26
24 to 16
14 to 10
8 to 4
2 to 00

6.3.3 Unit of product. The unit of product is the continuous length of wire contained on a spool or reel, or in a package.

6.3.4 Specimen. A specimen consists of the individual piece of the unit of product upon which the test is made.

6.3.5 Defective unit. Failure in any one test constitutes a defect. However, if the same unit of product fails more than one test in any one group, it is counted as only one defective unit in that group.

6.3.6 Sample. A sample consists of a group of articles (spools, reels, or packages) chosen from an inspection lot for purposes of inspection and treated as an entity.

6.4 Engineering information.

6.4.1 Construction D. When insulated wire with shield (construction D) is used, caution should be taken to prevent short circuiting of shield to conductor which may be caused by soldering.

6.4.2 Voltage rating. In dc circuits, the wire covered by this specification may be used at voltages 1.4 times the rms voltage ratings shown in table I. Cognizance should be taken of possible corona, particularly when using types HWP and HWR wire in AWG sizes 22 to 16, inclusive.

6.4.3 Temperature rating. The temperature rating of 90°C (see 1.1) indicates primarily that the wire covered by this specification is not intended for high-temperature applications. This rating is approximate; it applies to the insulated wire without covering and may be raised slightly when the construction includes a covering over the insulation. The rating is ambient temperature plus temperature rise due to conductor current. When a nylon jacket is used, the temperature rating may be raised to approximately 100°C.

6.4.4 Abrasion resistance. When wire is subject to abrasion, it is recommended that nylon-jacketed wire be used, since nylon jacket is known to possess superior abrasion resistance.

6.5 Subject term (key word) listing:

Braid, glass yarn
Braid, synthetic yarn
Polyethylene
Polyvinyl Chloride
Shield, copper
Single-conductor
Styrene Butadiene Rubber
Synthetic-resin insulated

6.6 Marginal notations. The margins of this specification are marked with an asterisk to indicate where significant changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written irrespective of marginal notations and relationship to the last previous issue.

Note: Caution should be taken during handling and disposal of all solvents, insulating, jacketing, soldering, and other materials in accordance with ASTM C930 and FED-STD-313.

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Custodian:
Army - CR
Navy - SH
Air Force - 85

Review activities:
Army - EA, MI
Air Force - 11
Navy - SH
DLA - IS

User activities:
Army - ME
Navy - OS

Preparing activity:
Army - CR

Agent:
DLA - IS

(Project 6145-2002)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-W-76D	2. DOCUMENT DATE (YYMMDD) 21 September 1992

3. DOCUMENT TITLE
Wire and Cable, Hookup, Electrical, Insulated General Specification For

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (*Include Zip Code*)	d. TELEPHONE (*Include Area Code*) (1) Commercial (2) AUTOVON (*If applicable*)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME Commander U.S. Army Communications-Electronics Command	b. TELEPHONE (*Include Area Code*) (1) Commercial 908-532-5851 (2) AUTOVON 992-5851
c. ADDRESS (*Include Zip Code*) ATTN: AMSEL-ED-TM Fort Monmouth, NJ 07703-5023	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340