INCH-POUND

MIL-DTL-3432J
22 December 2009
SUPERSEDING
MIL-DTL-3432H
23 January 2006

DETAIL SPECIFICATION

CABLES, (POWER AND SPECIAL PURPOSE) AND WIRE, ELECTRICAL (300 AND 600 VOLTS)

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 and multiple conductor cables with and without shields for use in 300 and 600 volts root mean square (rms) applications (see 6.1).

1.2 Classification. Cables covered in this specification are furnished in accordance with the type designation specified and are classified by the element thereof.

1.2.1 Type designation. The type designation is formed as follows:

M 3432 -	08	HG	E	(2/16S-4/12)	SJ	1090
Part or Identifying Number (PIN) (1.2.1.1)	Total number of conductors (1.2.1.2)	Class (1.2.1.3)	Flexibility (1.2.1.4)	Conductor data (1.2.1.5)	Shielding under jacket (1.2.1.6)	Outside diameter (1.2.1.7)

1.2.1.1 PIN. Cables covered by this specification are identified by "M3432" followed by a hyphen.

1.2.1.2 Total number of conductors. The total number of conductors (see 6.3.1) in a cable, exclusive of ground wires (see 6.3.2 and 6.3.4), is identified by a two-digit number. For cables with less than 10 conductors, a "0" precedes the number of conductors (example - 04 means 4 conductors) in a multiple conductor power cable.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAI, P.O. Box 3990, Columbus, OH 43218-3990, or email to WireCable@dla.mil . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil.

1.2.1.3 Class. The class of cables is identified by a two letter symbol, the first letter of which designates the duty (see 6.1) in accordance with table I. The second letter indicates the application of the cables in accordance with table II.

TABLE I. Duty of cables. 1/

(Class) designation 1st letter	Duty	Voltage rating (max volts)
L	Light	300
M	Medium	600
H	Heavy	600

1/ For insulation thickness(see 3.2.3) and jacket thickness(see 3.2.7).

TABLE II. Application of cables.

Class designation 2nd letter	Application
G	General purpose, medium low temperature, -40 °C to +75 °C
O	Medium low temperature, oil resistant, -40 °C to + 75 °C
L	Low temperature, heat resistant, -55 °C to +75 °C
D	Low temperature, oil and heat resistant, -55 °C to +75 °C
H	Low temperature, heat and weather resistant, -55 °C to +90 °C
B	Low temperature, oil and weather resistant, -55 °C to +80 °C
C	Low temperature, oil and heat resistant, -55 °C to +80 °C
K	Low temperature, oil heat, and weather resistant, -55 °C to +80 °C
N	Low temperature, oil and heat resistant, -55 °C to +90 °C 1/
E	Low temperature, ozone, oil, weather, and heat resistant, -65 °C to +90 °C

1/ Synthetic polyisoprene may be blended with natural rubber.

1.2.1.4 Flexibility. Flexibility of a cable is based upon the flexibility of the conductors within the cable. All conductors and ground wires within the same cable will be of the flexibility designated (see 3.1.1 and 3.1.2). The flexibility is identified as follows:

S - Semi-flexible
F - Flexible
E - Extra-flexible

1.2.1.5 Conductor data.

1.2.1.5.1 Number and size of individual conductors. The number of individual conductors of the same wire size are designated by that number followed by a slash and a number indicating the conductor wire size. For example: “3/22" indicates 3 number 22 AWG conductors. When cables are made up of different wire sizes, each different wire size is individually represented, with a dash separating each different wire size. For example: "-6/14-1/8" indicates 6 number 14 AWG conductors and 1 number 8 AWG conductor.

1.2.1.5.2 Unshielded grouped conductors. Conductors twisted together to form a group (such as pairs, triples, quads, etc.) are designated, immediately following the wire size, by "x" followed by the number of these conductor groups contained in the cable. For example, "2/20 x 1" indicates 2 number 20 AWG conductors twisted together to form a pair; "3/22 x 4" indicates four groups, each group consisting of 3 number 22 AWG conductors twisted together to form a triple.

1.2.1.5.3 Shielding.

1.2.1.5.3.1 Grouped shielding. When one or more groups of copper conductors have a common shield over each conductor group, the designator “S x (number of groups)" follows the wire size; for example, "2/22 S x 6" indicates six pairs of number 22 AWG conductors, with a shield over each pair. When a single group has an overall shield, the designation "x 1" is to be omitted since conductors under a shield are twisted to form one group, for example; "2/20 S" indicates one twisted pair of number 20 AWG conductors under a common shield.

1.2.1.5.3.2 Individual shielding. When each conductor of the same size is individually shielded, the letter “I” follows the letter “S". For example: "3/14 SI indicates 3 number 14 AWG conductors, each conductor individually shielded. A shielded single conductor is to be designated by the letter “S" instead of "SI". For example: "1/18 S" indicates 1 number 18 AWG conductor shielded.

1.2.1.5.4 Uninsulated ground drain wires. Uninsulated ground drain wires are designated in the same manner as conductors specified in 1.2.1.5 except the letter "R" is to follow the wire size. For example: "3/8 R" indicates 3 number 8 AWG ground wires. Uninsulated ground wires are not counted in the total number of conductors.

1.2.1.5.5 Cabling. All conductors and groups that are cabled together beneath the jacket, and under the jacket shield, should be enclosed in parentheses. For example: "(2/20 x 2 - 3/18)" indicates a cable made up of two twisted pairs of number 20 AWG conductors and 3 number 18 AWG conductors.

1.2.1.5.6 Cable configuration. Cables composed of two conductors laid parallel are to be designated by the letter “F", which is to follow the conductor number. For example, "2F/8" indicates 2 number 8 AWG conductors laid parallel.

1.2.1.6 Shielding under the jacket. When single shielding is over all conductors and beneath the jacket, the letters "SJ" follows the parentheses that enclose the conductor data. When double shielding beneath the jacket is specified, the letters "SSJ" will follow the parentheses that enclose the conductor data. No letters are used if an overall shield beneath the jacket is not present.

1.2.1.7 Outside diameter.

1.2.1.7.1 Cables (except parallel conductors). The outside diameter of the cable is indicated by four significant figures expressing the diameter in mils (thousandths of an inch) to the nearest figure divisible by five. If a tolerance other than that specified in 3.2.8.1 is required, it is indicated by placing the tolerance immediately after this element of type designation (see 1.2.1.8b and 1.2.1.8f).

1.2.1.7.2 Parallel conductor cables. The outside diameter of the parallel conductor cable should be designated by giving the major diameter followed by a slant, followed by the minor diameter. The diameter, either major or minor, should be indicated in mils (thousandths of an inch) by four significant figures. If a tolerance other than that specified in 3.2.8.2 is required, it should be indicated by placing the tolerance immediately after the major or minor diameter.

1.2.1.8 Use and examples of type designations. Use of type designations formed as indicated in 1.2.1 is not intended to limit the number of cable types procured under this specification. Representative examples of type designations are as follows:

a. M3432 - 10LGF(6/22-2/20-2/18x1)0640 represents a 10 conductor, light duty, general purpose, flexible cable with 6 number 22 AWG conductors, 2 number 20 AWG conductors, and one twisted pair number 18 AWG conductor. The cable has an outside diameter of .640 inch (16.3 mm).

b. M3432 - 18HLF(3/20x4-3/18x1-3/16)1040 ±.025 represents an 18 AWG conductor, heavy duty, heat resistant, flexible cable with four triples, each triple composed of 3 number 20 AWG conductors twisted together; one triple composed of 3 number 18 AWG conductors twisted together; and 3 number 16 AWG

conductors. The cable has an outside diameter of 1.040 inches (26.4 mm) with a tolerance of .025 inch (.635 mm) specified.

c. M3432 - 06MDE(3/22S-2/20SI-1/16S)SJ0430 represents a six conductor, medium duty, oil resistant, extra-flexible cable with 3 number 22 AWG conductors twisted together to form a triple, in a common shield; 2 number 20 AWG conductors, each individually shielded; and 1 number 16 AWG conductor individually shielded. The cable has an overall shield with a jacket or sheath. The cable has an outside diameter of 0.430 inch (10.9 mm).

d. M3432 - 15 MDF(2/22SX5-2/20S-2/18SI-1/16S)1620 represents a 15 conductor, medium duty, oil and heat resistant, flexible cable with five pairs of number 22 AWG conductors, each pair individually shielded; one shielded pair of number 20 AWG conductors; 2 number 18 AWG conductors, each individually shielded; and 1 number 16 AWG shielded conductor. The cable has an outside diameter of 1.620 inches (41.1 mm).

e. M3432 - 02HGF(2/4-2/8R)1080 represents a two conductor, heavy duty, general purpose, flexible cable with 2 number 4 AWG conductors, and 2 number 8 AWG uninsulated ground wires. The cable has an outside diameter of 1.080 inches (27.4 mm).

f. M3432 - 02HGS(2F/8)0920 ±.050/0510 represents a two conductor, heavy duty, general purpose, semi-flexible parallel cable with 2 number 8 AWG conductors having a major diameter of .920 inch (23.4 mm) with a tolerance .050 inch (1.27 mm) specified and a minor diameter of 0.510 inch (13.0 mm).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-228 - Cable and Wire, Insulated; Methods of Testing

COMMERCIAL ITEM DESCRIPTION

A-A-59551 - Wire, Electrical, Copper (Uninsulated)

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-I-631 - Insulation, Electrical, Synthetic-resin Composition, Non-rigid

MIL-P-24216 - Polypropylene Cores, Strands Centers, and Substrands for Wire Rope

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-104 - Limit for Electrical Insulation Color

MIL-STD-686 - Cable and Cord, Electrical; Identification Marking and Color Coding of

(Copies of these documents are available online at http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Ave, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM G21	-	Materials to Fungi, Synthetic Polymeric, Determining Resistance of
ASTM D4976	-	Polyethylene Plastics Molding and Extrusion Materials
ASTM D1248	-	Polyethylene Plastics Extrusion Materials for Wire and Cable
ASTM D4066	-	Nylon Injection and Extrusion Materials (PA)

(Copies of these documents are available online from http://ww w.astm.org or from the ASTM International, P.O. Box C700,100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

UNDERWRITERS LABORATORIES INCORPORATED (UL)

UL 1581	-	Wires, Electrical, Cables, and Flexible Cords

(Copies of this document are available online from http://www.ul.com or from the Underwriters Laboratories, Inc., Publication Stock, 333 Pfingsten Road, Northbrook, IL 60062-2096.)

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA-T-28-562 - Test Method for Measurement of Hot Creep of Polymeric Insulations

(Copies of this document are available from http://www.icea.net or from Insulated Cable Engineers Association, P.O. Box 1568, Carrollton, GA 30112.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 10012 - Equipment, Quality Assurance Requirements for Measuring - Part 1 Metrological Confirmation System for Measuring Equipment

(Copies of this document are available from http://www.iso.ch or from International Organization for Standardization American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY10036.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

NCSL Z540.3 - General Requirements for Calibration of Measuring and Test Equipment

(Copies of this document are available from http://www.ncsli.org or from National Conference of Standards Laboratories (NCSL), 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Materials. Materials shall be specified herein. Acceptance or approval of any constituent material shall not be construed as a guaranty of acceptance of the product. When a definite material is not specified, a material shall be used which will enable the wire and cable to meet the requirements of this specification. All materials shall be fungus resistant in accordance with ASTM G21.

3.1.1 Wire strands.

3.1.1.1 Copper strands. The strands comprising the conductor, uninsulated ground wires (see 6.3.4), and braided shields, shall be soft, drawn, or annealed wire conforming to the applicable requirements of A-A-59551.

3.1.2 Insulating and jacketing compounds. The insulating and jacketing compounds shall be as specified in table III, as indicated by the application of the cable (see table II).

TABLE III. Compounds in accordance with table B-I.

Class designation 2nd letter	Insulating compound designators in accordance with table B-I.	Jacketing compound designator in accordance with table B-I.
G	IS, IH, S, O, 1/ 2/ 3/	S, O, JN 1/ 2/ 3/
O	IS, IH, S, O 1/ 2/ 3/	S, O, JN 1/ 2/ 3/
L	IS-L, IH, S, O 1/ 2/ 3/	S, O, JS-L, JN-L 1/ 2/ 3/
D	IS-L, IH, S, O 1/ 2/ 3/	S, O, JN-L 1/ 2/ 3/
H	IH, S, O 1/ 2/ 3/	S, O, JH 1/ 2/ 3/
B	IH 3/	JN-L 3/
C	IE 3/	JN-L 3/
K	IE 3/	JU 3/
N	IR, IL 2/ 3/	JR, JN 3/
E	S, O 1/ 2/ 3/	S, O 1/ 2/ 3/

1/ For S and O insulating and jacketing designations, see appendix A herein for additional performance requirements.
2/ Types IS, S, O and JH are not for CECOM use.
3/ For definitions of insulating and jacketing compound designators, refer to table B-I.

3.1.2.1 Polyethylene. Polyethylene shall be in accordance with ASTM D4976 or equivalent.

3.1.2.2 Polyurethane. Polyurethane shall be of a polyetherurethane type.

3.1.2.3 Crosslink polyethylene. Crosslink polyethylene shall meet the requirements of table B-II, insulation for cables rated 0 to 2000 volts.

3.1.2.4 Polyamide (nylon). Polyamide shall be in accordance with ASTM D4066.

3.1.3 Recycled, recovered, or environmentally preferable materials. Recycled, recovered or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.1.4 Fillers and binders. Materials used for fillers and binders shall be compatible with the requirements of the finished cable. Twisted polyethylene film or foam polypropylene is acceptable for use with thermoplastic materials only. The yarns shall be clean, dry, and substantially free from all foreign particles, knots, lumps, or any substance that would impair the insulation of the conductor. All materials shall be fungus resistant in accordance with ASTM G21.

3.1.5 Separators. Materials used for separators shall be one of the types specified in 3.12.5.1 and 3.2.5.2.

3.1.5.1 Polyester tapes. Where used, polyester tapes shall conform to MIL-I-631 type G, form T_f. Polyester tape may be polyethylene-coated for subsequent heat sealing.

3.1.5.2 Polypropylene tape. Where used, polypropylene shall be in accordance with MIL-P-24216.

3.2 Design and construction. Cables shall be of the design, construction, and physical dimensions specified herein.

3.2.1 Conductors. Conductors shall be in accordance with A-A-59551. For a particular size and flexibility, the conductors shall be of the type, class, and service listed in table IV (see 1.2.1.4).

3.2.2 Ground wires.

3.2.2.1 Uninsulated ground drain wires. Uninsulated ground drain wires shall be in accordance with A-A-59551 and table V. Each ground drain wire shall have a green cover of fibrous braid, or extruded rubber or plastic (see 1.2.1.5.4, 3.2.6.2 and 6.3.4). When extruded rubber or plastic is used as a covering, it shall be marked "GND" (ground) in contrasting color with a maximum of 3 inches intervals in accordance with MIL-STD-686.

3.2.2.2 Equipment ground wires. Equipment ground wires shall have green insulation (see 6.3.2).

3.2.3 Insulated conductors. Insulated conductors shall be free stripping and extruded over the conductors. Insulated conductors shall be readily separated from each other. The minimum thickness, measured at a cross section of the insulation, for various cable duties and conductor sizes, shall be specified in table VI. The minimum insulation thickness, however, may be 80% of the nominal thickness at the area of contact between contiguous insulated conductors. There shall be no kinking of the insulated conductor within the sheath. Polyethylene insulated conductors of 24 through 12 AWG shall have 0.003 inch (.0762 mm) minimum thickness extruded jacket of polyamide.

3.2.4 Shielding. Shielding shall be applied over the individual conductors, over two or more conductors, or over the entire group of conductors, as specified (see 1.2.1.5.3). The shield shall consist of a braid providing a minimum coverage of 85% (see 4.7.1). Irregularities, breaks, and discontinuities shall be avoided in the application. There shall be no strands protruding through the insulation or the jacket. For insulated conductors in sizes 500 Kcmil to 10 AWG inclusive, the shielding shall consist of a single or double braid of strands, each strand having a nominal diameter of .0063 inch (.16 mm). For insulated conductors in AWG sizes number 12 through 22 inclusive, the strand shall be of .0050 inch (.127 mm) nominal diameter. For a shield applied over two or more conductors grouped together, or over the entire group of conductors, when the diameter covered is .625 inch (15.9 mm) or less, the shielding shall consist of a single or double braid of strands, each with a nominal diameter of .0050 inch (.127 mm) or .0063 inch (.16 mm). When the diameter covered is more than .625 inch (15.9 mm), strands with a nominal diameter greater than .063 inch (.16 mm) may be used for the braid.

3.2.4.1 Shield cover. For a single conductor, or two or more conductors grouped together under one shield, there shall be a separator applied directly on the shield. When the diameter over the shield does not exceed .020 inch (.508 mm), .0050 inch (.127 mm) to .0080 inch (.203 mm) thick polyamide may be extruded instead of polyester tape over the shields that have polyethylene insulated components. For overall shield, there shall be an overlapping, helical wrap of polyester or polypropylene tape applied over the cable core prior to shielding. (see 3.2.6.4).

3.2.5 Identification coding. The individual conductors of all cables and single wires shall be coded for their entire length in accordance with MIL-STD-686.

a. The standard means of coding shall include the following:

(1) Solid-colored insulation with tracers, when required.

(2) Color-coded 1/2 to 1 mil polyester tape, with or without 1/2 to 1 mil heat-sealable adhesion.

(3) Color-coded 1 mil polyester tape with 1/2 to 1 mil heat-sealable adhesive in 8 AWG or larger, when tracers are required.

(4) Color-coded, filled tapes in 8 AWG and larger, when tracers are not required.

(5) Coding by marking.

(6) Color code by green braid (ground wire only).

b. Color shall be in accordance with MIL-STD-104, class 1 for plastics and elastomers, and class 2 for thermosetting compounds. Where black, blue, brown, purple, or red (i.e., two or more of these colors) are used in the same cable, the colors (other than black) shall be light to nominal. Gray shall be dark (or slate) when in the same cable with white.

3.2.5.1 Solid-color insulation. The entire thickness of plastic or rubber insulation shall be solid colored, when practicable. When the entire thickness is not solid colored, insulation shall be applied over the inner core to form an integral part of the insulation wall. Cables having up to and including six conductors shall employ solid coloring, and each conductor shall be clearly distinguishable.

3.2.5.2 Stripe tracers. The tracer shall be in accordance with MIL-STD-686. All materials for stripping shall be nonconductive.

3.2.5.3 Coding by marking. Where prototype models or short runs of cables are specified for procurement (less than 10,000 feet) and the individual conductors of the cables have an outside diameter of .065 inch (1.65 mm) or larger, the contractor shall code the conductors by marking or coloring in accordance with MIL-STD-686.

3.2.6 Grouping and cabling. When the cables are grouped (see 1.2.1.5.2 and 1.2.1.5.5), the conductors within the group shall be twisted together. All the conductors and groups of conductors shall be cabled together in an arrangement that shall form an essentially round construction (except for parallel conductors). Where there are mixtures of different conductor sizes and element constructions (shielded singles, shielded pairs), the larger diameter conductors and shielded wires shall be toward the center.

3.2.6.1 Length of lay. The lay-up of cable layers shall be unidirectional. For cables employing semi- flexible conductors and ground wires, if applicable, the length of lay shall be not greater than 20 times the outer diameter of the layer. For cables employing flexible conductors and ground wires, if applicable, the length of lay shall be not greater than 16 times the outer diameter of the layer. For cables employing extra-flexible conductors and ground wires, if applicable, the length of lay shall be not greater than 12 times the outer diameter of the layer. The outer diameter of the layers is the diameter over the separator or binder, if used (see 3.2.6.4).

TABLE IV. Constructional and direct current resistance requirements of conductors.

Conductor Size (AWG and Kcmil)	Conductor dc resistance at 25°C max (Ω/1000 ft)	Semi flexible			Flexible				Extra-flexible			
		Wire type A-A-59551		No. of Strands	Wire type A-A-59551		Service	No. of Strands	Wire type A-A-59551		Service	No. of Strands
		Type	Class		Type	Class			Type	Class		
500	.023	E	G	259	E	H	---	427	---	---	---	---
450	.025	E	G	259	E	H	---	427	---		---	---
400	.028	E	G	259	E	H	---	427	---		---	---
350	.032	E	G	259	E	H	---	427	---		---	---
300	.038	E	G	259	E	H	---	427	---		---	---
250	.045	E	G	259	E	H	---	427	---		---	---
4/0	.054	E	G	133	E	H	---	259	---	---	---	---
3/0	.069	E	G	133	E	H	---	259	---	---	---	---
2/0	.086	E	G	133	E	H	---	259	---	---	---	---
1/0	.113	E	G	133	E	H	---	259	R	K	---	1064
1	.142	E	G	133	E	H	---	259	R	K	---	836
2	.180	E	G	49	E	1/	---	259	R	K	---	665
3	.213	E	G	49	E	H	---	133	R	K	---	532
4	.283	E	G	49	E	H	---	133	R	K	---	420
6	.450	E	G	49	E	H	---	133	R	K	---	266
8	.715	---	---	---	E	G	---	49	R	K	---	168
									or E	H		133
10	1.14	---	---	---	B	K	Severe	104	R	M	---	259
12	1.81	B	J	41	B	K	Severe	65	B	M	Extra Severe	165
									or R	M	---	168
14	2.82	B	J	26	B	K	Severe	41	B	M	Extra Severe	104
16	4.49	B	K	26	B	M	Severe	65	B	O	Extra Severe	104
18	7.15	B	K	16	B	M	Severe	41	B	O	Extra Severe	65
20	11.35	---	---	---	B	M	Severe	26	B	O	Extra Severe	41
22	18.09	---	---	---	B	M	Severe	19	B	O	Extra Severe	26
24	24.50	---	---	---	B	O	Severe	19	B	P	Extra Severe	26

1/ Number 2 AWG conductor shall be type RC, except it shall be composed of 259 - 16.0 mil strands.

TABLE V. Constructional and direct current resistance requirements of uninsulated ground drain wires.

Ground wire size	Ground wire resistance at 25°C max	Semi flexible				Flexible				Extra-flexible				Length of lay max 1/
		No. of strands	Dia of strands	A-A-59551 Type	A-A-59551 Class	No. of strands	Dia of strands	A-A-59551 Type	A-A-59551 Class	No. of strands	Dia of strands	A-A-59551 Type	A-A-59551 Class	
AWG	Ω/1000 Ft		Mils				Mils				Mils			In.
4/0	.054	133	39.9	E	G	259	28.6	E	H					---
3/0	.069	133	35.5	E	G	259	25.5	E	H					---
2/0	.086	133	31.6	E	G	259	22.7	E	H					---
1/0	.113	133	28.2	E	G	259	20.2	E	H					---
1	.142	133	25.1	E	G	259	18.0	E	H					---
2	.173	49	36.8	E	G	133	22.3	E	H					...
3	.218	49	32.8	E	G	133	19.9	E	H		10.0			---
4	.283	49	29.2	E	G	133	17.7	E	H	420	10.0	R	K	---
5	.350	49	26.0	E	G	133	15.8	E	H	336	10.0	R	K	---
6	.450	49	23.1	E	G	133	14.0	E	H	266	10.0	R	K	---
7	.556	19	33.1	C	C	49	20.6	E	G	210	10.0	R	K	---
8	.715	19	29.5	C	C	49	18.4	E	G	168	10.0	R	K	---
9	.884	19	26.2	C	C	49	16.4	E	G	133	10.0	R	K	---
10	1.11	7	38.5	C	B	19	23.4	C	C	104	10.0	B	K	2.00
11	1.41	7	34.3	C	B 2/	19	20.8	C	C 2/	82	10.0	B	K 2/	1.50
12	1.77	7	30.5	C	B	19	18.5	C	C	65	10.0	B	K	1.25

1/ Since many of these sizes are not listed in A-A-59551, the maximum length of lay is specified herein, instead of the service. This is the equivalent of extra severe service.

2/ Since these sizes are not listed in A-A-59551, the applicable class is listed for information only.

TABLE VI. Insulation thickness.

Duty (see table I)	Rubber, TPE, and crosslink polyethylene			Polyethylene		
	Conductor size inclusive (AWG and Kcmil)	Insulation thickness (in./mm)		Conductor size inclusive (AWG and Kcmil)	Insulation thickness (in./mm)	
		Nom. 1/	Min.		Nom. 1/	Min.
Light	24 to 18	.016(.41)	.013(.33)	25 to I8	.010(.25)	.008(.20)
	16 to 14	.018(.46)	.015(.38)	16 to 14	.012(.31)	.010(.25)
	12 to 10	.021(.53)	.018(.46)	12 to 10	.015(.38)	.012(.31)
Medium	24 to 20	.030(.76)	.025(.64)	24 to 20	.012(.31)	.010(.25)
	18 to 16	.033(.84)	.028(.71)	18 to 16	.014(.36)	.012(.31)
	14 to 12	.036(.91)	.031(.79)	14 to 12	.016(.41)	.014(.36)
	10 to 8	.038(.97)	.033(.84)	10 to 8	.020(.51)	.016(.41)
	6 to 2	.047(1.19)	.042(1.07)			
	1 to 2/0	.063(1.6)	.056(1.42)			
Heavy	24 to 20	.030(.76)	.025(.64)	24 to 16	.015(.38)	.012(.31)
	18 to 16	.033(.84)	.028(.71)	14 to 12	.020(.51)	.017(.43)
	14 to 10	.047(1.19)	.042(1.07)	10	.030(.76)	.025(.64)
	8 to 6	.055(1.4)	.050(1.27)	8 to 4	.035(.89)	.032(.81)
	4 to 2	.063(1.6)	.057(1.45)	2	.042(1.07)	.038(.97)
	1	.070(1.78)	.063(1.6)	1	.046(1.17)	.041(1.04)
	1/0 to 4/0	.078(1.98)	.070(1.78)	1/0 to 2/0	.056(1.42)	.052(1.32)
	250 to 500 Kcmil	.094(2.39)	.084(2.13)	3/0 to 4/0	.064(1.63)	.060(1.52)
				250 to 500 Kcmil	.075(1.9)	.070(1.78)

1/ Nominal dimensions are included for information only.

3.2.6.2 Uninsulated ground drain wires. When specified (see 1.2.1.5.4), uninsulated ground drain wires shall be included in two, three, four, and five conductor, heavy duty unshielded cables in which all conductors are of the same size, and shall be cabled together with the conductors and fillers, if used. The number of uninsulated ground drain wires shall be the same as the number of conductors. The minimum size of the uninsulated ground drain wires shall be as specified in table VII and is dependent upon the size and number of conductors. Uninsulated ground drain wires shall not be furnished in conductor sizes less than 8 AWG.

TABLE VII. Minimum size of uninsulated ground drain wires.

Power conductor sizes (Kcmil and AWG)	Minimum ground drain wire sizes (AWG)			
	Number of power conductors			
	Two	Three	Four	Five
500	4/0	2/0	1/0	2
400	3/0	1/0	1	3
350	2/0	1	2	4
250	1/0	2	3	5
4/0	1	3	4	6
3/0	2	4	5	7
2/0	3	5	6	8
1/0	4	6	7	9
1	5	7	8	9
2	6	8	9	10
3	7	9	9	10
4	8	10	10	12
6	10	10	12	12
8	10	12	12	12

3.2.6.3 Fillers. Fillers shall be used when required to affect a circular cross section (see 3.1.4).

3.2.6.4 Binders and separators. A binder applied over the cabled conductors to hold them in place is optional. A separator shall be applied over the cabled conductor prior to the application of the shield or jacket. The use of a separator for unshielded conductors of 8 AWG and larger shall be optional with the manufacturer. A separator shall be applied over the shield, if present, prior to the application of the jacket. For single conductor cable where no shield is present, a separator shall not be applied. Separators shall be applied as a heat barrier over the cabled conductors with polyethylene insulation, prior to extrusion of the jacket. The binders and separators shall be of the types specified in table VIII.

TABLE VIII. Binders and separators.

Binder types (optional)	Separator types		
	For unshielded cable	For shielded cable	
		Under shield	Over shield
Open wrap, open braid	Closed wrap, closed braid, compound - filled tape, polyester or polypropylene tape.	Polyester or polypropylene tape.	Closed wrap, closed braid, compound-filled tape, polyester or polypropylene tape.

3.2.7 Jacket. The jacket shall be extruded and then vulcanized (except for thermoplastics) over the cabled conductors or shielding, when used, and shall be well centered, single - or double-layer jacket. Double-layer jackets shall be used on cables whose minimum jacket thickness is .098 inch (2.49mm) or over as specified in table IX. Double-layer jackets shall be applied in two concentric layers that are strongly bonded together; the outer layer shall be at least 50% of the total thickness. A reinforcement consisting of an open braid or two layers of seine twine or cabled cotton, or the equivalent, applied in reverse directions, shall be provided between the layers of the jacket. For single conductor cables where no shield is present, the jacket shall be applied directly over the insulation and adhere to the insulation. The jacket thickness shall be as specified in table IX, unless special outside diameters are specified.

TABLE IX. Jacket thickness.

Calculated core diameter inches(mm), inclusive	Jacket thickness					
	Duty L		Duty M		Duty H	
	Nominal in. (mm)	Minimum in. (mm)	Nominal in. (mm)	Minimum in. (mm)	Nominal in. (mm)	Minimum in. (mm)
.125 and under (3.17 and under)	.020 (.51)	.018 (.46)	.027 (.67)	.024 (.61)	.035 (.89)	.032 (.81)
.126 to 0.155 (3.2 to 3.94)	.022 (.56)	.019 (.48)	.031 (.79)	.028 (.71)	.040 (1.02)	.036 (.91)
.156 to .219 (3.96 to 5.56)	.024 (.61)	.022 (.56)	.039 (.99)	.035 (.89)	.045 (1.14)	.041 (1.04)
.220 to .234 (5.59 to 5.94)	.026 (.66)	.023 (.58)	.039 (.99)	.035 (.89)	.078 (1.98)	.070 (1.78)
.235 to .290 (5.97 to 7.37)	.031 (.79)	.028 (.71)	.047 (1.19)	.042 (1.07)	.078 (1.98)	.070 (1.78)
.291 to .300 (7.39 to 7.62)	.031 (.79)	.028 (.71)	.047 (1.19)	.042 (1.07)	.094 (2.39)	.085 (2.16)
.301 to .430 (7.65 to 10.9)	.050 (1.27)	.045 (1.14)	.063 (1.6)	.057 (1.45)	.094 (2.39)	.085 (2.16)
.431 to .540 (10.9 to 13.7)			.070 (1.78)	.063 (1.6)	.094 (2.39)	.085 (2.16)
.541 to .640 (13.7 to 16.3)			.078 (1.98)	.070 (1.78)	.109 (2.77)	.098 (2.49)
.641 to .740 (16.3 to 18.8)			.094 (2.39)	.085 (2.16)	.125 (3.17)	.113 (2.87)
.741 to .850 (18.8 to 21.6)			.109 (2.77)	.098 (2.49)	.141 (3.58)	.127 (3.23)
.851 to 1.100 (21.6 to 27.9)			.125 (3.17)	.113 (2.87)	.156 (3.96)	.140 (3.56)
1.101 to 1.320 (28 to 33.5)			.156 (3.96)	.140 (3.56)	.172 (4.37)	.155 (3.94)
1.321 to 1.550 (33.6 to 39.4)			.172 (4.37)	.155 (3.94)	.188 (4.78)	.169 (4.29)
1.551 to 1.820 (39.4 to 46.2)					.203 (5.16)	.183 (4.65)
1.821 to 2.050 (46.3 to 52.1)					.220 (5.59)	.198 (5.03)
2.051 to 2.300 (52.1 to 58.4)					.235 (5.97)	.212 (5.38)
2.301 to 2.550 (58.4 to 64.8)					.250 (6.35)	.225 (5.71)
2.551 to 2.800 (64.8 to 71.1)					.265 (6.73)	.239 (6.07)
2.801 to 3.100 (71.1 to 78.1)					.280 (7.11)	.252 (6.4)
3.101 to 3.500 (78.8 to 88.9)					.295 (7.49)	.266 (6.76)
3.501 to 3.950 (88.9 to 100)					.310 (7.87)	.279 (7.09)
3.951 to 4.450 (100 to 113)					.330 (8.38)	.297 (7.54)
4.451 to 5.00 (113 to 127)					.345 (8.76)	.311 (7.9)

3.2.7.1 Polyurethane jacket. For medium and heavy-duty cables, the jacket shall be reinforced with polyester or glass fiber strands treated (if necessary) to bond to polyurethane. The fibers shall be applied over the cable core and bonded to the jacket.

3.2.7.2 Jacket color. The jacket color shall be black in accordance with MIL-STD-104.

3.2.8 Diameter tolerance.

3.2.8.1 Cable diameter tolerance (except parallel conductors). The outside diameter of cables having a specified diameter of less than .500 inch (12.7 mm) shall have a tolerance of ± .015 inch (.381 mm). The outside diameter for cables having a specified diameter from .500 to .700 inch (12.7 to 17.8 mm) inclusive shall have a tolerance of ± .020 inch (.508 mm). The outside diameter for cables having a specified diameter of more than .700 inch (17.8 mm) shall have a tolerance of ± 3%. The diameter of a cable at any cross section (except for parallel conductor cable) shall be considered the average of the major and minor diameters at that cross section. If a special tolerance is required on the outside diameter, such tolerances shall be indicated at the end of the type designation (see 1.2.1.8).

3.2.8.2 Parallel conductors. The outside diameter of a parallel conductor cable shall have a tolerance of ± .040 inch (1.02 mm) for a major diameter and a tolerance of ± .030 inch (.762 mm) for the minor diameter. If a special tolerance is required on the outside diameter, such tolerances shall be indicated at the end of the type designation (see 1.2.1.8).

3.3 Spark test. The insulated conductor shall withstand the applicable voltage specified in table XVII.

3.4 Voltage withstand. The insulated conductor in the finished cable shall withstand the specified dielectric voltage in table XVII.

3.5 Insulation resistance. When measured, the insulation resistance shall be not less than the value obtained from the following formula:

$$R = K \log_{10} \frac{d + 2c}{d}$$

Where: R - Insulation resistance in megohms – 1,000 feet.
K - 2,000 for SBR, 50,000 for polyethylene, and 10,000 for EPDM, TPE, and crosslink polyethylene.
d - Average diameter under the insulation.
c - Specified nominal insulation thickness.

NOTE: d and c shall be expressed in the same units.

3.6 Direct current resistance. The cable resistance shall not exceed the values shown in tables IV and V.

3.7 Surface resistance. Black jacket, black insulation, and black striped jackets and insulation shall have a surface resistance of 10 megohms per inch minimum when tested in accordance with method 6041 of FED-STD-228, or 100 megohms minimum when tested in accordance with method 1340 of UL 1581.

3.8 Hot creep (crosslink polyethylene only). The elongation and set shall not exceed the specified values in table B-II.

3.9 Cold bend. The insulation, jacket, and inked markings shall not crack under bending at the applicable lower temperature listed in table II.

3.10 Polyethylene shrink-back. When tested, it shall shrink back a maximum .0625 inches (1.59mm) and shall not split or crack.

3.11 Polyamide heat stability. There shall be no tears or cracks in the polyamide materials. Wrinkles or softening and flowing of the polyamide shall not be cause for rejection.

3.12 Marking. The cable jacket or marker tape shall be marked in accordance with MIL-STD-686. In addition, the manufacturer's name or trademark and the year of manufacture shall be included. The outer surface of the cables shall be smooth and free from raised markings. All letters and numbers in the marking shall be of the same height. There shall be no spacing between letters and numbers in the type designation, for example, M3432-06HOF(6/18)0525.

3.12.1 Marking durability (polyethylene and polyamide insulation jackets only). When the cable is tested, there shall not be a continuous line evident through any letter or numeral of the ink marking nor through any striping applied to the outer surface of polyethylene or polyamide material when subjected to 250 cycles (500 strokes) of abrasive action.

3.13 Workmanship. Cables shall be constructed and finished in a thoroughly workmanlike manner in accordance with accepted high grade production techniques. The cables shall be a uniform and consistent product and shall be free from any defects which will adversely affect the serviceability of the product, such as lumps, kinks, splits, abrasions, scrapes, corroded surface, skin impurities, and faulty extruded surface.

4. VERIFICATION

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

a. Materials inspection (see 4.4).

b. Conformance inspection (see 4.6).

4.2 Requirements cross-reference matrix. Table X provides a cross-reference matrix of the section 3 requirements tested or verified in the specification below.

TABLE X. Requirements cross-reference matrix.

Requirement	Verification	Requirement	Verification
3.1	4.4	3.2.6.1	4.7.1, table XIII
3.1.1.1	4.4, table XI	3.2.6.2	4.7.1, table XIII
3.1.2	4.4, table XI	3.2.6.3	4.7.1, table XIII
3.1.2.1	4.4, table XI	3.2.6.4	4.7.1, table XIII
3.1.2.2	4.4	3.2.7	4.7.1, table XIII
3.1.2.3	4.4, table XI	3.2.7.1	4.7.1, table XIII
3.1.2.4	4.4, table XI	3.2.7.2	4.7.1, table XIII
3.1.3	4.4, table XI	3.2.8	4.7.1, table XIII
3.1.4	4.4, table XI	3.2.8.1	4.7.1, table XIII
3.1.5.1	4.4, table XI	3.2.8.2	4.7.1, table XIII
3.1.5.2	4.4, table XI	3.3	4.7.2, table XIII
3.2	4.7.1	3.4	4.7.3, table XIII
3.2.1	4.7.1, table XIII	3.5	4.7.4, table XIII
3.2.2.2	4.7.1, table XIII	3.6	4.7.5, table XIII
3.2.3	4.7.1, table XIII	3.7	4.7.6, table XIII
3.2.4	4.7.1, table XIII	3.8	4.7.7, table XIII
3.2.4.1	4.7.1, table XIII	3.9	4.7.8, table XIV
3.2.5	4.7.1, table XIII	3.10	4.7.10, table XVI
3.2.5.1	4.7.1, table XIII	3.11	4.7.11, table XVI
3.2.5.2	4.7.1, table XIII	3.12	4.7.1, table XIII
3.2.5.3	4.7.1, table XIII	3.12.1	4.7.9, table XIV
3.2.6	4.7.1, table XIII	3.13	4.7.1, table XIII

4.3 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspections shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with NCSL Z540.3 and ISO 10012.

4.4 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials listed in table XI used in fabricating the cables are in accordance with the applicable referenced specifications or requirements prior to such fabrication.

TABLE XI. Material inspection.

Material	Requirement paragraph	Applicable specification
Copper	3.1.1.1	A-A-59551
Insulating and jacketing compounds	3.1.2	Appendix A, Appendix B, or ASTM D4066
Polyethylene	3.1.2.1	ASTM D4976, ASTM D1248 or equivalent
Crosslink polyethylene	3.1.2.3, 3.8	Table B-II
Polyamide (nylon)	3.1.2.4	ASTM D4066
Fillers and binders	3.1.4	ASTM G21
Polyester tape	3.1.5.1	MIL-I-631
Polypropylene tape	3.1.5.2	MIL-P-24216

4.4.1 Reinspection. If the cable is supplied on spools, reels, or coils or in precut lengths and is more than 12 months or 4 quarters of a year old from the date of last inspection to the date of shipment, the cable shall be inspected again to meet the applicable aging tests of appendices A or B of this specification, or ASTM D4066 for the insulation and jacket compounds used.

4.5 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of FED-STD-228.

4.6 Conformance inspection. Conformance inspections shall consist of group A, B, and C inspections.

4.6.1 Inspection of the product for delivery. Inspection of the product for delivery shall consist of groups A and B.

4.6.1.1 Inspection lot. An inspection lot shall consist of all cables of the same type designation (see 1.2.1) produced under essentially the same conditions, and offered for inspection at the same time.

4.6.1.2 Unit of product. The unit of product shall be taken as a continuous length of cable contained on a spool, reel, or coil. The unit of product shall not exceed 5,000 feet on each spool, reel, or coil.

4.6.1.3 Inspection sample. The inspection sample shall be product selected at random from the lot without regard to quality and shall be of the size specified in table XII.

TABLE XII. Inspection sample.

Production lot size 1/	Sample size
2 to 8	2
9 to 15	3
16 to 25	5
26 to 50	8
51 to 90	13
91 to 150	20
151 to 280	32
281 to 500	50
501 to 1200	80
1201 to 3200	125
3201 to 10000	200
10001 to 35000	315

1/ Lot size will be based on number of reels, spools, or coils of product.

4.6.1.4 Selection of sample units. Sample units for inspection shall be taken from each unit of product. A sample unit is defined as a length of cable drawn from a unit of product.

4.6.1.5 Test specimen. A test specimen may be the entire sample unit (length of finished cable) or any portion or any portion of the sample unit that is to be tested.

4.6.1.6 Group A inspection. Group A inspection shall consist of the inspections specified in table XIII, in the order shown.

4.6.1.6.1 Group A acceptance. Each sample selected in accordance with 4.6.1.4 shall be examined to determine conformance with the requirements in table XIII. If one or more defects are found in the inspection sample, the production lot shall be rejected and shall not be supplied to this specification.

TABLE XIII. Group A inspection.

Examination	Requirement paragraph	Test method paragraph
Visual and dimensional		
Conductors	3.2.1	4.7.1
Uninsulated ground wires	3.2.2.1	4.7.1
Insulated conductors	3.2.3	4.7.1
Shielding	3.2.4	4.7.1
Identification coding	3.2.5	4.7.1
Grouping and cabling	3.2.6	4.7.1
Jacket	3.2.7	4.7.1
Diameter tolerance	3.2.8	4.7.1
Marking	3.12	4.7.1
Workmanship	3.13	4.7.1
Electrical (in the order shown)		
Spark test	3.3	4.7.2
Voltage withstand	3.4	4.7.3
Insulation resistance	3.5	4.7.4
Direct current resistance	3.6	4.7.5
Surface resistance	3.7	4.7.6
Hot creep (crosslink polyethylene only)	3.8	4.7.7

4.6.1.7 Group B inspection. Group B inspection shall consist of the inspections specified in table XIV and shall be made on sample units which have been subjected to and which have passed group A inspection. Sample size selection shall be in accordance with table XV (small sample inspection).

TABLE XIV. Group B inspection.

Inspection	Requirement paragraph	Test method paragraph
Cold bend	3.9	4.7.8
Marking durability (polyethylene polyamide insulation jackets only)	3.12.1	4.7.9

TABLE XV. Small sample inspection.

Lot size (passed group A inspection)	Sample size
2 to 25	2
26 to 150	3
151 to 1200	5

4.6.1.7.1 Group B acceptance. Each sample selected in accordance with 4.6.1.7 shall be examined to determine conformance with the requirements of table XIV. If one or more defects are found in the inspection sample, the production lot shall be rejected and shall not be supplied to this specification. Group B inspections may be performed in any order acceptable to the government.

4.6.1.7.2 Disposition of sample units. Samples subjected to group B tests shall not be delivered on contract or order.

4.6.2 Periodic inspection. Periodic inspection shall consist of group C. Where the results of this inspection show noncompliance with the applicable requirements, delivery of products which have passed groups A and B inspection shall be delayed.

4.6.2.1 Group C inspection. Group C inspection shall consist of the inspections specified in table XVI. Group C inspections shall be made on sample units selected from inspection lots that have passed groups A and B inspection.

TABLE XVI. Group C inspection.

Inspection	Requirement paragraph	Test method paragraph
Polyethylene shrink-back	3.10	4.7.10
Polyamide heat stability	3.11	4.7.11

4.6.2.1.1 Inspection sample. One sample shall be selected per each 5,000 feet of cable, or fraction thereof, not to exceed the total of five samples per order. Samples shall be selected periodically through the life of the contract to assure representative results.

4.6.2.1.2 Noncompliance. No failures shall be allowed in group C inspection. If a sample unit fails to pass group C inspection, 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 inspections or the inspection that 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 re- inspection, information concerning the failure and the corrective action taken shall be furnished to the cognizant inspection activity and the procuring activity.

4.7 Methods of inspection.

4.7.1 Visual and dimensional inspection. Cable shall be inspected to verify that the design, construction of conductors, ground wires, insulated conductors, shielding, identification coding, grouping and cabling, jacket, diameter tolerances, marking, and workmanship are in accordance with the applicable requirements. The inspections shall be made on a specimen not less than 2 feet in length and cut no closer than 5 feet from the end of the sample.

4.7.2 Spark test. All insulated conductors shall be subjected to the spark test in accordance with method 6211 of FED-STD-228 or method 900 of UL 1581 with the following exceptions:

a. It shall be performed on all insulated conductors prior to cabling or shielding.

b. For conductors larger than 6 AWG, an adaptation of method 6211, satisfactory to the Government inspector, shall be used.

c. Speed shall be adjusted to ensure that contact is maintained for at least 0.25 seconds between the electrode and any point on the insulation or according to the formula in method 900 of UL 1581.

d. The frequency of the voltage shall be 60Hz or 400Hz, or as listed in UL 1581.

e. Use of voltmeter-equipped spark testers is optional.

f. Spark test voltage shall be in accordance with table XVII.

TABLE XVII. Spark and dielectric withstanding test voltage.

All insulation materials			
Specified nominal thickness inclusive Inch (mm)	Spark test voltage (volts rms)	Specified nominal thickness inclusive inch (mm)	Dielectric withstand voltage (volts)
0 to .029 (0 to .74)	3,000	0 to .020 (0 to .51)	1,000
.030 to .044 (.764 to 1.12)	6,000	.021 to .031 (.53 to .79)	1,500
.045 to .059 (1.14 to 1.50)	7,000	.032 to .047 (.81 to 1.20)	3,000
.060 and up (1.52 and up)	10,000	.048 to .063 (1.22 to 1.60)	3,500
		.064 to .077 (1.63 to 1.96)	4,000
		.078 to .094 (1.98 to 2.39)	5,000

4.7.3. Voltage withstand. Cables shall be tested as specified in method 6111 of FED-STD-228. The following exceptions shall apply:

a. The test shall be performed only on finished cables.

b. The source of power shall not be less than 5kVa.

c. The crest factor of the test voltage shall not differ by more than ±10% from that of a sinusoidal wave when the transformer is loaded with the test specimen.

d. The immersion period shall be at least 6 hours for unshielded cables. Cables with an overall shield shall not be immersed in water, and shall be tested dry.

e. For unshielded cables, an alternating potential, as specified in table XVII, shall be applied between two terminals. One terminal shall be used to test each conductor in turn, and the other shall be for all remaining conductors. Any uninsulated ground drain wires, if present, shall be tied together in electrical contact with the water.

f. For shielded cables, an alternating potential, as specified in table XVII, shall be applied between two terminals. One shall be used to test each conductor in turn, and the other shall be for all the remaining conductors. Any ground wires, if present, and the shield shall be tied together. The test voltage shall be maintained for 60 seconds +5, - 0 from the time it is reached.

4.7.3.1 Alternate voltage withstand. The following alternate procedure may be used when tested as specified in 4.7.3. Specimens are to be tested dry.

a. Arrange the conductors in a rectangle containing rows and columns; for example, a 20-conductor cable would have five columns and four rows. A 33-conductor cable would have five columns and seven rows, with two unused spaces.

b. Connect all the conductors in columns together. Do this for each column.

c. Apply the specified test voltage, for the specified time, between each column of the rectangle in turn, and the remaining columns connected together.

d. Disconnect all the conductors in a column. Do this for each column.

e. Connect all conductors in a row together. Do this for each row.

f. Apply the specified test voltage for 60 seconds +5, - 0, between each row the rectangle in turn, and the remaining rows connected together.

g. Connect all the conductors together.

h. If shields are present, apply the specified voltage from table XVII between all the conductors connected together and the shields connected together.

4.7.4 Insulation resistance. Insulation resistance of the cables shall be determined as specified in method 6031 of FED-STD-228 except that:

a. The test shall be performed only on finished cables.

b. The insulation resistance shall be measured immediately after the voltage withstand test, and optionally after the cable has been immersed at least six hours. The cable may be tested dry.

c. The test voltage shall be not less than 200V nor more than 500V dc.

d. The polarity of the conductor shall be maintained negative with respect to the water.

e. For unshielded cables, the potential shall be applied between two terminals. One will test each conductor in turn, and the other will test all the remaining conductors and uninsulated ground drain wires, if present, tied together in electrical contact with the water.

f. For shielded cables, the potential shall be applied between two terminals. One will test each conductor in turn, and the other will test all the remaining conductors, the uninsulated ground drain wires, if present, and the shields tied together, in electrical contact with the water. Cables with an overall shield shall not be immersed in water and shall be tested dry.

g. If the measurement is made at a temperature other than 15.6°C, the manufacturer shall correct the measured value of insulation resistance to the resistance at 15.6°C. If the insulation resistance is equal to or greater than that required by 3.5 when the measurement is made at temperature greater than 15.6°C, no correction factor is needed. The manufacturer shall demonstrate that the correction factor is accurate for his compound.

h. Insulation resistance may be determined in less than 1 minute, if the galvanometer has ceased fluctuating and the reading indicates that a steady insulation resistance value has been obtained.

4.7.5 Direct current resistance. The direct current resistance of each conductor and uninsulated ground drain wire, if present, shall be measured on the finished cables as specified in FED-STD-228, method 6021.

4.7.6 Surface resistance. The uninsulated conductors and jacketed cables shall be tested in accordance with method 6041 of FED-STD-228 or method 1340 of UL 1581. All specimens, after having been provided with the required electrodes but prior to testing, shall be cleaned by the procedure described in the test method. In positioning the specimens in the test chamber, the specimens shall be placed so that their ends are a minimum of 1 inch from any wall of the chamber unless otherwise specified in the test procedure.

4.7.7 Hot creep (crosslink polyethylene). The crosslink polyethylene insulation shall be tested in accordance with ICEA-T-28-562.

4.7.8 Cold bend.

4.7.8.1 Specimens. One length of cable from each sample unit shall be prepared for test. The length shall be divided into two parts. Provide one specimen for checking inked markings and jacketed cable as a whole, and a duplicate specimen for checking insulated conductors apart from the finished cable. The set shall be tested aged. If failure occurs to any one specimen, two additional specimens shall be prepared from the same sample unit and tested. If either of the additional specimens fail testing, the sample unit represented thereby shall be considered defective.

4.7.8.2 Procedure. The jacketed cable specimens and the insulated conductor specimen shall be aged in an air oven for 48 hours, 30 minutes at 71± 2°C, removed from the oven, and allowed to cool to room temperature. Aged specimens selected for checking inked markings and cables as a whole, shall be attached to the proper size mandrel as determined in 4.7.8.2.1. The specimens selected for checking insulation apart from the cable shall have the jacket removed and one of each differently colored insulated conductor shall be attached to the proper size mandrel as determined in 4.7.8.2.1. The specimens shall be suspended vertically with lower ends weighted sufficiently to keep specimens taut and to permit bending them without handling. The mandrel and specimens shall be placed in the cold chamber at the lower temperature ± 2°C specified in table II, for a minimum of 4 hours. While at this temperature, the jacketed cable specimens shall be bent for 6 close turns, one turn for polyethylene insulation, around the mandrels at the rate of 15 - 18 turns per minute. The insulated conductor specimens (shielding or non-adhering color coding removed) shall be bent at the rate of one turn per second. If six turns cannot be obtained from a specimen because its length is restricted by space limitations in the cold chamber, the number of turns obtainable from a 5-foot specimen shall be permitted. After the test has been completed, the jacket on the specimens of cable shall be examined using a magnifying glass of at least 3X magnification and then removed. The conductor insulation on all specimens shall be examined for cracks using the same power magnifying glass.

4.7.8.2.1 Mandrels. The mandrel shall be of a standard size in one of the diameters (in inches) specified in table XVIII. The standard size selected shall be the largest size that does not exceed the value computed in table XIX, except that the .062 inch (1.57mm) mandrel shall be used when a smaller size is indicated by the computation.

TABLE XVIII. Mandrel diameters.

Inch/(mm)	Inch/(mm)	Inch/(mm)	Inch/(mm)
.062/(1.57)	.500/(12.70)	1.90/(48.3)	5.56/(141.2)
.094/(2.39)	.680/(17.27)	2.38/(60.5)	6.63/(168.4)
.125/(3.18)	.840/(21.34)	2.88/(73.2)	8.63/(219.2)
.188/(4.78)	1.050/(26.67)	3.50/(88.9)	10.75/(273.1)
.250/(6.35)	1.310/(33.27)	4.00/(101.6)	
.375/(9.53)	1.660/(42.16)	4.50/(114.3)	

TABLE XIX. Computed mandrel size.

Nominal outside diameter of insulated conductor or cable, inclusive 1/ Inch (mm)	Mandrel size, maximum		
	Unshielded cable Inch (mm)	Shielded cable Inch (mm)	Individual insulated conductors Inch (mm)
Up to .150(3.81)	1.0(25.4) x OD	3.0(76.2) x OD	1.0(25.4) x OD
.151(3.84) to .250(6.35)	1.0(25.4) x OD	3.0(76.2) x OD	1.5(38.1) x OD
.251(6.38) to .300(7.62)	1.0(25.4) x OD	3.0(76.2) x OD	2.0(50.8) x OD
.301(7.65) to .350(8.89)	2.0(50.8) x OD	3.0(76.2) x OD	2.0(50.8) x OD
.351(8.92) to .450(11.4)	2.5(63.5) x OD	3.0(76.2) x OD	2.5(63.5) x OD
.451(11.5) to .550(14)	3.0(76.2) x OD	3.0(76.2) x OD	3.0(76.2) x OD
.551(14) to .750(19)	4.0(102) x OD	4.0(102) x OD	
.751(19) to .950(24.1)	5.0(127) x OD	5.0(127) x OD	
.951(24.2) to 1.500(38.1)	6.0(152) x OD	6.0(152) x OD	
1.501(38.1) to 2.00(50.8)	8.0(203) x OD	8.0(203) x OD	
2.001(51.1) and over	10.0(254) x OD	10.0(254) x OD	

1/ For the nominal outside diameter cable (see 1.2.1.7). The nominal outside diameter of the insulated conductor shall be determined from the nominal outside diameter of the conductor and the nominal insulation thickness (see table VI). For parallel cables, the nominal outside diameter shall be the major axis.

4.7.9 Marking durability. A short specimen of finished wire or sheath shall be firmly clamped in a horizontal position with its upper longitudinal surface area freely exposed. A small steel mandrel.025 inch diameter (0.625mm) ±.001 inch (.0254mm) shall be repeatedly rubbed over the insulation surface at the stripe so that the longitudinal axis of the mandrel and specimen will be at right angles to each other. A weight shall be affixed to the jig holding the rubbing mandrel so that the combined jig and weight exerts a 500-gram thrust normal to the insulation surface. A motor-driven reciprocating cam mechanism and counter shall be used to permit an accurately measured number of abrasion strokes. The length of stroke in one direction shall be .375 inch (9.53mm) and the frequency of strokes shall be 120 strokes per minute (each stroke consisting of a 180° rotation of the eccentric drive mechanism). The direction of motion shall be along the axis of the wire or cable jacket and perpendicular to the axis of the mandrel. This procedure shall be repeated on one additional specimen selected at least 50 feet away from the previous specimen.

4.7.10 Polyethylene shrink-back. A 7-inch long specimen shall be cut from the insulated conductor. Shield and color coding braid, tape, or jacket shall be removed. The specimen shall then be cut to 6 inches (152.4mm) with the conductor flush with the insulation. The specimen shall then be air oven aged at 85± 1°C for 24 hours ± .5 hour. The specimen shall then be removed and allowed to cool to room temperature. The amount the conductor extends beyond the insulation shall be measured at each end and the insulation shall be examined for splitting or cracking.

4.7.11 Polyamide heat stability.

4.7.11.1 Polyamide coating over the primary insulation. A 1-foot specimen shall be bent around a metal mandrel six times the outside diameter of the specimen for two turns and taped down on its ends. The specimen and the mandrel shall be placed in a gravity convection type oven at a temperature of 93.3± 2.9°C for 24 hours. Remove the specimen and mandrel from the oven and cool them in a silica gel desiccator or equivalent until they return to room temperature (1 hour minimum). Remove them from the desiccator, straighten the specimen and inspect for tears or cracks in the material.

4.7.11.2 Polyamide coating under or over component shield. A sufficient length of specimen shall be used to ensure at least six close turns when bent on a metal mandrel, six times the outside diameter of the specimen. Each turn shall be in contact with the next. The ends of the specimen shall be taped together so that the turns are held in place on the mandrel. The mandrel and specimen shall be suspended in a gravity convection oven at the temperature of 148.9± 2.8°C for 15 minutes. The specimen and mandrel shall be removed from the oven and cooled in a silica gel desiccator or equivalent until the specimen is at room temperature (1 hour minimum). Remove them from the desiccator, unwrap the coils, and inspect for tears or cracks in the material.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The cables covered by this specification are intended for use by the Armed Services in extensive electrical and electronic applications. The cables may be used to transmit power, synch pulses, data transmission voltages, broadband, audio, or control power. The shielded cables are suitable for radio-frequency use in limited applications. A tough and flexible jacket is essential because the cables will be subjected to extreme mechanical abuse and extreme humidity and temperature conditions. Cables designated for light, medium, and heavy-duty are for use as indicated in 6.1.1 through 6.1.3.

6.1.1 Light-duty (L) cables. Light-duty cables are intended for use in test equipment in short lengths, or for interconnection of major components. They are intended to withstand severe flexing and frequent manipulation. Light-duty cables should not be used where they will be stepped on, run over by vehicles, beaten, or subjected to severe impacts. Light-duty cables are suitable for lightweight portable tools or small motor and generator leads where flexibility rather than long life is essential.

6.1.2 Medium-duty (M) cables. Medium-duty cables are intended to withstand the same usage as heavy duty cables except they should not be used where they will be run over by vehicles or subjected to severe impacts. They are intended to be a substitute for all uses of heavy-duty cables when the reduction in weight would be advantageous to the equipment they are used in. Medium-duty cables are suitable for small portable tools, sound equipment, radio receivers, and motor leads, which do not require the heavier, sturdier, heavy-duty cables.

6.1.3 Heavy-duty (H) cables. Heavy-duty cables are intended for use where they will be subjected to extreme service impacts or will be run over by heavy vehicles, such as trucks, tanks, or the like. They are designed to withstand severe flexing and mechanical abuse over long periods of time without deterioration. Heavy-duty cables are suitable for portable tools, extension lamps, charging cables, and control cables.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.

b. The specific issue of individual documents referenced (see 2.2.1 and 2.3).

c. Complete type designation (see 1.2.1).

d. Lengths required.

e. Packaging requirements (see 5.1).

6.3 Definitions.

6.3.1 Insulated conductor. A conductor consists of a stranded wire, with insulating covering, suitable for carrying an electric current.

6.3.2 Equipment ground wire. An insulated conductor (green) intended for grounding non-current-carrying metal parts of equipment.

6.3.3 Wire. A single metallic conductor of stranded construction designed to carry current in an electrical circuit.

6.3.4 Uninsulated ground drain wires. The cover for uninsulated ground drain wires are covered with a non-insulating material, and should not be confused with the green insulated conductor used in portable power cables as the equipment ground conductor (see 6.3.2). These uninsulated ground drain wires are used in heavy duty outdoor and mine cables.

6.4 Disposal. Caution should be taken during handling and disposal of all insulating and jacketing materials in accordance with ASTM C930 and FED-STD-313.

6.5 Subject term (key word) listing.

Extra flexible
Fillers and binders
Ground drain
Heavy duty
Hot creep
Light duty
Medium duty
Semi flexible
Separators

6.6 Environmentally preferable material. Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website at http://www.epa.gov/osw/hazard/wastemin/priority.htm. Included in the list of 31 priority chemicals are cadmium, lead, and mercury. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

6.7 Environmental. Environmental pollution prevention measures are contained in the packaging material specifications referenced herein. Refer to material specifications or preparing activity for recommended disposability methods.

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

APPENDIX A

PROCEDURE FOR TESTING INSULATING AND JACKETING COMPOUNDS
TYPE TPE-O AND TPE-S (LOW TEMPERATURE)

A.1 SCOPE

A.1.1 Scope. This appendix details the procedure for testing samples of insulating and jacketing compounds for both low temperature, heat and ozone resistant, olefinic thermoplastic elastomer (TPE-O) and low temperature, heat and ozone resistant, styrenic thermoplastic elastomer (TPE-S). This appendix is a mandatory part of the specification. The information contained herein is intended for compliance only.

A.2 APPLICABLE DOCUMENTS

A.2.1 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise indicated, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM D624	-	Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

(Copies of this document are available from http://www.astm.org or from the ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

A.3 PHYSICAL PROPERTY REQUIREMENTS

	TPE-O	TPE-S
Unaged		
Tensile strength, minimum psi	1,000	1,000
Elongation, minimum%	250	250
Tear strength, minimum lb/in, using ASTM D624, die C	150	150
Tensile strength at 100% modulus, minimum psi	200	200
* Air oven aging, 168 hours ± 1 hour at 136±1°C:		
Tensile strength retention, minimum %	80	80
Elongation, minimum % of original	65	65
* Oil immersion (ASTM # 2 oil), 18 hours ± 0.5 hour at 121±1°C (jacket only):		
Tensile strength retention, minimum %	75	75
Elongation, minimum % of original	75	75
Ozone resistance (after air-oven conditioning).		
168 ± I hour in ozone (jacket only) at 50°C	No cracking	No cracking
Brittleness temperature:		
Unaged, maximum °C	-55	-55
Aged, maximum °C	-55	-55
Maximum torsional stiffness ratio:	10	10
Cold tension recovery (minimum % at -55°C):	TBD	TBD

* In lieu of doing performance tests, supplier may also provide a certificate of compliance in accordance with UL 1581 if it conforms to the values specified in this appendix.

INSULATING AND JACKETING COMPOUND PHYSICAL AND MATERIAL REQUIREMENTS

B.1 SCOPE

B.1.1 Scope. This appendix contains detailed requirements for insulating and jacketing compounds. The requirements shown may be verified using test procedures from a nationally recognized standards organization such as ASTM, etc. This Appendix is a mandatory part of the specification. The information contained herein is for compliance only.

TABLE B-I. Insulating and jacketing compound designators.

DESIGNATOR	DESCRIPTION	PHYSICAL PROPERTY REQUIREMENTS
IS	MEDIUM LOW TEMPERATURE, STYRENE BUTADIENE RUBBER (SBR)	B.2.1
IS-L	LOW TEMPERATURE, HEAT RESISTANT STYRENE BUTADIENE RUBBER (SBR)	B.2.2
IR	LOW TEMPERATURE, NATURAL RUBBER	B.2.3
IL	LOW TEMPERATURE, NATURAL RUBBER DEPOSITED FROM A RUBBER LATEX COMPOUND	B.2.4
IH	LOW TEMPERATURE, HEAT AND OZONE RESISTANT, ETHYLENE-PROPYLENE RUBBER (EPM) OR ETHYLENE-PROPYLENE-DIENE RUBBER (EPDM)	B.2.5
IE	POLYETHELYNE, LOW DENSITY, CRACK RESISTANT, HIGH FREQUENCY DIELECTRIC IN NATURAL COLORS, MELT INDEX 0.4 MAX.	B.2.6
TPE -S	LOW TEMPERATURE HEAT AND OZONE RESISTANT, STYRENIC THERMOPLASTIC ELASTOMER	B.2.7
TPE-O	LOW TEMPERATURE WEATHER RESISTANT, OLEFINIC THERMOPLASTIC ELASTOMER	B.2.8
JS-L	LOW TEMPERATURE, HEAT RESISTANT, STYRENE- BUTADIENE RUBBER	B.2.9
JR	LOW TEMPERATURE NATURAL RUBBER	B.2.10
JN(CR)	MODERATE LOW TEMPERATURE CHLOROPRENE RUBBER (CR)	B.2.11
JN-L(CR)	LOW TEMPERATURE CHLOROPRENE RUBBER	B.2.12
JH	LOW TEMPERATURE, HEAT AND WEATHER RESISTANT, ETHYLENE – PROPYLENE (EPM), OR ETHYLENE-PROPYLENE-DIENE RUBBER (EPDM)	B.2.13
JU	LOW TEMPERATURE HEAT AND WEATHER RESISTANT, POLYURETHANE THERMOPLASTIC ELASTOMER	B.2.14
JN	MODERATE LOW TEMPERATURE, CHLORINATED POLYETHYLENE RUBBER (CM)	B.2.15
JN-L	LOW TEMPERATURE, CHLORINATED POLYETHYLENE RUBBER (CM)	B.2.16

B.2 PHYSICAL PROPERTY REQUIREMENTS

B.2.1 Insulating compound, type IS, medium low temperature styrene butadiene rubber (SBR).

	Walls 6 to 20 mils thick	Walls over 20 mils thick
Unaged:		
Tensile strength, minimum psi	450	600
Elongation, minimum %	200	250
Set, maximum, inch	.500	.500
After 95 ± ½ hour oxygen bomb aging at 70°C:		
Tensile strength, minimum % of original	75	75
Elongation, minimum % of original	65	65
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 100°F	no visible cracks	no visible cracks
Brittleness temperature, unaged, max, °C	-40	-40
After aging, max °C	-40	-40

B.2.2 Insulating compound, type IS-L, low temperature, heat resistant styrene butadiene rubber (SBR).

	Walls 6 to 20 mils thick	Walls over 20 mils thick
Unaged:		
Tensile strength, minimum psi	450	600
Elongation, minimum %	200	250
Set, maximum, inch	.375	.375
After 168 ± 1 hour oxygen bomb aging at 80°C:		
Tensile strength, minimum % of original	50	50
Elongation, minimum % of original	50	50
After 20 ± ½ hour air pressure aging at 127 ± 2°C:		
Tensile strength, minimum % of original	50	50
Elongation, minimum % of original	50	50
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 100°F	no visible cracks	no visible cracks
Brittleness temperature, unaged, max. °C	-55	-55
After aging, max. °C	-55	-55
Torsional stiffness, maximum ration at -55°C	10°	10°

B.2.3 Insulating compound, type IR, low temperature, natural rubber.

	Walls 6 to 20 mils thick	Walls over 20 mils thick
Unaged:		
Tensile strength, minimum psi	800	1200
Elongation, minimum %	300	400
Set, maximum, inch	.375	.125
After 95 ± ½ hour oxygen bomb aging at 70°C:		
Tensile strength, minimum % of original	75	75
Elongation, minimum % of original	75	75
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 100°F	no visible cracks	no visible cracks
Brittleness temperature, unaged, max.°C	-55	-55
After aging, max.°C	-55	-55

B.2.4 Insulating compound, type IL, low temperature, natural rubber deposited from a rubber latex compound.

Unaged:	
Tensile strength, minimum psi	3000
Elongation, minimum %	650
Set, maximum, inch	.063
After 95 ± 1 hour oxygen bomb aging at 70°C:	
Tensile strength, minimum % of original	70
Elongation, minimum % of original	70
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 100°F	no visible cracks
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55

B.2.5 Insulating compound, type IH, low temperature, heat and ozone resistant ethylene-propylene rubber (EPM) or ethylene-propylene-diene rubber (EPDM).

Unaged:	
Tensile strength, minimum psi	800
Elongation, minimum %	250
Set, maximum, inch	.375
Tensile stress at 200% elongation, minimum psi	200
After 168 ± 1 hour oxygen bomb aging at 80°C:	
Tensile strength, minimum % of original	90
Elongation, minimum % of original	75
After 20 ± 1/2 hour air pressure aging at 127°C:	
Tensile strength, minimum % of original	90
Elongation, minimum % of original	75
Oven aging at 121°C:	
Tensile strength, minimum % of original	85
Elongation, minimum % of original	75
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 120°F	no visible cracks
Brittleness temperature, unaged, max.°C	-55
After aging, max °C	-55
Torsional stiffness ratio, maximum, at -55°C.	5
Torsional modulus, maximum psi, at -55°C.	900
Cold tension recovery, minimum %, at -55°C.	10

B.2.6 Insulating compound, type IE, polyethylene, low density, crack resistant, high frequency dielectric in natural colors, melt index 0.4 max.

Unaged:	
Tensile strength, minimum psi	1400
Elongation, minimum %	400
After 48 ± 1/2 hour air oven aging at 99 ± 1°C:	
Tensile strength, minimum % of original	75
Elongation, minimum % of original	75
After 24 ± 1/2 hour air oven aging at 99 ± 1°C:	
Insulation shrink back	No splitting or cracking
Maximum inch	.063
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55

B.2.7 Insulating and jacketing compound, type TPE-S low temperature, heat and ozone resistant, styrenic thermoplastic elastomer.

Unaged:	
Tensile strength, minimum psi	1300
Elongation, minimum %	400
Tear strength, minimum lb-in	160
Tensile strength at 200% modulus, minimum psi	250
Tensile strength at 400% modulus, minimum psi	500

B.2.8 Insulating and jacketing compound, type TPE-O low temperature, weather resistant, olefinic thermoplastic elastomer.

Unaged:	
Tensile strength, minimum psi	1140
Elongation, minimum %	700
Set, maximum inch	.250
Tensile strength at 100% modulus, minimum psi	640
Tensile strength at 300% modulus, minimum psi	870
Tear strength, lb-in	195.5

B.2.9 Jacketing compound, type JS-L low temperature, heat resistant, styrene butadiene rubber.

Unaged:	
Tensile strength, minimum psi	1500
Elongation, minimum %	300
Set, maximum inch	.375
Tensile stress, (200% elongation, minimum psi)	300
Tear resistance, minimum lb-in	25
After 95 ± ½ hour oxygen bomb aging at 70°C:	
Tensile strength, minimum % of original	75
Elongation, minimum % of original	65
After 168 ± 1 hour air oven aging at 70°C:	
Tensile strength, minimum % of original	75
Elongation, minimum % of original	65
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 100°F	no visible cracks
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55
Torsional stiffness ratio, max	10
Cold tension recovery, minimum % at -55°C	20

B.2.10 Jacketing compound, type JR low temperature, natural rubber.

Unaged:	
Tensile strength, minimum psi	2000
Elongation, minimum %	350
Set, maximum inch	.250
After 95 ± ½ hour oxygen bomb aging at 70°C:	
Tensile strength, minimum % of original	65
Elongation, minimum % of original	65
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 100°F	no visible cracks
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55

B.2.11 Jacketing compound, type JN moderate low temperature, chloroprene rubber (CR).

Unaged:	
Tensile strength, minimum psi	1800
Elongation, minimum %	300
Set, maximum inch	.375
Tensile stress, (200% elongation, minimum psi)	500
After 95 ± ½ hour oxygen bomb aging at 70°C:	
Tensile strength, minimum % of original	75 (but not less than 1600 psi)
Elongation, minimum % of original	65 (but not less than 250 psi)
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 120°F	no visible cracks
Brittleness temperature, unaged, max.°C	-40
After aging, max.°C	-40
After oil immersion:	
Tensile strength, minimum % of original	60
Elongation, minimum % of original	60

B.2.12 Jacketing compound, type JN-L low temperature, chloroprene rubber (CR).

Unaged:	
Tensile strength, minimum psi	1500
Elongation, minimum %	300
Set, maximum inch	.375
Tensile stress, (200% elongation, minimum psi)	500
Tear resistance, minimum lb-in	20
After 95 ± ½ hour oxygen bomb aging at 70°C:	
Tensile strength, minimum % of original	75
Elongation, minimum % of original	75
After 168 ± 1 hour air oven aging at 70°C:	
Tensile strength, minimum % of original	80
Elongation, minimum % of original	80
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 120°F	no visible cracks
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55
Torsional stiffness ratio, max	30
After oil immersion:	
Tensile strength, minimum % of original	60
Elongation, minimum % of original	60

B.2.13 Jacketing compound, type JH low temperature, heat and weather resistant, ethylene-propylene (EPM), or ethylene-propylene-diene rubber (EPDM).

Unaged:	
Tensile strength, minimum psi	1600
Elongation, minimum %	400
Set, maximum inch	.375
Tensile stress, (200% elongation, minimum psi)	300
Tear resistance, minimum lb-in	25
After 168 ± 1 hour air oven aging at 121°C:	
Tensile strength, minimum % of original	85
Elongation, minimum % of original	80
After 168 ± 1 hour oxygen bomb aging at 80°C:	
Tensile strength, minimum % of original	85
Elongation, minimum % of original	70
After 20 ± 1 hour air pressure aging at 127°C:	
Tensile strength, minimum % of original	85
Elongation, minimum % of original	80
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 120°F	no visible cracks
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55
Torsional stiffness ratio, max	10
Cold tension recovery, minimum	10
Torsional modulus at -55°C maximum psi	2000

B.2.14 Jacketing compound, type JU low temperature, heat and weather resistant, polyurethane thermoplastic elastomer.

Unaged:	
Tensile strength, minimum psi	3500
Elongation, minimum %	550
Set, maximum inch	.250
Tensile stress, (100% elongation, minimum psi)	550
Tensile stress, (300% elongation, maximum psi)	1000
Tear resistance, minimum lb-in	90
Durometer, “A” maximum points	82
After 20 ± 1 hour air pressure aging at 127°C:	
Tensile strength, minimum % of original	50
Elongation, minimum % of original	50
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 120°F	no visible cracks
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55
Torsional stiffness ratio, max	35
Torsional modulus at -55°C maximum psi	20,000

Hydrolytic stability:	
Tensile strength, minimum % of original	50
Elongation, minimum % of original	70
Durometer “A”, maximum points change	8

B.2.15 Jacketing compound, type JN moderate low temperature, chlorinated polyethylene rubber (CM).

Unaged:	
Tensile strength, minimum psi	1800
Elongation, minimum %	300
Set, maximum inch	.375
Tensile stress, (200% elongation, minimum psi)	500
After 95 ± ½ hour oxygen bomb aging at 70°C:	
Tensile strength, minimum % of original	75 (but not less than 1600 psi)
Elongation, minimum % of original	65 (but not less than 250 psi)
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 120°F	no visible cracks
Brittleness temperature, unaged, max. °C	-40
After aging, max. °C	-40
After oil immersion:	
Tensile strength, minimum % of original	60
Elongation, minimum % of original	60

B.2.16 Jacketing compound, type JN-L low temperature, chlorinated polyethylene rubber (CM).

Unaged:	
Tensile strength, minimum psi	1500
Elongation, minimum %	300
Set, maximum inch	.375
Tensile stress, (200% elongation, minimum psi)	500
Tear resistance, minimum lb-in	20
After 95 ± ½ hour oxygen bomb aging at 70°C:	
Tensile strength, minimum % of original	75
Elongation, minimum % of original	75
After 168 ± 1/2 hour air oven aging at 70°C:	
Tensile strength, minimum % of original	80
Elongation, minimum % of original	80
Ozone resistance (after air oven conditioning and 168 ± 1 hour in ozone) at 120°F	no visible cracks
Brittleness temperature, unaged, max. °C	-55
After aging, max. °C	-55
Torsional stiffness ratio, max	30
After oil immersion:	
Tensile strength, minimum % of original	60
Elongation, minimum % of original	60

TABLE B-II. Insulation for cables rated 0 through 2000 volts physical and aging requirements.

Physical Requirements	
Tensile strength, minimum	1800 psi, 12.5 MPa
Elongation at rupture, minimum %	250
Aging Requirements	
After Air Oven Test @ 121°C ± 1°C for 168 hours	
Tensile Strength and Elongation at Rupture, Minimum % of Unaged Value	75
After Hot Creep Test at 150°C ± 2°C, Filled	
Hot Creep Elongation, Maximum % 1/	175
Hot Creep Set, Maximum % 1/	10
After Hot Creep Test at 150°C± 2°C, Unfilled	
Hot Creep Elongation, Maximum % 1/	100
Hot Creep Set, Maximum % 1/	5

1/ If this value is exceeded, the solvent exception test may be performed and will serve as a referee method to determine compliance (maximum percent after 20 hours drying time – 30).

CONCLUDING MATERIAL

Custodians:
Army – CR
Navy - AS
Air Force-85
DLA-CC

Preparing activity:
DLA – CC

(Project 6145-2009-045)

Review activity:
Army – EA

NOTE: The activities listed above were interested in this document as of the date of this document. Since organization and responsibilities can change, please verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil.