

MIL-C-5136C
8 March 1968

Superseding
MIL-C-5136B
12 November 1959

MILITARY SPECIFICATION

CABLE, POWER, ELECTRICAL POLYCHLOROPRENE SHEATHED, BUNA COMPOUND INSULATED

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

1. SCOPE

1.1 This specification covers buna compound insulated single-conductor or multi-conductor electrical power cable covered with a polychloroprene sheath.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

J-C-98	Cable and Wire, Insulated; Methods of Sampling and Testing
QQ-W-343	Wire, Electrical and Nonelectrical, Copper, (Uninsulated)

Military

MIL-I-3930	Insulating and Jacketing Compounds, Electrical (for Cable, Cord, and Wire)
MIL-C-12000	Cable, Cord, and Wire, Electric, Packaging of

STANDARDS

Federal

FED. STD. NO. 242	Cable and Wire, Electrical (Power, Fixed Installation)
-------------------	--

/FSC 6145/

MIL-C-5136C

Military

MIL-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of US Military Property
MIL-STD-686	Cable and Cord, Electrical, Identification Marking and Color Coding of
MIL-STD-831	Test Reports, Preparation of

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

3. REQUIREMENTS

3.1 Preproduction.— This specification makes provisions for preproduction testing.

3.2 Design and construction.— Voltage rating, number of conductors, conductor size, and minimum number of strands for cables covered by this specification as listed in table I shall be as specified (see 6.2).

TABLE I. Stranded conductors

Voltage rating	No. of conductors	Conductor size AWG	No. of strands per conductor (minimum)	Cable nominal diameters (inches)
300	2	16	19	.406
600	2	14	37	.468
600	1	12	7	.281
600	2	12	7	.500
600	2	16	7	.437
600	1	2/0	19	.765
600	7	1C-12	Solid	.671
		6C-16	Solid	
600	15	1C-12	Solid	.906
		14C-16	Solid	

3.2.1 Conductor.— Conductors shall be soft drawn copper type S or type C, class B, in accordance with QQ-W-343. Conductors shall be protected by a continuous coating of tin, lead, or a metal alloy that will not be affected by the insulation.

3.2.1.1 Splices.— The splices in the conductor shall be in accordance with QQ-W-343.

3.2.1.2 Stranding.— Unless otherwise specified (see 6.2), the conductors used in all cable shall be concentrically stranded.

3.2.1.3 Area of conductors.— The area of cross section of the completed conductor shall not be less than 98 percent of the area specified in table II. The area of a cross section of a conductor shall be considered to be the sum of the cross sectional areas of its component strands at any point when measured perpendicular to their axis.

MIL-C-5136C

TABLE II. Conductor resistance

Conductor size AWG	Area CM	Ohms resistance per 1,000 feet
16	2,583	4.350
14	4,110	2.679
12	6,530	1.685
2/0	133,100	0.08266

3.2.1.4 Resistance.— The resistance of any conductor per 1,000 feet of complete cable at +20° C shall be not greater than the applicable value listed in table II. In multiconductor cables, a 2 percent increase above the values listed in table II is permissible to allow for the increased length of conductor.

3.2.2 Insulation.— The insulation shall conform to type IS as specified in MIL-I-3930.

3.2.2.1 Insulation thickness.— The average thickness of the insulation shall be not less than that specified in table III. The minimum thickness at any point shall be not less than 90 percent of the average thickness. If insulation is applied in more than one layer, adjacent layers shall be vulcanized into a homogeneous mass and this mass shall be taken as a whole for all measurements and tests.

TABLE III. Insulation thickness

Voltage rating	Conductor size AWG	Average thickness of insulation on each conductor (in 64th of an inch)	Average thickness of sheath on single conductor cable (in 64th of an inch)
300	16	2	-
600	16, 14, 12	3	3
600	2/0	7	4

3.2.2.2 Insulation resistance.— The insulation resistance of the conductors at +15.5° C shall be not less than that calculated from the following formula:

$$R = K \log_{10} \frac{D}{d}$$

Where:

R = Insulation resistance at +15.5° C
in megohms per 1,000 feet

D = Outside diameter of insulated
conductor in inches

d = Outside diameter of uninsulated
conductor in inches

K = Constant for the insulating material,
and shall be 2,000 for the insulating
material designated in this specification

See NOTE on page 4.

MIL-C-5136C

NOTE: If the temperature at which the insulation resistance was measured differs from +15.5° C, the resistance shall be corrected to that at +15.5° C by multiplying the measured value by a coefficient corresponding to the temperature at which the measurement was made. The coefficient for the material used should be obtained from the manufacturer as the coefficient for the insulating material will vary with different formulations of the compound.

3.2.2.3 Repair.- Where repairs of joints are made in the insulation, the work shall be done in such a manner that the repaired part of the joint, and all parts affected in the process shall be as strong and durable electrically and mechanically as the remainder of the insulation, and shall conform to all the thickness limitations specified in 3.2.2.1.

3.2.2.4 Cabling.- The individual conductor of a multiconductor cable shall be assembled to form a round cable. Each conductor of a multiconductor cable shall be identified by a different color, by coloring the insulation or by a colored tape, braid, or neoprene paint covering applied over the insulation. The color coding shall comply with the color scheme for electrical cables as specified in MIL-STD-686. The cable shall be laid up with a round suitable lay. Where necessary, the interstices may be filled with saturated jute.

3.2.3 Sheath.- The sheath shall conform to type JN as specified in MIL-I-3930. The sheath shall be tightly and concentrically formed around the core. The sheath shall also adhere tightly to the insulation of single conductor cable when applied to the insulation. A compound filled tape or braid may be used between the insulation and sheath on conductor size No. 2/0. The average thickness of a sheath shall be not less than the values specified in tables III and IV. The minimum thickness at any point shall be not less than 90 percent of the average thickness.

TABLE IV. Sheath thickness

Diameter under sheath (inches)	Thickness of sheath on multiconductor cable (in 64th of an inch)
0 - 0.425	5
0.426 - 0.700	6
0.701 - 1.050	7

3.3 Alternate design and construction.- When specified by the procuring activity, other than military, the requirements specified herein may be waived for the cables listed in table V, and these cables furnished in accordance with the requirements indicated. (See 6.2.)

TABLE V. Cable requirements

Cable	Alternate requirements
300V, 2 conductor, No. 16 AWG	Underwriters Laboratory, Type SJO
600V, 2 conductor, No. 14 AWG	Underwriters Laboratory, Type SJO
600V, 1 conductor, No. 12 AWG	FED. STD. NO. 242

MIL-C-5136C

3.4 Interchangeability.- All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The drawing number requirements of MIL-STD-100 shall govern changes in the manufacturer's part numbers.

3.5 Identification of product.- Each reel of cable shall be marked for identification in accordance with MIL-STD-130. The additional identification data to be applied to each reel shall consist of the following:

Size of conductors _____
 Number of conductors _____
 Voltage rating _____
 Length of cable _____ feet

3.5.1 Reels.- Each reel shall be plainly marked on the outside of both ends with the information specified in 3.5. Paper labels shall not be used. Each reel shall have a permanent-type label, tag, or plate marked with the information specified in 3.5 attached on the inside of a flange so that it will be visible when the reel is unlagged. The label, tag, or plate shall remain in place when all or part of the cable is removed.

3.5.2 Marker threads.- Marker threads shall be provided in the 7- and 15-conductor control cables and in the single-conductor, size 2/0 cable, to identify the manufacturer. The marker threads shall be nonhygroscopic. The number of marker threads and color of each thread shall be identical to that utilized by the manufacturer to identify other cables.

3.5.3 Surface marking of cable.- The manufacturer's name and the contract number shall be legibly marked on the surface of all 7- and 15-conductor control cables and on all single-conductor, size 2/0 cable procured directly by the Government. The markings shall be of paint or ink and at intervals not exceeding 10 feet. The markings shall be durable and not readily smeared during handling of the cable.

3.6 Workmanship.- Workmanship shall be of the quality necessary to produce cable free from all defects which affect proper functioning in service. The exterior surfaces shall be smooth, uniform, and free from splinters, ridges, grooves, indentations, and protuberances.

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, the supplier may utilize his own facilities or any other commercial laboratory acceptable to 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 Classification of inspection.- The examination and testing of the cable shall be classified as follows:

- (a) Preproduction inspection (4.3)
- (b) Quality conformance inspection (4.4)

MIL-C-5136C

4.3 Preproduction inspection.-

4.3.1 Preproduction test sample tested by the contractor.- The contractor shall subject 50 feet of cable to the preproduction tests specified in 4.3.2.

4.3.2 Inspections.- Preproduction inspection shall consist of all tests specified under 4.6.

4.3.3 Preproduction test report.- After the contractor completes the preproduction inspection he shall prepare a preproduction test report in accordance with MIL-STD-831 and furnish three complete copies of the report to the procuring activity.

4.4 Quality conformance inspection.- Quality conformance inspection shall consist of:

- (a) In-process inspection (4.4.1)
- (b) End-product inspection (4.4.2)

4.4.1 In-process inspection.- In-process inspection shall consist of the following:

- (a) Individual wire strand inspection (4.4.1.1)
- (b) Uninsulated conductor inspection (4.4.1.2)
- (c) Insulated conductor inspection (4.4.1.3)

4.4.1.1 Individual wire strand inspection.-

4.4.1.1.1 Lot.- A lot of individual wire strand shall consist of reels of the same coating and size produced at the same time from the same source.

4.4.1.1.2 Sampling plan.- Each reel in the lot of individual wire strand shall be inspected for conductor coating as specified in 4.6.3.

4.4.1.2 Uninsulated conductor inspection.-

4.4.1.2.1 Lot.- A lot of uninsulated conductors shall consist of reels of the same coating and size, stranded or solid, produced at the same time from the same source.

4.4.1.2.2 Sampling plan.- Each reel of stranded or solid wire shall be inspected for the conductor wire size as specified in 4.6.2. In the case of solid wire conductors, this inspection may be done concurrently with the coating inspection of 4.4.1.1.2.

4.4.1.3 Insulated conductor inspection.-

4.4.1.3.1 Lot.- A lot of insulated conductors shall consist of each reel of the same size and insulation material from the same batch.

4.4.1.3.2 Sampling plan.-

4.4.1.3.2.1 Each reel shall be inspected for conductor resistance as specified in 4.6.4.

MIL-C-5136C

4.4.1.3.2.2 A sample length of insulated conductor, not less than 2 feet long, shall be taken from six randomly selected reels in the lot and subjected to the insulation thickness test of 4.6.7 and insulation material test of 4.6.9.

4.4.2 End-product inspection.-

4.4.2.1 Lot.- A lot of completed cable shall be defined as that length of completed cable on reels obtained from one batch of sheath material and of the same conductor and size.

4.4.2.2 Sampling plan A.- Six sample reels shall be selected at random from each lot of reels of completed cable. A length of cable, at least 2 feet long, shall be taken from each of the sample cables and subjected to the sheath material test of 4.6.10 and sheath thickness test of 4.6.8.

4.4.2.2.1 Rejection and retest.- When one or more samples from a lot fail to meet the specification, acceptance of all cable in the lot shall be withheld until the extent and cause of the failure are determined. After corrections have been made, inspection of 4.4.2.2 shall be repeated for the lot which failed.

4.4.2.3 Sampling plan B.- Each reel of completed cable in the lot shall be subjected to the following inspections:

- (a) Examination of product (4.6.1)
- (b) Dielectric strength (4.6.5)
- (c) Insulation resistance (4.6.6)

4.4.2.3.1 Rejection and retest.- When a reel in the lot fails to meet any of the specified examinations and tests, acceptance of all reels in the lot will be withheld until the extent and cause of failure are determined. After corrections have been made, reinspection will be made in accordance with 4.4.2.3.

4.4.2.4 Individual inspection may continue.- For production reasons, individual inspections may be continued pending investigation and correction of any failure under sampling plans A or B. However, submission to the Government for acceptance shall not be made until it has been determined that the entire lot meets all the requirements of this specification.

4.4.3 Defects in cable already accepted.- The investigation of a test failure could indicate that defects may exist in cable already accepted. If so, the contractor shall fully advise the procuring activity of all defects likely to be found and methods of correcting them.

4.5 Test conditions.-

4.5.1 Unless otherwise specified, tests shall be conducted at room temperature, pressure, and humidity.

4.6 Inspection methods.-

4.6.1 Examination of product.- The cable shall be carefully inspected to determine compliance with this specification with respect to workmanship, construction, and dimensions not otherwise inspected during the following tests.

MIL-C-5136C

4.6.2 Conductor wire size.- The size of the uninsulated conductor shall be examined in accordance with QQ-W-343.

4.6.3 Conductor coating.- The coating tests shall be in accordance with QQ-W-343.

4.6.4 Conductor resistance.- The resistance of each reel shall be determined by using test Method 6021 of J-C-98.

4.6.5 Dielectric strength.- Each reel of completed cable shall withstand without failure the high potential tests listed in table VI. The high voltage tests shall be in accordance with test Method 6111 of J-C-98.

TABLE VI. High potential tests

Voltage rating	Conductor size AWG	Test voltage
300	16	1,000
600	16, 14, 12	3,000
600	2/0	4,000

4.6.6 Insulation resistance.- Each reel of cable shall be subjected to test in accordance with test Method 6031 of J-C-98 to determine compliance with the insulation resistance requirements specified in 3.2.2.2. This test shall be conducted immediately following the test specified in 4.6.5.

4.6.7 Insulation thickness.- The average thickness of insulation shall be tested in accordance with test Method 1011 of J-C-98. The calculated insulated thickness shall meet the requirements specified in 3.2.2.1.

4.6.8 Sheath thickness.- The average thickness of the sheath shall be determined by measuring the outside diameter of the sample length of completed cable and subtracting the diameter of the conductor plus the separator, if one is used, plus twice the thickness of the insulation from it. The difference shall be divided by 2, and the result taken as the thickness of the sheath. Measurements shall be taken by the same method as specified in 4.6.7. The calculated sheath thickness shall meet the requirements specified in 3.2.3.

4.6.9 Insulation material.- The three samples of insulation material shall be tested to determine compliance with the requirements specified for this material in MIL-I-3930. If one or more of the samples fail to conform to the requirements specified, the cable made up with that batch of insulation material shall be rejected.

4.6.10 Sheath material.- The three samples of sheath material shall be subjected to tests to determine compliance with the physical requirements specified for this material in MIL-I-3930. If one or more of the samples fail to conform to the requirements specified, the cable made up with sheath from that lot of sheath shall be rejected.

4.7 Inspection of preparation for delivery.- Preparation for delivery shall be inspected for conformance to section 5.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging.-

5.1.1 Cables shall be prepared for delivery in accordance with MIL-C-12000. Packaging shall be as specified for level A.

MIL-C-5136C

5.1.2 Cable lengths.-- Unless otherwise specified (see 6.2) cable shall be procured in the following lengths:

1C-2/0.....1,000 feet
 7C control.....2,000 feet
 15C control.....1,000 feet
 All others.....5,000 feet

5.1.2.1 Tolerances.-- The length of the cables supplied shall not vary more than -0 to +10 percent of the values specified in 5.1.2.

5.2 Packing.-- Packing shall be level A in accordance with MIL-C-12000.

5.3 Marking.-- The exterior of each reel shall be marked in accordance with MIL-STD-129. The nomenclature shall be as follows:

CABLE, POWER, ELECTRICAL, POLYCHLOROPRENE, SHEATHED, BUNA COMPOUND
 INSULATED.

5.3.1 Additional marking not covered by MIL-STD-129.-- The following marking shall also be added:

Size of conductors _____
 Number of conductors _____
 Voltage rating _____
 Length of cable _____ feet.

6. NOTES

6.1 Intended use.-- The cables are intended for use in airport lighting circuits at both temporary and permanent installations. They shall be constructed for continuous outdoor service, either on the surface of the ground, buried directly in the ground, or submerged in water.

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

- (a) Title, number, and date of this specification.
- (b) Voltage rating, number of conductors, minimum number of strands and conductor size (see 3.2).
- (c) Stranding required, if other than concentrically stranded (see 3.2.1.2).
- (d) When requirements for cables listed in table V are to be waived (see 3.3).
- (e) The length of cable to be supplied, if other than as specified in 5.1.2.

6.3 Marginal indicia.-- The margins of this specification are marked to indicate where changes, deletions, or additions to the previous issue have been made. This is done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Figures are not so marked. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written, irrespective of the marginal notations and relationship to the last previous issue.

MIL-C-5136C

Custodians:

Army - EL
Navy - AS
Air Force - 11

Preparing activity:

Air Force - 11

Reviewer activities:

Army - EL
Navy - AS
Air Force - 11

Project No. 6145-0517