MIL-C-19787C(OS)
29 July 1969
Superseding
MIL-C-19787B(Wep)
14 March 1960

MILITARY SPECIFICATION

CABLE, ELECTRIC, TORPEDO, 65 CONDUCTOR (FOR TORPEDO CONTROL, ELECTRIC SETTING)

This specification has been approved by the Naval Ordnance Systems Command, Department of the Navy

1. SCOPE

1.1 This specification covers the requirements for the procurement, manufacture, inspection, and testing of 65-conductor electric cables. The cables are distinguished by their miniature size, type of insulation, features of construction, and the general conditions of their service use.

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

(a) Type MSTCF 65-Conductor, Plain, Extra Thin Wall

(b) Type MSTCP 65-Conductor, Plain, Thin Wall

2. APPLICABLE DOCUMENTS

2.1 The following documents of issue in effect on the date of invitation for bids or request for proposals form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-W-00343	Wire, Electrical, Uninsulated

FSC 6145

MILITARY

MIL-C-572	Cords, Yarns and Monofilaments-Organic Synthetic Fiber
MIL-L-15016	Lubricating Oil, General Purpose
MIL-C-12000	Cable, Cord, and Wire, Electric; Packaging of

STANDARDS

FEDERAL

Fed Test Method Std No. 228	Cable and Wire, Insulated; Methods of Testing

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-831	Test Reports, Preparation of

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

3. REQUIREMENTS

3.1 Description. Electric cables covered by this specification are plain (unarmored) multiconductor, minimum diameter cables having a tough abrasion-resisting polychloroprene sheath. The cables are designed to be compatible with special type electrical connectors and therefore must be of uniform cross-sectional area and compactness throughout the manufactured length.

3.1.1 General. Electric cables covered by this specification shall be manufactured in accordance with design requirements of this specification and applicable documents listed herein.

3.1.2 Definition of terms. Unless otherwise defined herein, the technical terms used in this specification shall be as defined under "Definition of Terms" in FED-STD-228.

3.1.2.1 Manufactured length. A manufactured length is any one single length of completed cable to which the impervious sheath is applied in one continuous operation.

3.1.2.2 Cable assembly. A cable assembly consists of a core of two twisted conductors surrounded by four layers of helically wound insulated-conductors of odd or equal number and size. Successive layers are laid in alternate directions with length of lay as shown in Table I.

3.2 First article sample. When specified in the contract or purchase order (see 6.2) and before production has commenced, a sample or samples of the electric cable shall be made available to the contracting officer or his authorized representative for approval in accordance with 4.2.1. Approval of the first article sample authorizes the commencement of production but does not relieve the supplier of responsibility for compliance with all applicable provisions of this specification.

3.3 Construction

3.3.1 Finished cable. The finished cable is composed of 65 electrical conductors, identified by numbers, letters, and color coding in accordance with Table II for the A-cable and Table III for the B- and C-cables.

3.3.2 Conductors. The conductors shall be stranded and of a size, temper, coating, and insulation thickness in accordance with the following tables:

(a) Type MSTCF-65: Table IV

(b) Type MSTCP-65: Table V

3.3.3 Shielding. Conductors numbered 1, 2, 3, 7, 8, 9, and 10 shall have a black rayon braid applied directly over the insulation. Over this, a tinned copper electrical shielding braid and an outer covering of black rayon braid shall follow. Electrical shielding and rayon braids shall be in accordance with 3.8.5. The outer rayon braid shall be suitably treated to prevent fraying when cut.

3.3.4 Components assembled. The finished conductors shall be laid up symmetrically about the center core in layers arranged in accordance with Table I and Figure 1 (for A-cable) and Figure 2 (for B- and C-cables). Binder thread shall be applied over each layer to hold the assembly firm. The completed assembly shall be covered with a braid of closely woven cotton thread having not less than two plies (see 3.8.5).

3.3.5 Cable sheath. A polychloroprene sheath in accordance with 3.8.6 shall be applied over the assembly.

3.4 Dimensions and tolerances. Dimensions and tolerances for the finished cables are given on Figures 1 and 2. Component part dimensions are given in Tables IV and V and on related tables in applicable specifications. Where tolerances are not specified, commercial tolerances representing best commercial manufacturing practice shall apply. The tolerances given are the maximum allowable. Every effort should be made to assure a minimum variation in the outside diameter of the finished cable over the manufactured length.

3.5 Manufacturer's identification. The cables shall be provided with a continuous cotton or cellulose marker tape approximately 1/8 inch wide. The following information shall be printed on the tape at approximately one foot intervals:

Name of Manufacturer and Location of Plant

Year of Manufacture, Specification and Type of Cable

3.6 End seals. An end seal shall be applied to each end of each length before shipment. The alternate method as specified in MIL-C-12000 shall be used.

3.7 Operational characteristics. The cables covered by this specification form a part of the electrical signal transmission system between the torpedo fire control system and the torpedo in its launcher (see 6.1). The cables are subjected to environmental conditions peculiar to submarine use and under such conditions must be relatively free from self-induced voltage pickup on the shielded leads. Type MSTCF-65 cable is subjected to submergence in salt water and must successfully withstand an external 1000 psi hydrostatic test pressure without penetration of the cable sheath or electrical failure due to compression effect on the conductors. Type MSTCF-65 and MSTCP-65 cables are subjected to repeated flexing due to opening and closing of the torpedo tube breech door and must sucessfully pass bend tests in accordance with 3.8.9.

3.8 Performance requirements and product characteristics. The characteristics and physical properties of materials used in the construction of the cables shall conform to the requirements of 3.8.1 through 3.8.12.

3.8.1 Material. All materials used in the manufacture of the cables and not covered by specifications herein shall be of a quality and form which will ensure compliance with requirements of this specification.

3.8.2 Circuit identification. Each conductor in the cable shall be provided with a permanent color code in accordance with Tables II or III, as applicable. The color shall be applied as the outer layer of insulation.

3.8.3 Copper conductors. Copper conductors shall be tinned-stranded wires of a size and temper in accordance with tables as follows:

(a) MSTCF-65: Table IV

(b) MSTCP-65: Table V

The copper wire shall conform to requirements of QQ-W-343.

3.8.4 Conductor insulation (dipped). The conductor insulation shall consist of natural rubber or natural rubber covered with a layer of polychloroprene in accordance with the tables as follows:

(a) MSTCF-65: Table IV

(b) MSTCP-65: Table V

The layers of insulation shall be homogeneous and shall be deposited by the dip method and vulcanized after application to the conductors. The insulation shall be of such composition that it will not act injuriously upon the conductors. When tested in accordance with FED-STD-228, the insulation shall conform to the physical requirements of 3.8.4.1 through 3.8.4.5.

3.8.4.1 Tensile strength. The tensile strength of test specimens of the conductor insulation shall be not less than 2800 psi for MSTCF-65 or 1200 psi for MSTCP-65.

3.8.4.2 Elongation. Specimens of the conductor insulation shall have an ultimate elongation of not less than 650 percent.

3.8.4.3 Set. The set, under 200 percent elongation for 5 seconds, shall not exceed 1/16 inch, using a 2 inch gage length, when measured one minute after release.

3.8.4.4 Oxygen pressure aging. After being aged in an oxygen bomb for 96 hours at 70 degrees centigrade (C), at a pressure between 290 and 310 psi, the tensile strength shall be not less than 2400 psi for MSTCF-65 or 1000 psi for MSTCP-65, and the elongation shall be not less than 600 percent.

3.8.4.5 Dielectric strength of conductor insulation. All lengths of individual insulated conductors shall be capable of withstanding a 3000-volt spark test without rupture. The insulated conductors of the core and inner layers 1, 2, and 3 shall withstand a 1500-volt spark test while being cabled.

3.8.4.5.1 Spark test. The power capacity of the sparking equipment shall be as high as practicable and sufficient to maintain the required testing voltage under all normal load conditions. Means shall be provided for regulating the testing voltage to within five percent of the specified value at all times. The testing voltage may be measured by a kilovoltmeter or electrostatic voltmeter having a burden that will not affect the value or wave shape of the testing voltage. An indicating voltmeter connected to the low-tension side of the transformer may be used, provided its readings are calibrated to give a true indication of the voltage across the dielectric of the wire being tested. The equipment shall include a fault-signal system that will automatically stop the machine, and give a visible signal until manually reset. The electrode shall be of a suitable bead chain or fine link mesh construction, and the finished cable or insulated conductor shall be passed through the electrode at a speed such that the insulation will be subjected to the specified test voltage for a period of not less than 0.2 second, and which will locate all faults.

3.8.5 Conductor shielding and rayon or cotton cover braid. The conductor shielding and rayon cover braid shall conform to the requirements of 3.8.5.1 and 3.8.5.2. Cotton cover braid shall conform to the requirements of 3.8.5.3.

3.8.5.1 Copper shielding braid. The conductor shielding braid shall be number 36 AWG soft tinned copper wire. Coverage shall be not less than 80 percent, as determined by the following formula:

$$K = (2F - F^2) \times 100$$

where:

K = Percent Coverage

a = Angle of braid with axis of cable

$\text{Tan } a = 2\pi DP/C$

d = Diameter of individual braid wire in inches

C = Number of carriers

D = Diameter of conductor under braid in inches

F = NPD/Sin a

N = Number of wires per carrier

P = Picks per inch of cable length

The tangent of the angle between the copper wire and the axis of the conductor shall be not less than 0.577 (angle of 30 degrees).

3.8.5.2 Rayon braid. Rayon fiber used as shield separator braids shall be of the best quality and form suitable for the purpose. It shall be clean, dry, and free from foreign matter deleterious to its insulating quality and shall conform to requirements of MIL-C-572. The tangent of the angle between the rayon thread and the axis of the conductor shall be not less than 0.700 (angle of 35 degrees).

3.8.5.3 Cotton braid. All cotton used in the construction of cable assemblies shall be clean, dry, and free from foreign matter deleterious to the conductors. The tangent of the angle between the cotton thread and the axis of the cable shall be not less than 0.700 (angle of 35 degrees). The cotton braid thickness shall be not less than 0.014 inch.

3.8.6 Cable sheath. A tough, resilient, abrasion-resistant polychloroprene sheath shall be applied over the cotton braid covered conductor assembly. The sheath shall be homogeneous, free from porosity, of a quality typical of best manufacturing procedure and shall be so compounded and vulcanized in lead that when tested as in FED-STD-228 it will conform to the requirements of 3.8.6.1 through 3.8.6.5. The sheath thickness and cable diameter shall be in accordance with Figures 1 or 2, as applicable. The wall thickness shall be uniform within 0.015 inch.

3.8.6.1 Tensile strength. The tensile strength of the cable sheath shall be not less than 2500 psi.

3.8.6.2 Elongation. Specimens of cable sheath shall have an ultimate elongation of not less than 350 percent.

3.8.6.3 Set. The set, under 200 percent elongation for 5 seconds, shall not exceed 1/4 inch, using a 2-inch gage length, when measured one minute after release.

3.8.6.4 Oxygen pressure aging. After 96 hours aging at 70 degrees C in an oxygen bomb at a pressure of 290 psi to 310 psi, the tensile strength of the cable sheath shall be not less than 2000 psi and the ultimate elongation shall be not less than 300 percent.

3.8.6.5 Hot oil immersion. After 18 hours at 120 degrees C, in oil conforming to MIL-L-15016, Military Symbol 3100, the tensile strength and elongation of the cable sheath shall be not less than 60 percent of the values measured before aging.

3.8.7 Dielectric strength and insulation resistance of completed cable. All lengths of completed cable shall withstand a 5 second application of 1000 volts ac test potential applied between each conductor and all adjacent conductors and shields. Immediately following this high potential test, a test between each conductor and all adjacent conductors shall show an insulation resistance of at least 50 megohms per 100 feet when a direct current potential of not less than 200 nor more than 500 volts dc is applied.

3.8.8 Capacitance. The capacitance of the 7 shielded leads in the cable with respect to their shields, when measured at a frequency of one kilocycle per second ± 10 percent and tested in accordance with 4.4.8, shall fall within the following limits:

(a) MSTCF-65: 70.0 mmf per foot
40.0 mmf per foot

(b) MSTCP-65: 90.0 mmf per foot
55.0 mmf per foot

3.8.9 Cable bend requirements. The cable shall show no evidence of failure when subjected to the room temperature 90 degree bend test in accordance with 4.4.9 and the cold temperature 180 degree bend test in accordance with 4.4.10.

3.8.10 Moisture penetration of cable sheath. The cable shall show no evidence of moisture penetration through the cable sheath when subjected to tests in accordance with 4.4.11. Hydrostatic test pressures are as follows: MSTCF-65, 1000 psi; MSTCP-65, 25 psi minimum.

3.8.11 Minimum standards. The requirements specified herein for each component material and for the completed cable assembly constitute the minimum acceptable standards for quality and performance under tests.

3.8.12 Workmanship. The finished cable, including all components, shall be first class in workmanship and shall be constructed and finished in a manner to assure compliance with all requirements of this specification. Particular attention shall be paid to uniformity of cross-sectional area and compactness throughout the manufactured length. The standards of workmanship exhibited in any approved preproduction sample, subject to any qualification stated in the Government's notice of approval, shall be determinative of the requirements of the contract relative to workmanship insofar as not specifically covered by applicable specifications.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his

own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Sampling

4.2.1 Lot. A lot shall be defined as follows, based upon footage ordered:

Order	Lot Size
Up to 10,000 feet	Total Order
10,000 to 50,000 feet	10,000 feet
Over 50,000 feet	25,000 feet

4.2.1.1 Unit of inspection. The unit of inspection for the determination of sample size shall be one inspection length. (An inspection length is defined as one manufactured, completed cable of one type offered to the inspector for acceptance.)

4.2.2 Number of samples

4.2.2.1 First article sample. When required (see 3.2), one first article sample of 100 feet of each type of cable being procured shall be supplied by the contractor. Samples accepted will be applied as part of the quantity specified in the contract or order. The sample shall be submitted for first article testing at an activity designated in the contract or order or by the Naval Ordnance Systems Command. Further production of cable prior to report of satisfactory compliance to specified requirements or approval by the contracting activity shall be at the contractor's risk.

4.2.2.2 Quality conformance sample. The sampling plan and tests to be performed shall be as designated in the applicable test paragraph.

4.3 Inspection

4.3.1 Classification of inspection. The examination and testing of cables covered by this specification shall be classified as follows:

4.3.1.1 First article. First article inspection to determine compliance with minimum requirements shall be in accordance with 4.4.2 through 4.4.11.

4.3.1.2 Quality conformance. Quality conformance inspection to determine acceptability of the lot as defined in 4.2.1 shall consist of the tests or inspections of 4.4.2 through 4.4.11.

4.3.2 Examinations and tests

(a) Visual and dimensional (4.4.2)

(b) Copper conductor (4.4.3)

(c) Conductor insulation (4.4.4)

(d) Cable sheathing (4.4.5)

(e) Dielectric strength and insulation resistance of cable (4.4.6)

(f) Continuity (4.4.7)

(g) Capacitance (4.4.8)

(h) Room temperature bend (4.4.9)

(i) Cold temperature bend (4.4.10)

(j) Hydrostatic (4.4.11)

4.3.3 Action in case of failure

4.3.3.1 First article sample. In the event of the failure of a first article sample to comply with any of the test requirements in accordance with the associated acceptance criteria, the sample under consideration shall be rejected. However, if a test failure occurs as a result of an invalid testing procedure, the original test shall be discounted and an additional test shall be conducted in order to determine disposition of the first article sample. Such a rejection shall require that the manufacturer review and revise his process procedures and with the approval of the procuring activity submit another first article sample.

4.3.3.2 Quality conformance sample. In the event of the failure of any test sample to comply with the acceptance criteria of 4.3.2 (a), (e), and (f), the lot represented shall be rejected. However, in the event of the failure of any quality conformance test sample to comply with the acceptance criteria of 4.3.2 (b), (c), (d), (g), (h), (i), and (j), additional tests shall be run in duplicate on samples from the same cable length. If both additional tests are satisfactory, the lot shall be acceptable. If any failure occurs on the additional tests, the lot shall be rejected. If a test failure occurs as the result of an invalid testing procedure, the original test shall be discounted and an additional test shall be conducted in order to determine lot disposition. The manufacturer shall have the option of subjecting each length of completed

cable in a rejected lot to the tests prescribed in 4.3.2 wherein failure occurred and, after removing all defective lengths of cable, resubmit the lot for Government acceptance. In no case will cable lengths be less than specified below:

Type	Length (Ft. Minimum)
MSTCF	30
MSTCP* (For C cable)	150
MSTCP* (For B cable)	30

*Minimum length shall be as specified in the contract or order.

4.4 Inspection procedures

4.4.1 General. Methods employed for testing component materials and cable performance shall be as specified herein. Tests for conductor insulation and cable sheath shall be as specified in FED-STD-228, except as modified herein.

4.4.2 Visual and dimensional inspection. Each lot of cable submitted for Government inspection shall be visually and dimensionally examined externally for compliance with the requirements of this specification. The sample size and acceptance criteria for this inspection shall be determined in accordance with MIL-STD-105, AQL 1.0 percent defective. The Government shall, in its sole discretion, determine whether to use normal, tightened, or reduced inspection at the start of a contract. One end of each sample shall be checked for diameter, jacket wall, number and size of conductors, and color coding. Determination of lot size for this test shall be based on the number of inspection lengths as defined in 4.2.1.1. In addition, the manufacturer shall, during manufacture, examine each length of cable for surface flaws, pinholes, or pushbacks in the sheath and shall cut at any such defects.

4.4.2.1 Conductor lay. Upon completion of the test outlined in 4.4.11, the conductor lay shall be inspected for conformance with 3.1.2.2.

4.4.3 Copper conductor. Specimens taken from samples selected under 4.4.2 which have not been damaged shall be tested for conformance with 3.8.3.

4.4.4 Conductor insulation. Sample specimens consisting of sufficient length of completed cable shall be selected from each lot for subjection to this test. The sample size and acceptance criteria for this test shall be determined in accordance with MIL-STD-105, Inspection Level S-1. The entire lot shall be rejected if one or more defective units are found in the sample. The Government shall, in its sole discretion, determine

whether to use normal, tightened, or reduced inspection at the start of a contract. The minimum sample size shall consist of five sample specimens. However, if the number of inspection lengths (as defined in 4.2.1.1) is less than five, one sample specimen shall be taken from each. Three conductors shall be randomly selected from each sample specimen for physical testing of the conductor insulation in order to evaluate compliance with the requirements of 3.8.4.1 through 3.8.4.4.

4.4.5 Cable sheath. Sheath specimens shall be taken from each of the cable samples chosen for insulation testing for physical tests to determine compliance with the requirements of 3.8.6.1 through 3.8.6.5.

4.4.6 Dielectric strength and insulation resistance of cable. The completed cable shall be tested dry, without immersion in water, to determine conformance to 3.8.7. Sample plan used shall be in accordance with Table VI, Major B.

4.4.7 Continuity test. When specified, the continuity test shall be accomplished by taking dc resistance readings on each conductor. The resistance shall not exceed the following values:

Conductor AWG Size	Ohms per 1000 ft of Completed Cable
24	28.5
22	18.0
20	11.5
19	8.9
18	7.1
16	4.5

Sample plan used shall be in accordance with Table VI, Major A.

4.4.8 Capacitance. A sample, composed of one test specimen from each production lot and prepared in accordance with 4.4.8.1 (a) through (d), shall be tested to determine conformance with 3.8.8. The measurement technique used shall give reproducible results to three significant figures.

4.4.8.1 Preparation for tests. Prepare a 20 foot minimum length of cable as follows: (see Figure 3)

(a) Strip back cable sheathing $1\frac{1}{2}$ inches to 2 inches on each end of sample required for connections.

(b) Comb out shielding on the 7 shielded conductors back near the sheathing.

(c) Strip insulation from each shielded conductor approximately $\frac{1}{2}$ inch.

(d) For computation purposes, the length of cable shall be considered as the distance between the undisturbed ends of shielding ("L" in Figure 3).

4.4.9 Room temperature 90 degree bend test. Cable specimens of convenient length shall be randomly selected from the material under consideration in order to determine conformance with the 90 degree bend test requirement of 3.8.9. The sample size (number of specimens) and acceptance criteria shall be determined in accordance with MIL-STD-105, Inspection Level S-1, AQL 4.0% defective. Reduced inspection may be instituted and normal inspection reinstated in accordance with MIL-STD-105. The test shall be performed on suitable bend test equipment at room temperature with a weight suspended from the free end of the cable. The amount of weight shall be as follows:

(a) MSTCF-65: 16 pounds

(b) MSTCP-65: 28 pounds

Frequency of bending shall be from 12 to 15 complete cycles per minute. Bending shall be confined to one section of the cable, held by a beveled guider, which shall bend the cable 90 degrees vertically in opposite directions during one cycle. The size of the beveled guider shall be as follows:

(a) MSTCF-65: 1 inch inside diameter

(b) MSTCP-65: $1\frac{1}{2}$ inch inside diameter

Cable bending diameter shall be approximately four times the cable diameter. Conductors and shields shall be connected electrically so that any conductor breaks will stop the mechanism. Samples shall withstand the following number of full cycles without breaks or sheath rupture:

(a) MSTCF-65: 20 cycles

(b) MSTCP-65: 10 cycles

After bend testing, the sample shall be checked for continuity to determine evidence of shorts between adjacent conductors or between conductor and shields.

4.4.10 Cold temperature 180 degree bend test. Cable specimens of convenient length shall be randomly selected from the material under consideration in order to determine conformance to the 180 degree bend test requirement of 3.8.9. The sample size (number of specimens) and acceptance criteria shall be determined in accordance with MIL-STD-105, Inspection Level S-1, AQL 4.0 percent defective. Reduced inspection may be instituted and normal inspection reinstated in accordance with MIL-STD-105. The specimens and a mandrel of approximately 4 times the cable diameter shall be conditioned for 24 hours at -40 degrees F. Specimens and mandrel shall be removed from chamber and the 180 degree bend test shall be performed manually within one minute of removal. The cable shall be bent around the mandrel at a rate of approximately 20 degrees per second. Jacket and insulation shall be inspected for evidence of splitting and conductors shall be tested for continuity.

4.4.11 Hydrostatic test. Sample specimens shall be randomly selected from each lot for subjection to hydrostatic tests in order to evaluate lot compliance with the requirements of 3.8.10. Sample size and acceptance criteria shall be determined in accordance with MIL-STD-105, Inspection Level S-2, AQL 1.0 percent defective. Reduced inspection may be instituted and normal inspection reinstated in accordance with MIL-STD-105. The specimens shall be a convenient length of the completed cable, not less than six inches long. The specimens shall be sealed in a suitable test tank with the ends exposed to the atmosphere through stuffing tubes in the tank. The hydrostatic pressure shall be applied on the cable sheath within the tank for a period of three minutes. The open ends of the cable shall be examined for leakage during tests. For MSTCF-65 cable, while under test, 300 volts ac shall be applied for 5 seconds between each conductor and all adjacent conductors and shields, without dielectric failure. Immediately following the test, the specimens shall be removed from the tank and the outer sheath removed to further ensure that no water has entered the cable.

4.5 Test results. Test results of 4.4.3 through 4.4.11, if required, shall be prepared in accordance with MIL-STD-831 and forwarded to the Naval Ordnance Systems Command (see 6.2).

5. PREPARATION FOR DELIVERY

5.1 Cable shall be prepared for delivery in accordance with MIL-C-12000.

5.1.1 Packaging and packing

5.1.1.1 Levels. Level A or Level C shall be used as specified in the contract or order (see 6.2).

5.1.1.2 Packaging

5.1.1.2.1 End seals. An end seal shall be applied to each end of each length of cable. The method used shall be as specified in 3.6.

5.1.1.2.2 Coils or reels. The length and type of cable being prepared for delivery shall determine whether coils or reels shall be used for packaging. Determination shall be made as follows:

Length (No. of Feet)	Type	Coils or Reels
30-249	MSTCF and MSTCP	Coils
250-1000	MSTCF and MSTCP	Reels

Note: Reels shall be of the single-trip type.

5.2 Marking. In addition to the standard marking as specified in MIL-C-12000 and as required in the contract or order, each reel and coil of cable shall be marked with color stripes as follows to indicate year of manufacture. This color cycle shall repeat itself every fifth year:

Year of Manufacture	Identifying Color
1966	Red
1967	Green
1968	Orange
1969	Blue
1970	White

6. NOTES

6.1 Intended use

(a) Type MSTCF-65 electric cable forms a part of Type "A" Torpedo Control Cable Mark 1. This unit completes the torpedo fire control circuit within the torpedo tube and is severed at the torpedo when the torpedo is launched.

(b) Type MSTCP-65 electric cable forms a part of Type "B" Torpedo Control Cable Marks 2 and 3. These units form that part of the torpedo fire control circuit from the torpedo tube to the switch box.

(c) Type MSTCP-65 electric cable also forms a part of Type "C" Torpedo Control Cable. This unit completes that part of the fire control circuit from the switch box to the junction box.

6.2 Ordering data. Procurement documents should specify the following:

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

(b) Type of cable required (see 1.2)

(c) First article - Whether first article sample is required (see 3.2)

(d) Quality conformance sampling, if different from 4.2.2.2.

(e) Whether Level A or Level C packaging and packing is required (see 6.4).

(f) Test data required.

(g) Normal or reduced inspection with regard to 4.4.2, 4.4.4, 4.4.11.

6.3 Instructions for first article. When specified (see 6.2) and as soon as practicable after the award of a contract or order, a first article sample (see 4.2.2.1) shall be separately packaged and forwarded to an activity designated in the contract or order by the Naval Ordnance Systems Command. The activity so designated shall have the responsibility for testing to determine compliance with the requirements of the specifications and drawings and of notifying the contracting officer of approval or disapproval. Samples shall be plainly identified by securely attached durable tags, marked with the following information:

(1) Samples for first article testing

(2) Contract or order number

(3) Specification

(4) Manufacturer's name and part number

6.4 Criteria for use of proper level of packaging and packing

(a) Level A. This level shall be used for those items which are to be shipped to indeterminate destinations or stored under indeterminate conditions for redistribution anywhere.

(b) Level C. This level shall be used only when it is definitely known that the packaged item is to be shipped to domestic installations for immediate use at the first receiving activity.

Preparing Activity
Navy - OS
Project No. 6145-N084

TABLE I

LAYER ARRANGEMENT AND CONDUCTOR SEQUENCE

LAYER	CONDUCTORS	SEQUENCE	LENGTH OF LAY
CORE	2	43, 44	MAX. 1-INCH L.H.
1st LAYER	9	41, 42, 45, 47, 48, 49, 50, 51, 52	APPROX.3-IN.R.H.
2nd LAYER	15	38, 39, 40, 46, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63,	APPROX.3-IN.L.H.
3rd LAYER	21	4, 5, 11, 12, 13, 14, 15, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37,	APPROX.4-IN.R.H.
4th LAYER	18	1, 6, 16, 2, 17, 18, 3, 19, 20, 7, 21, 8, 22 9, 23, 10, 65, 64,	APPROX.6-IN.L.H.

Table II
Identification of Cable Conductors
With Connector Contacts for A-Cable

CONDUCTOR NO.	COLOR CODE	LETTER CODE	CONDUCTOR NO.	COLOR CODE	LETTER CODE
1	BLACK	M	34	WHITE	U
2	BLACK	d	35	WHITE	c
3	BLACK	m	36	WHITE	V
4	BROWN	u	37	WHITE	l
5	WHITE	t	38	RED	x
6	YELLOW	AH	39	BLACK	w
7	BLACK	AG	40	BLACK	p
8	BLACK	n	41	BROWN	q
9	BLACK	e	42	BLUE	h
10	BLACK	W	43	GREEN	i
11	WHITE	z	44	YELLOW	&
12	WHITE	AL	45	BLUE	Z
13	WHITE	AK	46	BLACK	g
14	WHITE	v	47	BLUE	Q
15	WHITE	o	48	BLUE	R
16	GREEN	F	49	BLUE	S
17	GREEN	AA	50	BLUE	a
18	GREEN	AB	51	BLUE	j
19	RED	AC	52	BLUE	r
20	RED	AD	53	BLACK	Y
21	GRAY	AE	54	BLACK	P
22	GRAY	AF	55	BLACK	H
23	GRAY	L	56	BLACK	I
24	WHITE	f	57	BLACK	J
25	WHITE	X	58	BLACK	K
26	WHITE	O	59	BLACK	T
27	WHITE	N	60	BLACK	b
28	WHITE	G	61	BLACK	k
29	WHITE	A	62	BLACK	s
30	WHITE	B	63	BLACK	y
31	WHITE	C	64	RED	AI
32	WHITE	D	65	RED	AJ
33	WHITE	E			

Table III
Identification of Cable Conductors
With Connector Contacts for B- and C-Cables

CONDUCTOR NO.	COLOR CODE	LETTER CODE	CONDUCTOR NO.	COLOR CODE	LETTER CODE
1	BLACK	M	34	WHITE	v
2	BLACK	d	35	WHITE	o
3	BLACK	m	36	WHITE	f
4	BROWN	u	37	WHITE	X
5	WHITE	AK	38	RED	N
6	YELLOW	AH	39	BLACK	P
7	BLACK	AG	40	BLACK	H
8	BLACK	n	41	BROWN	I
9	BLACK	e	42	BLUE	J
10	BLACK	W	43	GREEN	i
11	WHITE	G	44	YELLOW	&
12	WHITE	A	45	BLUE	T
13	WHITE	B	46	BLACK	U
14	WHITE	C	47	BLUE	b
15	WHITE	D	48	BLUE	s
16	GREEN	F	49	BLUE	r
17	GREEN	AA	50	BLUE	x
18	GREEN	AB	51	BLUE	q
19	RED	AC	52	BLUE	p
20	RED	AD	53	BLACK	Y
21	GRAY	AE	54	BLACK	O
22	GRAY	AF	55	BLACK	Q
23	GRAY	L	56	BLACK	R
24	WHITE	E	57	BLACK	S
25	WHITE	K	58	BLACK	a
26	WHITE	V	59	BLACK	j
27	WHITE	c	60	BLACK	k
28	WHITE	l	61	BLACK	h
29	WHITE	t	62	BLACK	g
30	WHITE	AL	63	BLACK	Z
31	WHITE	z	64	RED	AI
32	WHITE	y	65	RED	AJ
33	WHITE	w			

TABLE IV

COMPONENT PARTS AND DIMENSIONS (CABLE MSTCF-65)

CONDUCTOR					INSULATION	
CONDUCTOR NUMBER	AWG. SIZE	STRANDING	TEMPER **	COATING	MIN. AVG. WALL NATURAL RUBBER (INCHES)	CONDUCTOR DIA. (INCHES) * NOMINAL
1, 2, 3, 7, 8, 9, 10,	24	7/.0080	HARD	TIN	.010	.098
4, 5, 11, 12, 13 14, 15, 24, 25, 26 27, 28, 29, 30, 31 32, 33, 34, 35, 36 37, 38, 39, 40, 41 42, 45, 46, 47, 48 49, 50, 51, 52, 53 54, 55, 56, 57, 58 59, 60, 61, 62, 63	24	7/.0080	HARD	TIN	.010	.048
6, 43, 44,	24	7/.0080	HARD	TIN	.018	.064
16, 17, 18,	20	7/.0126	SOFT	TIN	.010	.062
19, 20, 21, 22 23 64, 65,	18	7/.0159	SOFT	TIN	.010	.072

* DIAMETER OVER ALL COVERINGS
** BEFORE TINNING

TABLE V

COMPONENT PARTS AND DIMENSIONS (CABLE MSTCP-65)

CONDUCTOR					INSULATION			
					MIN. AVG. WALL (INCHES)			
CONDUCTOR NUMBER	AWG. SIZE	STRANDING	TEMPER	COATING	NATURAL RUBBER	SYNTHETIC RUBBER	TOTAL	CONDUCTOR DIA (INCHES) * NOMINAL
1, 2, 3, 7, 8, 9, 10,	22	7/.0100	SOFT	TIN	.005	.010	.015	.114
4, 5, 11, 12, 13, 14, 15, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63,	22	7/.0100	SOFT	TIN	.005	.010	.015	.064
6,	22	7/.0100	SOFT	TIN	.005	.014	.019	.072
16, 17, 18, 21, 22, 23	18	7/.0159	SOFT	TIN	.005	.010	.015	.082
19, 20, 64, 65,	16	7/.0192	SOFT	TIN	.005	.010	.015	.092
43, 44,	19	7/.0136	SOFT	TIN	.005	.011	.016	.077

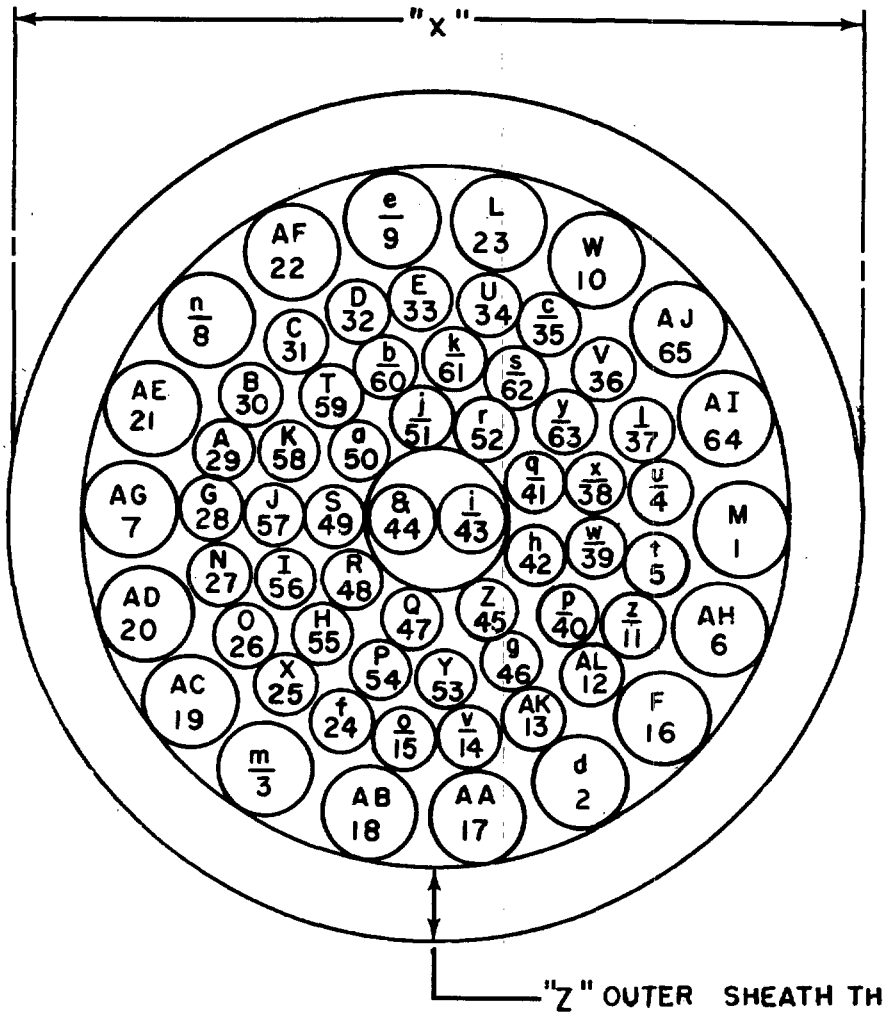
* DIAMETER OVER ALL COVERINGS

TABLE VI

SAMPLING SCHEDULE

No. of Conductors In Lot	Sample Size	Acceptance Number	
		Major A	Major B
65-800	50	0	1
801-3200	150	1	4
3201-8000	225	2	5

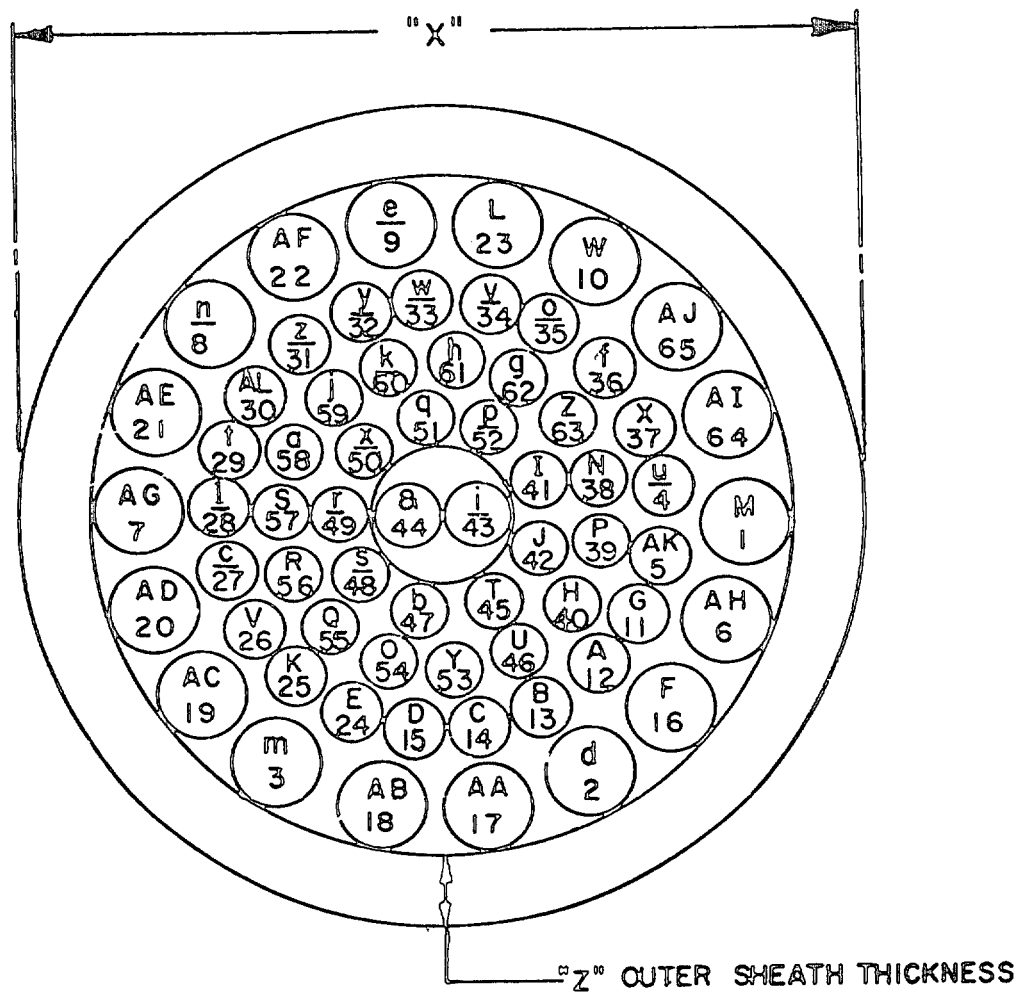
Note: Lot size is determined by multiplying number of conductors (65) per inspection length times number of inspection lengths. The proper sample size shall be taken and the defects shall not exceed the applicable acceptance number. Sampling applies to number of conductors rather than number of inspection lengths.



CABLE TYPE	"X"	"Z"
MSTCF - 65	0.710 ± .015	0.045 MIN. *

*MINIMUM AT THINNEST POINT

FIGURE 1. LAY OF CONDUCTORS IN A-CABLE



CABLE TYPE	"X"	"Z"
MSTCP-65	0.945 ±.020	0.100

FIGURE 2. LAY OF CONDUCTORS IN B- AND C-CABLES

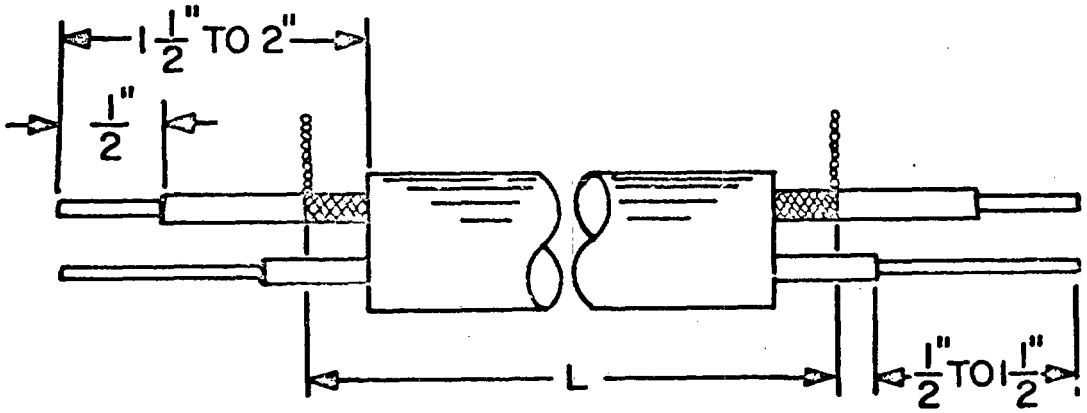


FIGURE 3. CABLE SPECIMEN FOR CAPACITANCE TEST

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SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

MIL-C-19787C(OS) CABLE, ELECTRIC, TORPEDO, 65 CONDUCTOR (FOR TORPEDO CONTROL, ELECTRIC

ORGANIZATION *(Of submitter)*

CITY AND STATE SETTING)

CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*	DATE

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