

MIL-C-27212B (USAF)
1 July 1970
Superseding
MIL-C-27212A (USAF)
3 July 1961

MILITARY SPECIFICATION

CABLE, POWER, ELECTRICAL, AIRPORT LIGHTING CONTROL

1. SCOPE

1.1 SCOPE.-This specification covers seven-conductor cables designed specifically for 300V airport lighting control circuits.

1.2 CLASSIFICATION.-Cables shall be of the following classes as specified (see 6.2):

Class 1 - Unshielded

Class 2 - Shielded

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

QQ-W-343 Wire, Electrical (Uninsulated)

Military

MIL-D-1000 Drawings, Engineering and Associated Lists

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 228 Cable and Wire, Insulated; Methods of Testing

PSC 6145

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Military

MIL-STD-129 Marking For Shipment and Storage
MIL-STD-130 Identification Marking of U.S. Military
Property
MIL-STD-831 Test Reports, Preparation of

(Copies of documents 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 PREPRODUCTION.--This specification makes provisions for pre-production inspection.

3.2 DESIGN AND CONSTRUCTION.--The cable shall be a seven-conductor cable, with one 12 AWG conductor and six 18 AWG conductors. The individual conductors of the cable shall be assembled to form a round core. For class 1 cable, the sheath shall be tightly and concentrically applied over the central core. For class 2 cable, a metallic shielding tape shall be utilized between the core and sheath. The diameter of the finished cable shall not exceed 0.500 inch. The cable shall be constructed so it can be satisfactorily pulled through long conduits.

3.2.1 CONDUCTORS.--The conductors shall be type C, class B, in accordance with QQ-W-343. The individual strands of the conductors shall be of soft-drawn copper and provided with a continuous coating of tin, lead, or lead alloy.

3.2.1.1 SPLICES.--Splices in the conductor shall be in accordance with QQ-W-343.

3.2.2 INSULATION.--The insulation over the individual conductors of the cable shall conform to type IP or type IL as specified in MIL-I-3930. The insulation shall be white in color.

3.2.2.1 INSULATION THICKNESS.--The average thickness of the insulation shall be not less than 0.020 inch. The minimum thickness at any point shall be not less than 0.018 inch.

3.2.2.2 COLOR CODING.--The conductors of the cable shall be coded by means of legible, printed markings on the surface of the insulation. The markings shall include both the number of the conductor and the name of the color. The coding shall be as follows:

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<u>Color</u>	<u>No.</u>
Black (for the 12 AWG conductor)	1
White	2
Red	3
Green	4
Orange	5
Blue	6
White, black	7

3.2.2.2.1 The ink utilized in the markings shall be of a permanent type that will not fade nor smear. The numbers and letters shall be approximately 1/16 inch in height. The markings shall be repeated continuously along the length of the conductor at intervals not exceeding 3 inches.

3.2.2.3 REPAIRS.-Where repairs of joints are made in the insulation, the work shall be done in such a manner that the repaired part or 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 of the thickness limitations specified in 3.2.2.1.

3.2.3 SHEATH.-The sheath shall conform to type JP or type JN as specified in MIL-I-3930. The sheath shall be tightly and concentrically formed around the core. The average thickness of the sheath shall be not less than 0.046 inch. The minimum thickness at any point shall be not less than 0.040 inch.

3.2.4 SHIELDING.-The shield shall consist of a metallic, nonmagnetic tape that will completely cover the central core of insulated conductors. The metal tape shall be at least 0.002 inch thick and applied so that there is a minimum lap of 10 percent. The tape shall be substantially free from burrs and joints and shall be made electrically continuous by welding, soldering, or brazing. The metallic shield tape shall be applied over a fibrous or other nonmetallic and nonconducting tape.

3.3 PERFORMANCE.-The cable shall be capable of satisfactory continuous service when buried directly in the ground, installed in conduits, or submerged in water.

3.3.1 CONDUCTOR 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 below:

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<u>AWG Wire Size</u>	<u>Ohms Resistance per 1,000 feet</u>
12	1.685
18	6.650

3.3.2 DIELECTRIC STRENGTH.-Each reel of completed cable shall withstand without failure a high potential of 1,500V.

3.3.3 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.

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.

3.4 INTERCHANGEABILITY.-All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The drawing number requirements of MIL-D-1000 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 300 _____
 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 SURFACE MARKING OF CABLE.-The manufacturer's name, contract number, and the specification number shall be legibly marked on the surface of all cable procured directly by the Government. The markings shall be durable and shall not readily smear 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 visible to the naked eye.

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 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)

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 inspection 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 for approval.

4.3.4 PREPRODUCTION TEST SAMPLE FOR THE PROCURING ACTIVITY.-Along with the preproduction test report, the contractor shall submit the sample to the

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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.

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, 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.-

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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.

4.6.2 CONDUCTOR WIRE SIZE.- The size of the uninsulated conductor shall be tested 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 of completed cable shall be determined by using test method 6021 of Fed-Std-228.

4.6.5 DIELECTRIC STRENGTH.- The high voltage tests shall be in accordance with test method 6111 of Fed-Std-228.

4.6.6 INSULATION RESISTANCE.- Each reel of cable shall be subjected to test in accordance with test method 6031 of Fed-Std-228 to determine compliance with the insulation resistance requirements specified in 3.3.3. 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 Fed-Std-228. 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.- 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.- 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.

4.6.11 PREPRODUCTION INSULATION RESISTANCE.- The cable, with bare ends

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kept dry, shall be immersed in a grounded tap water bath and soaked for 20 days. The direct-current insulation resistance shall be measured daily at 3,000V. Any evidence of excessive current leakage due to improper insulation, softening, or swelling of the material shall be cause for rejection.

4.7 INSPECTION OF THE PRESERVATION, PACKAGING, AND PACKING.-The inspection of the preservation, packaging, and packing shall be in accordance with the instructions in 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 to conform to the level specified in the contract or order (see 6.2).

5.1.2 CABLE LENGTHS.-Unless otherwise specified by the procuring activity, cable shall be supplied in continuous lengths of 2,000 feet (see 6.2).

5.1.2.1 TOLERANCES.-The length of the cable supplied shall not vary more than -0 to +10 percent of the value specified in 5.1.2.

5.2 PACKING.-Packing shall be in accordance with MIL-C-12000 to conform to the level specified in the contractor order.

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, AIRPORT LIGHTING CONTROL.

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 300 _____
 Length of cable _____ feet.

6. NOTES

6.1 INTENDED USE.-The cable is intended for use in airport lighting control circuits and will be connected to the terminals of pilot relays and control switches.

6.2 ORDERING DATA.-Procurement documents should specify the following:

a. Title, number, and date of this specification

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- b. Class of cable required (see 1.2).
- c. The length of cable to be supplied (see 5.1.2).
- d. The level of packaging and packing (see 5.1.1 and 5.2).

Custodian:
Air Force - 80

Preparing activity:
Air Force - 80

Reviewers:
Air Force - 80