

MIL-C-15479C(SHIPS)  
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SUPERSEDING  
MIL-C-15479B(SHIPS)  
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MILITARY SPECIFICATION  
CABLES, POWER, ELECTRICAL,  
SUBMARINE, NAVY STANDARD HARBOR DEFENSE

1. SCOPE

1.1 Scope. - This specification covers standard submarine cables for use in harbor defense systems. These cables are intended for use as loop, signal, control and hydrophone links between components of water stations and between water stations and shore stations.

1.2 Classification. - Standard submarine cables shall be of the following types, as specified (see 6.1):

- Type 201 - Single conductor armored coaxial signal cable.
- Type 203 - Three conductor armored magnetic loop tail cable.
- Type 204 - Four conductor armored lateral or main hydrophone cable.
- Type 210 - Ten conductor armored herald control and magnetic loop control cable.
- Type 216 - Sixteen conductor armored main hydrophone cable.

2. APPLICABLE DOCUMENTS

2.1 The following specifications, standards and drawings, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

- L-P-590 - Plastic Compound, Molding and Extrusion, Polyethylene.
- QQ-W-461 - Wire, Steel (Carbon); Bare and Zinc Coated.

MILITARY

- MIL-C-17 - Cables, Radio Frequency; Coaxial, Dual Coaxial, Twin Conductor, and Twin-Lead.
- MIL-C-915 - Cable, Cord and Wire, Electrical (Shipboard Use).

NAVY DEPARTMENT

General Specifications for Inspection of Material.

STANDARDS

MILITARY

- MIL-STD-104 - Limits for Electrical Insulation Color.

DRAWINGS

BUREAU OF SHIPS

- RE-10D724 - Reel, Steel Cable.

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

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2.2 Other publications. - The following document forms a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply:

**A. S. T. M. STANDARDS**

Designation B8-41 - Untinned Copper Wire.

(Application for copies should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.)

**3. REQUIREMENTS**

3.1 Material. - The material shall be as specified in the applicable paragraphs of Specification MIL-C-17, the American Society for Testing Materials Standards, and as specified herein.

3.2 Conductor wire. - All individual conductors shall meet the requirements of the American Society for Testing Materials Designation D8-41 for untinned copper wire. When repairs or joints are made in the conductor, the work shall be so performed that the joint and adjacent conductor is as strong and durable, electrically and mechanically as the original wire. The wire size of individual strands shall be within plus or minus 0.002 inch.

3.3 Conductor insulation. - All individual conductors shall be insulated with dielectric material conforming to Specification L-P-590. Unless colored material is required herein, the dielectric shall conform to type II, grade 4 of Specification L-P-590. When colored material is required herein, the dielectric shall conform to type II, grade 5 of Specification L-P-590. The insulating compound shall fit closely to the conductor with a pronounced adhesion which shall not prevent stripping the insulation when splicing.

3.3.1 All individual insulated conductors of the specified types, when tested under the conditions specified in section 4, shall withstand the voltage shown in table I. Either alternating current (a. c.) or direct current (d. c.) voltage may be used for all voltage tests at the option of the person making the test. The voltage source shall deliver the specified voltage under load.

Table I - Test-voltages.

Type	Volts a. c. root mean square (r. m. s.)	Volts d. c.
201	15,600	48,800
203	9,200	27,600
204	5,000	15,000
210	5,000	15,000
216	5,000	15,000

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3.3.2 The conductor resistance, when tested in accordance with section 4, shall conform to the limits per 1000 feet shown in table II.

Table II - Conductor resistance.

Type	Maximum d.c. conductor resistance ohms per 1000 feet at 25° Centigrade (C.)
201	0.68
203	1.00
204	2.52
210	2.52
216	2.52

3.3.3 Insulation resistance. - The insulation resistance of the individual insulated conductors and of the completed cable shall be at least 10,000 megohms per 1000 feet at 60° Fahrenheit (F.), when tested as specified in 4.5.7.

3.4 Fillers. - Where specified, fillers or filaments shall be cabled with the insulated conductors to form a firm, well-rounded cross-section. The filaments shall consist of a material such as that used for conductor insulation, and shall be completely noncontaminating to the materials used for conductor insulation (see 3.3), tapes (see 3.6), and inner jacket (see 3.7) with respect to undesirable electrical, mechanical, or chemical effects.

3.4.1 Fillers for watertight construction. - In addition to the fillers specified in 3.4, all cables shall contain sealing compounds to provide watertight construction within the limits specified in the appendix to Specification MIL-C-915, except that the maximum acceptable limits shall be 1 cubic inch for types 204, 210, and 216 and 3 cubic inches for types 201 and 203. The sealing compounds shall not have any deleterious effects on the electrical, physical, or chemical properties of the conductors, conductor insulation, tapes, or inner jacket.

3.5 Color coding. - All insulated conductors shall be color coded in accordance with Standard MIL-STD-104 and with the further stipulations of this specification.

3.6 Tapes. - Where specified, a tape shall be applied helically to the cable with an overlap of approximately 20 percent of the width of the tape which shall prevent deleterious effect due to possible migration of the plasticizer from the synthetic resin jacket and shall have sufficient mechanical strength to maintain a firm well-rounded core.

3.6.1 Marker tape. - A continuous heat and moisture resistant marker tape, approximately 1/8 to 1/4 inch wide, shall be inserted between the tape and inner synthetic resin jacket of each cable and shall repeat the following information at approximately 1-foot intervals: Navy type number of cable, manufacturer's name and plant location, contract number, serial number, and year of manufacture.

3.7 Inner jacket. - A jacket of type I synthetic resin, conforming to Specification MIL-C-17, or equivalent, shall be applied over the taped core.

3.8 Armor wire. - Armor wire shall be galvanized steel wire with a tensile strength between 50,000 and 70,000 pounds per square inch (p.s.i.) and an elongation of not less than 10 percent in 10 inches after application to the cable. The zinc coating shall be in accordance with type 3 of Specification QQ-W-461.

3.8.1 The permissible variations over or under the specified nominal diameter of the armor wire shall be 0.004 inch.

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3.8.2 The armor wire shall be capable of withstanding not less than 35 twists in a length equivalent to 100 diameters. The twist shall be in a plane perpendicular to the longitudinal wire axis and the twist shall be at a rate of 90 degrees per second.

3.8.3 Armor wire shall be applied to the cable helically with an even tension and a left hand lay at an angle of approximately 20 degrees and the number of wires shall be such as to insure approximately 95 percent coverage at the pitch circumference of the armor where the pitch diameter is equal to the outer diameter of the inner cable jacket plus the diameter of the armor wire. The wire shall be so preformed that it will remain in proper position and permit maximum flexibility of the finished cable. All armor wire joints shall be welded and thoroughly cleaned after welding and coated with zinc. Joints so treated shall be capable of meeting all requirements specified for the original wire.

3.9 Outer jackets. - A jacket of type I synthetic resin, conforming to Specification MIL-C-17, shall be applied over the armor. It shall not be tubed, but shall fit the form of the armor as closely as possible and shall have a smooth outer surface.

3.10 Mechanical requirements. - All cables shall meet the applicable requirements of Specification MIL-C-17, when tested under conditions specified in section 4.

3.10.1 All cables shall be capable of bending without injury about a mandrel 30 inches in diameter to permit processing by cable handling equipment aboard the cable laying vessel.

3.11 Minimum manufactured lengths. - All insulated conductors and jacketed cores shall be manufactured in continuous integral multiples of cable lengths specified (see 5.1.1).

3.12 Splicing. - If the contract or order provides for cable to be spliced at the place of manufacture before shipment, either before or after armoring, the order in which the lengths are to be spliced together and the arrangement of the conductors in the splice shall be determined from a splicing diagram which shall be furnished to the contractor by the bureau or agency concerned or by the Government inspector. All splices shall be made in accordance with this splicing diagram.

3.12.1 Methods of splicing. - On all cable splices made by the manufacturer, the conductors shall be butt brazed or soldered. The splices shall be so made that all parts affected in the process shall be as strong and durable, electrically and mechanically, as the remainder of the cable.

3.12.2 Armor splicing. - On cable spliced after armoring, the armor splice may be made by laying back the wire in its original position and electrically butt welding as specified in 3.12.1 to form a complete splice, or the armor wires may be laid back in position one at a time parallel with the splice. As an armor wire from one side is brought into position, one from the opposite side shall be laid in place beside it, so that they will interlock in the center of the splice. Care shall be taken to remove the sharp bend at the temporary serving. The wire shall be evenly distributed around the splice and squeezed into position, if necessary, with cable splicing clamps to form a smooth round splice, as small in diameter as possible. Place a serving of 10 turns of 0.134 inch diameter galvanized iron serving wire around the center of the splice, drawing it as tightly as possible with the serving stick. On each side of this serve, select four armor wires (six if the armor is light) spaced equidistantly around the splice, bend them back over the center serving, and hammer and squeeze them down snugly with the other armor wires to form an interlocking joint. Serve the balance of the splice with 0.134 inch diameter galvanized iron serving wire, drawn as tightly as possible with the serving stick. If the armor is smaller than 0.134 inch diameter, the serving wire shall be of the same diameter as the armor. To start the serving, loop the serving wire around one of the armor wires and lay the end parallel with the armor so that it will project beyond the farther end of the serving. When the serve is completed, the two ends of the serving wire shall be twisted together for 1 inch and hammered down parallel with the serve. Start each serving as close as possible to the center serving, and serve towards the ends of the splice. The final turn shall be made and secured about 1 inch before the end of the jacket is reached, taking care that the armor wires do not injure the jacket while serving.

3.12.3 The serving stick or device used shall be so constructed that it does not materially injure the galvanized coating of the serving or armor wire during the serving operation.

3.12.4 A consecutive number will be assigned for each splice on the splicing diagram. Each splice shall be marked in duplicate with this number by means of bands of iron wire placed on the cable at points 3 feet from each end of each splice, except where it interferes with the extrusion of the outer jacket. The number of turns of iron wire so placed shall coincide with the number of the splice. In order to facilitate counting, the turns shall be applied in groups of five turns with a 1-inch spacing between groups, example: Splice No. 12 would consist of two bands of five turns each and one band of two turns.

3.12.5 After completing the splice of the inner jacket, the splice shall be tested in accordance with 4.5.6.

### 3.13 Type 201 - single conductor armored coaxial signal cable. -

3.13.1 The inner conductor shall be approximately No. 8 AWG, 7 strand, untinned copper wire, meeting the requirements of 3.2. Each strand shall be 0.049 inch in diameter.

3.13.2 The inner conductor shall be insulated as specified in 3.3, and the average diameter of the insulated conductor shall be not less than 0.460 inch and the minimum wall thickness shall be not less than 0.141 inch.

3.13.3 A shielding braid of approximately No. 28 AWG (0.0128 inch diameter) untinned copper wire shall be applied over the insulated conductor with a minimum braid angle of 35 degrees and a minimum coverage of 88 percent.

3.13.4 A tape shall be applied over the copper shield in accordance with 3.6.

3.13.5 A synthetic resin jacket, as specified in 3.7, shall be applied over the taped core, the average outer diameter of which shall be  $0.749 \pm 0.015$  inch and the minimum wall thickness shall be 0.093 inch.

3.13.6 An armor of galvanized steel wire, as specified in 3.8, 0.134 inch in diameter, shall be applied over the inner jacket.

3.13.7 A synthetic resin jacket, as specified in 3.9, with a total wall thickness at any point about the circumference of the cable of not less than 0.1575 (12/64) inch shall be applied over the armor. The wall thickness shall be measured from the outer surface of the armor wire to the outer surface of the outer jacket along a cable radius passing through the diameter of an armor wire. The maximum outer diameter of the finished cable shall not exceed 1.465 inches.

### 3.14 Type 203 - Three conductor armored magnetic loop tail cable. -

3.14.1 The three conductors shall be approximately No. 10 AWG, 7 strand, untinned copper wire, meeting the requirements of 3.2. Each strand shall be 0.040 inch in diameter.

3.14.2 Each conductor shall be insulated as specified in 3.3, the average diameter of each insulated conductor shall be not less than 0.304 inch and the minimum wall thickness of insulation shall be not less than 0.083 inch.

3.14.3 A minimum of three filaments in accordance with 3.4 and the three insulated conductors shall be laid up spirally with a right hand lay to form a firm, well-rounded core.

3.14.4 The insulated conductors shall be color coded in accordance with 3.5 as follows:

Core - Black, white, red.

3.14.5 A tape shall be applied over the core in accordance with 3.6.

3.14.6 A synthetic resin jacket, as specified in 3.7, shall be applied over the taped core, the average outer diameter of which shall be  $0.885 \pm 0.015$  inch and the minimum wall thickness shall be 0.093 inch.

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3.14.7 An armor of galvanized steel wire, as specified in 3.8, 0.134 inch in diameter shall be applied over the inner jacket.

3.14.8 A synthetic resin jacket, as specified in 3.9, with a total wall thickness at any point about the circumference of the cable of not less than 0.1875 (12/64) inch shall be applied over the armor. The wall thickness shall be measured from the outer surface of the armor wire to the outer surface of the outer jacket along a cable radius passing through the diameter of an armor wire. The maximum outer diameter of the finished cable shall not exceed 1.602 inches.

3.15 Type 204 - four conductor armored lateral or main hydrophone cable. -

3.15.1 The four conductors shall be approximately No. 14 AWG, 7 strand untinned copper wire meeting the requirements of 3.2. Each strand shall be 0.0253 inch in diameter.

3.15.2 Each conductor shall be insulated as specified in 3.3, the average diameter of each insulated conductor shall be not less than 0.176 inch and the minimum wall thickness shall be not less than 0.043 inch.

3.15.3 The four insulated conductors, with filaments in accordance with 3.4, if necessary, shall be laid up spirally with a right hand lay to form a firm, well-rounded core.

3.15.4 The insulated conductors shall be color coded in accordance with 3.5 as follows:

Core - Black, white, red, green.

3.15.5 A tape shall be applied over the core in accordance with 3.6.

3.15.6 A synthetic resin jacket, as specified in 3.7, shall be applied over the taped core, the average outer diameter of which shall be  $0.655 \pm 0.015$  inch and the minimum wall thickness shall be 0.093 inch.

3.15.7 An armor of galvanized steel wire, as specified in 3.8, 0.109 inch in diameter shall be applied over the inner jacket.

3.15.8 A synthetic resin jacket, as specified in 3.9, with a total wall thickness at any point about the circumference of the cable of not less than 0.1875 (12/64) inch shall be applied over the armor. The wall thickness shall be measured from the outer surface of the armor wire to the outer surface of the outer jacket along a cable radius passing through the diameter of the armor wire. The maximum outer diameter of the finished cable shall not exceed 1.321 inches.

3.16 Type 210 - ten conductor armored herald control and magnetic loop control cable. -

3.16.1 The 10 conductors shall be approximately No. 14 AWG, 7 strand, untinned copper wire, meeting the requirements of 3.2. Each strand shall be 0.0253 inch in diameter.

3.16.2 Each conductor shall be insulated as specified in 3.15.2.

3.16.3 A minimum of two filaments in accordance with 3.4 and two insulated conductors shall be laid up spirally with a right hand lay to form a firm, well-rounded inner core. Eight additional insulated conductors, with filaments in accordance with 3.4 if necessary, shall be laid up spirally with a left hand lay to form a firm, well-rounded outer core.

3.16.4 The insulated conductors shall be color coded in accordance with 3.5 as follows:

Core - White, black.

Outer layer - Red, green, yellow, brown, blue, orange, gray and purple  
(clockwise rotation).

3.16.5 A tape shall be applied over the outer core in accordance with 3.6.

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3.16.6 A synthetic resin jacket, as specified in 3.7 shall be applied over the taped core, the average outer diameter of which shall be  $0.935 \pm 0.015$  inch and the minimum wall thickness shall be 0.093 inch.

3.16.7 An armor of galvanized steel wire, as specified in 3.8, 0.134 inch in diameter shall be applied over the inner jacket.

3.16.8 A synthetic resin jacket, as specified in 3.9, with a total wall thickness at any point about the circumference of the cable of not less than 0.1875 (12/64) inch shall be applied over the armor. The wall thickness shall be measured from the outer surface of the armor wire to the outer surface of the outer jacket along a cable radius passing through the diameter of the armor wire. The maximum outer diameter of the finished cable shall not exceed 1.651 inches.

3.17 Type 216 - sixteen conductor armored main hydrophone cable. -

3.17.1 Each of the 16 conductors shall be approximately No. 14 AWG, 7 strand, untinned copper wire, Each strand shall be 0.0253 inch in diameter.

3.17.2 Each of the 16 conductors shall be insulated with dielectric, as specified in 3.3, to an average diameter of not less than 0.163 inch and minimum wall thickness of 0.049 inch.

3.17.3 Four insulated conductors, with filaments in accordance with 3.4, if necessary, shall be laid up spirally in a right hand lay to form a firm, well-rounded inner core.

3.17.4 The insulated conductors shall be color coded in accordance with 3.5 as follows:

Inner conductors - Black, white, red, green.

Outer conductors - Black, white, red, green, yellow, brown, blue, orange, gray, purple, tan and pink (clockwise rotation).

3.17.5 A tape shall be applied over the core formed by the four inner insulated conductors. A shielding braid of No. 28 AWG (0.0128 inch diameter) untinned copper wire shall be applied over the taped core with a minimum braid angle of 35 degrees and a minimum coverage of 88 percent.

3.17.6 A tape shall be applied over the shielding braid in accordance with 3.6.

3.17.7 Twelve additional insulated conductors, with filaments in accordance with 3.4, if necessary, shall be laid up spirally with a left hand lay over the taped inner core to form a firm, well-rounded outer core.

3.17.8 A tape shall be applied over the outer core in accordance with 3.6.

3.17.9 A synthetic resin jacket, as specified in 3.7, shall be applied over the taped core, the average outer diameter of which shall be  $1.120 \pm 0.015$  inches and the minimum wall thickness shall be 0.093 inch.

3.17.10 An armor of galvanized steel wire, as specified in 3.8, 0.134 inch in diameter shall be applied over the inner jacket.

3.17.11 A synthetic resin jacket, as specified in 3.9, with a total wall thickness at any point about the circumference of the cable of not less than 0.1875 (12/64) inch shall be applied over the armor. The wall thickness shall be measured from the outer surface of the armor wire to the outer surface of the outer jacket along a cable radius passing through a diameter of an armor wire. The maximum outside diameter of the finished cable shall not exceed 1.838 inches.

3.18 Workmanship. - Workmanship shall be as specified in Specification MIL-C-17, the American Society for Testing Materials Standards and as specified herein.



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## 4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests. - The methods of sampling, inspection, and tests conducted on the cable fall within the following classifications:

- (a) Acceptance inspection.
- (b) Production inspection:
  - (1) On individual conductors.
  - (2) On completed cable.

4.2 Sampling. - For purposes of sampling for acceptance inspection the Government inspector shall select from the first 1000 feet of completed cable the number of feet, not in excess of 100 feet, (usually a 50 foot sample is sufficient) deemed necessary by the Government laboratory for the tests.

4.3 Acceptance inspection. - Acceptance inspection shall be made at a Government laboratory designated by the bureau or agency concerned on samples selected as specified in 4.2. Acceptance inspection shall consist of any tests considered necessary by the Government laboratory to determine compliance with the requirements of this specification and shall include the following tests:

<u>Test</u>	<u>Reference</u>
Armor wire	4.5.1, 4.5.1.1 and 4.5.1.2
Cable dimensions	4.5.2
Voltage	4.5.3
Conductor resistance	4.5.4
Outer jacket integrity	4.5.5
Inner jacket	4.5.6
Insulation resistance	4.5.7
Watertight construction	4.5.8
Heat aging	MIL-C-17
Cold bending	MIL-C-17
Continuity	MIL-C-17
Dielectric strength	MIL-C-17
Capacitance	MIL-C-17
Attenuation (60 c. p. s. to 100 kc.)	MIL-C-17
Impedance	MIL-C-17

4.4 Production inspection. - Production inspection specified hereinafter shall be made at the place of manufacture by or under the supervision of the Government inspector.

4.4.1 Conductor insulation. - Each completed length of insulated conductor, before the application of any covering, shall be completely immersed in fresh water at room temperature for a period of 16 hours; after which period of time and while still immersed, it shall be subjected to the following tests:

<u>Test</u>	<u>Reference</u>
Voltage	4.5.3
Conductor resistance	4.5.4
Insulation resistance	4.5.7

4.4.1.1 In addition to the tests specified in 4.4.1, the Government inspector may require any additional tests he may consider necessary to determine conformance with this specification.

4.4.1.2 Each individual length of insulated conductor that meets the specified requirements shall be accepted and each length that fails shall be rejected.



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4.4.2 Completed cable. - Each length of completed armored and jacketed cable except as specified in 4.4.2.4, shall be completely immersed in fresh water for a period of not less than 1 hour to insure complete wetting and shall then be subjected to the test specified in 4.5.4. Each length of completed armored and jacketed cable shall also be subjected to the following tests:

<u>Test</u>	<u>Reference</u>
Armor wire	4.5.1
Cable dimensions	4.5.2
Voltage	4.5.3
Conductor resistance	4.5.4
Outer jacket integrity	4.5.5
Insulation resistance	4.5.7
Watertight construction	4.5.8

4.4.2.1 In addition to the tests specified in 4.4.2, the Government inspector may require any additional tests he may consider necessary to determine conformance with this specification.

4.4.2.2 Each individual length of completed cable that meets the specified requirements of this specification shall be accepted and each length that fails shall be rejected, but may be repaired in accordance with 4.4.2.3 and retested.

4.4.2.3 Repairs. - Lengths of completed cable that fail to meet the tests specified in 4.4.2 due to a localized fault or faults may be repaired and reoffered for inspection.

4.4.2.3.1 Where repairs are made to the cable, the work shall be performed in such a manner that all parts affected in the process shall be as strong and durable electrically and mechanically as the remainder of the cable. The armor may either be spliced in accordance with 3.12 or may be laid back in its original position and electrically butt welded. If the armor is welded, the joints in the several armor strands shall be staggered over a distance of not less than 30 feet, and the welds thoroughly coated with zinc.

4.4.2.3.2 The number of repairs or splices shall not exceed one for each length of completed cable not exceeding 5000 feet in length, with one additional repair or splice permitted for each additional 5000 feet or fraction thereof, provided that no two armor splices shall be less than 1000 feet apart.

4.4.2.4 If the contract or order calls for delivery of the cable either spliced or armored in carload lengths and coiled in a car, each carload length shall be tested after loading as specified in 4.4.2 through 4.4.2.3, inclusive except that it may be tested either wet or dry.

#### 4.5 Tests. -

4.5.1 Armor wire. - The wire shall be tested in accordance with Specification QQ-W-461 to determine conformance with 3.8, and shall be subjected to coverage test to determine conformance with 3.8.3. The wire shall withstand four 1-minute dips in the Preece test.

4.5.1.1 Measurement of diameter. - Measurements shall be made to determine conformance with 3.8.1.

4.5.1.2 The wire shall be subjected to a twist test to determine conformance with 3.8.2.

4.5.2 Cable dimensions. - All dimensions of the completed cable shall be measured to determine compliance with this specification.

4.5.2.1 The average diameter of the conductor insulation and outer diameter of the inner jacket shall be taken as the mean of the maximum and minimum diameter measured at any one point.

4.5.2.2 Measurements may be made with any type of micrometer reading to 0.001 inch, suitable for measurement of conductors of this character. All measurements shall be made before the conductors are taped or cabled. If the measurements of any coil or reel do not conform to the limits specified, that coil or reel shall be rejected.

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4.5.3 Voltage test. - Unless otherwise specified in the contract or order, potentials as required by table I, shall be applied between the conductor or conductors under test for a period of 5 minutes. In the tests listed herein "ground" shall be considered the armor wires of the completed cable connected together to act as a single conductor. If a.c. potential is used, the frequency shall be not less than 25 nor more than 100 cycles per second.

<u>Type</u>	<u>Test</u>
201	(a) The specified voltage shall be applied between inner conductor and the braided shield. (b) Two thousand five hundred volts shall be applied between the shield and ground.
203, 204 and 210	(a) Alternate conductors shall be connected so as to form two groups of conductors and specified voltage shall be applied between the two groups with one group grounded. (b) The test shall be repeated with other group grounded.
218	(a) Red and black inner conductors and the black outer conductors shall be connected to form one group, and the green and white inner conductors and the colored outer conductors to form a second group. The specified voltage shall be applied between the two groups with one group grounded and connected to the braided shield. (b) The test shall be repeated with other group grounded and connected to the braided shield.

4.5.4 Conductor resistance. - The conductor resistance shall be measured to determine conformance with 3.3.2 and table II.

4.5.5 Outer jacket integrity. - The integrity of the outer jacket shall be tested by applying at least 2,500 volts a.c. (r.m.s.) or a d.c. voltage equivalent to 2,500 volts a.c. (r.m.s.) peak to peak between all the armor wires connected together and the outer jacket (the water) for a period of 5 minutes. The purpose of this test is to detect flaws and imperfections in the outer jacket.

4.5.6 Inner jacket. - The splice of the inner jacket shall be immersed in water and a voltage test applied between the insulated conductors in accordance with 4.5.3. Any splice not meeting this requirement shall be rejected.

4.5.7 Insulation resistance. - Each insulated conductor and the completed cable shall have an insulation resistance of at least 10,000 megohms per 1000 feet at 80°F., when tested with a direct current potential of not less than 200 volts applied for 1 minute.

4.5.8 Water leakage shall be measured across the area bounded by the external surface of the inner jacket of each cable type to determine conformance with 3.4.1.

#### 4.6 Test records. -

4.6.1 Acceptance report. - A complete acceptance inspection record with conclusions as to acceptability of the cable shall be prepared by the Government laboratory making the acceptance inspection and forwarded to the bureau or agency concerned for approval. A duplicate copy shall be furnished the contractor. No cable shall be considered accepted until the test record is approved by the bureau or agency concerned.

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4.6.2 Production report. - The reports of the required production inspection, in tabular form as set forth in the appendix, shall be prepared by the contractor. At least once each month, one copy of each report, for the cable manufactured during the period, shall be certified by the Government inspector and forwarded to the bureau or agency concerned. No cable shall be shipped or accepted until the required reports are approved by and certified by the Government inspector.

4.7 Inspection procedures. - For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

## 5. PREPARATION FOR DELIVERY

5.1 Shipment. - Preparation for shipment shall be as follows:

5.1.1 Lengths. - Unless otherwise specified in the contract or order, the completed cable of each type shall be delivered as specified in table III.

Table III - Minimum cable lengths harbor defense submarine cables.

Type	Minimum length	Maximum reel dimensions (Inches)	
	Feet	Flange diameter	Inside traverse
201	5,000	84	48
203	5,000	84	48
204	3,000	84	48
210	5,000	84	48
216	3,000	84	48

5.1.2 Reels. - The actual length of the cable on each reel after final inspection at the place of manufacture shall be not less than specified in the contract or order.

5.1.2.1 Steel reels. - Cable shall be furnished on a nonreturnable steel reel conforming to the requirements of Drawing RE-10D724, Rev. C, except that drum ring, part No. 3, may have dimensions of 1/4 by 1-1/2 inches or 1/2 by 1-1/2 inches.

5.1.2.2 The reel shall be plainly marked to indicate the direction in which it should be rolled so as not to loosen the cable on the reel. The head of each reel shall be stenciled or lettered with waterproof ink or paint as follows:

Contractor's name and address.  
 Name and address of consignee.  
 Contract and item number.  
 Quantity and type number of cable.  
 Reel number.  
 Net weight of cable.  
 Net weight of reel.  
 Expiration date reel returnable for credit (month-year)(as applicable).

5.1.3 Carload shipment. - When the contract or order provides for shipment of cable in one length or various lengths in carload lots, (gondola cars) the actual length or lengths of the cable after final inspection at the place of manufacture, shall be not less than specified in the contract or order. The cable shall be coiled in flat even layers, starting at the outside and working toward the center of the coil, stopping at a point where the turns will not lie flat and excessive bending will become injurious to the cable, the diameter of the inner coil being dependent on the size and type of cable being coiled. The cable shall then

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cross-over to the outside again and successive layers be made in a similar manner. The cross-overs shall be distributed so that they do not all appear on one side of the coil. Pieces of dunnage slightly thicker than the diameter of the cable shall be placed alongside the cable on each cross-over so that excessive weight will not fall on this part of the cable. The ends of the cable shall be brought out clear of the coil for testing purposes. The cable shall be properly braced with shoring and antiabrasion protection to prevent shifting. The cable shall be properly roofed in order to minimize fire hazards and other injuries to the cable. One end of each length of cable shall have a tag securely attached showing the following information:

Contractor's name and address.  
 Name and address of the consignee.  
 Contract and item number.  
 Quantity and type number of cable.  
 Net weight of cable.

5.1.4 End seals. - All cable ends shall be sealed in accordance with Specification MIL-C-915.

## 6. NOTES

6.1 Ordering data. - Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) If carload lots are desired (see 4.4.2.4 and 5.1.3).
- (d) If less than standard reel lengths are desired (see 5.1.1).

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Preparing activity:  
 Navy - Bureau of Ships

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APPENDIX  
CERTIFIED TEST REPORT

Manufacturer \_\_\_\_\_  
Contract No. \_\_\_\_\_  
Factory order No. \_\_\_\_\_

Date of inspection \_\_\_\_\_  
Date of report \_\_\_\_\_  
Cable type No. \_\_\_\_\_  
Reel No. \_\_\_\_\_

We hereby certify that the following are true and correct results of inspection tests, conducted in accordance with Specification MIL-C-15479C and applicable amendments on the cable listed above and that the results of all the production inspection tests comply in every respect with the requirements of the specification except as noted below under remarks.

I. Cable dimension (to nearest 0.001 inch)

	Minimum Specification	Actual	Maximum Specification	Actual
(a) Outer diameter of inner jacket	-----	---	-----	---
(b) Outer diameter of outer jacket	-----	---	-----	---
(c) Thickness of outer jacket	-----	---	-----	---

II. Armor wire

- (a) Tensile strength (p.s.i.) \_\_\_\_\_  
Specified minimum 50,000,  
maximum 70,000.
- (b) Elongation (percent) \_\_\_\_\_  
Specified 10 percent in  
10 inches
- (c) Preece test (No. of dips passed) \_\_\_\_\_  
Specified minimum of  
four - 1 minute dips
- (d) Coverage in percent \_\_\_\_\_  
Specified approximately 95 percent

III. Electrical tests

- (a) Voltage test, see 4.5.3 (pass or fail) \_\_\_\_\_
- (b) Conductor resistance (ohms per 1000 feet) for each conductor, see 4.5.4
- Specified \_\_\_\_\_
- Actual \_\_\_\_\_
- (c) Outer jacket integrity, see 4.5.5 (pass or fail) \_\_\_\_\_
- (d) Insulation resistance, see 4.5.7
- Specified minimum 10,000 megohms per 1000 feet \_\_\_\_\_
- Actual \_\_\_\_\_

IV. Watertight construction test

- (a) Maximum limit of water leakage \_\_\_\_\_

REMARKS

Signature \_\_\_\_\_  
(Contractor representative)

Signature \_\_\_\_\_  
(Government inspector)



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