

Federal Aviation Agency

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ADVISORY CIRCULAR

SUBJECT : SPECIFICATION FOR L-846 ELECTRICAL WIRE FOR LIGHTING CIRCUITS
TO BE INSTALLED IN AIRPORT PAVEMENTS

1. **PURPOSE.** This circular describes the subject specification requirements and is published by the Federal Aviation Agency for the guidance of the public. The use of this specification is required for project activity under the Federal-aid Airport Program.
2. **DESCRIPTION OF PUBLICATION.** The specification requirements presented are for small diameter, thermoplastic insulated electrical wire with an overall polyamide (nylon) jacket to be installed in slots in pavements for circuits supplying in-runway lighting.
3. **APPLICABLE SPECIFICATIONS.** The following American Society for Testing and Materials (ASTM) specifications, military specifications, and Insulated Power Cable Engineers Association (IPCEA) publication of the issue in effect on date of application for qualification (paragraph 8), are applicable to this specification as referred to hereinafter.
 - a. **ASTM Specifications.**
 - (1) B 3 - Soft or Annealed Copper Wire
 - (2) B 8 - Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - (3) D 570 - Method of Test for Water Absorption of Plastics
 - b. **Military Specifications.**
 - (1) MIL-C-13777C - Cable, Special Purpose, Electrical
 - (2) MIL-M-20693A - Molding Plastic, Polyamide (Nylon), Rigid

c. IPCEA Standards Publication.

- (1) No. S-61-402 - Thermoplastic-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

d. Conflicts.

- (1) In the event of conflict between the above-mentioned specifications and this specification, this specification shall govern. Specifications and standards are referred to by basic number or title.
 - (2) Copies of ASTM specifications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pennsylvania, at published prices.
 - (3) Copies of military specifications may be obtained from the Armed Service Electro-Standards Agency, Fort Monmouth, New Jersey.
 - (4) Copies of IPCEA standards publication may be obtained from the Insulated Power Cable Engineers Association, 283 Valley Road, Montclair, New Jersey.
4. MATERIAL AND WORKMANSHIP. The wire shall be a first-grade commercial product, free from defects in material and workmanship which might affect either life or performance. Material shall be as specified hereinafter.
5. TYPE. Only one type wire shall be considered under this specification, and it shall be single conductor wire with 600-volt thermoplastic insulation and an overall jacket of polyamide.

6. DETAIL REQUIREMENTS.a. Conductors.

- (1) Stranded Conductors. All AWG sizes covered by this specification shall be stranded. Conductors shall be stranded in accordance with the applicable section of IPCEA Standards Publication No. S-61-402 for 600-volt wire. The stranding shall be Class C (19 wires). The minimum distance between joints in the completed conductor shall be in accordance with ASTM Specification B 8.
- (2) Material. Electrical conductors shall be soft drawn or annealed copper having an electrical resistivity not higher than that permitted by ASTM Specification B 3.

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- b. Insulation. The single conductor wire shall be insulated its entire length with polyvinyl-chloride insulation meeting the dimensional, electrical, and physical requirements specified in the applicable sections of IPCEA Standards Publication No. S-61-402 and this specification for 75° C. grade wire. The insulation shall be of circular cross section applied concentrically about the conductor and shall fit the conductor tightly. The insulating compound shall be free from pores, splinters, and other defects visible to the unaided eye. The minimum and average thickness of insulation shall be not less than values in Table 1 of this specification.
- c. Insulation Covering. No filler, braid, tape, or other covering between insulation and jacket shall be supplied.
- d. Jacket.
- (1) The polyvinyl-chloride insulation shall be covered with a tight, continuous, extruded polyamide jacket conforming to the dimensional requirements of Table 1. The melting point of specimens of the extruded jacket, excluding conductor and insulation, shall be between 210° C. and 225° C. when tested in accordance with Military Specification MIL-C-13777C. The jacket shall be a black, weather-resistant grade of nylon, and it shall meet all requirements of absorbance and carbon content tests specified in Military Specification MIL-M-20693A.
 - (2) The moisture absorption of the jacket shall not exceed 0.5% when tested in accordance with ASTM Specification D 570.

TABLE 1

Wire Size AWG	Insulating Thickness In Inches		Jacket Thickness In Inches		Maximum O.D. In Inches
	Min.	Avg.	Min.	Avg.	
		Spot		Spot	
14	0.020	0.017	0.006	0.004	0.140
12	0.020	0.017	0.006	0.004	0.160
10	0.030	0.025	0.006	0.004	0.210

- e. Wire Surface Marking. All wire produced under this specification shall be identified by markings continuously spaced. The markings shall be permanent and of a color that will provide good contrast with the black jacket. Such markings shall not materially affect the smoothness of the wire jacket. The wire identification shall give the following information:

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- (1) Manufacturer's name or trademark.
- (2) Conductor size.
- (3) Voltage rating.
- (4) Identification: FAA L-846.
- (5) Year of manufacture.
- (6) Additional information may be included if the manufacturer so desires.

7. SAMPLES AND TESTS.

- a. Samples. Samples of insulated conductors and completed wire shall be supplied in such lengths and quantities as required for the tests performed at the testing laboratory.
- b. Testing. The wire and its constituent parts shall be subjected to the electrical and physical tests described below and the applicable detail requirements under paragraph 6.

(1) Electrical Tests.

- (a) AC High Voltage Test on Completed Wire. An AC high voltage test shall be conducted on all wire after application of the jacket. The wire shall withstand, for 5 minutes, a 60-cycle voltage of approximately sine wave form whose value is not less than 3000 volts rms. The test shall be conducted in accordance with applicable sections of IPCEA Standards Publication No. S-61-402.
- (b) Insulation Resistance Test on Completed Wire. An insulation resistance test shall be conducted on all wire after completion of AC high voltage test. Test procedures shall be in accordance with the applicable sections of IPCEA Standards Publication No. S-61-402, and the values of insulation resistance shall be not less than those listed in the above publication.
- (c) Accelerated Water Absorption Requirements - Electrical Method (EM-60) at 75° C. ±1° C. This test shall be in accordance with applicable sections of IPCEA Standards Publication No. S-61-402, and the increase in capacitance shall not exceed the following:

1 to 14 days	-----	3.0%
7 to 14 days	-----	1.5%
14 to 28 days	-----	1.5%

(d) Dielectric Retention. A dielectric retention test shall be conducted on the insulation of the wire as outlined in applicable sections of IPCEA Standards Publication No. S-61-402.

(2) Physical Test. The physical test for the insulation shall be in accordance with applicable sections of IPCEA Standards Publication No. S-61-402, unless otherwise specified.

(a) Physical and Aging Requirements.

1 Original.

Tensile Strength, Minimum ----- 2500 psi
Elongation at Rupture, Minimum ----- 200%

2 After Oven Aging at 121° C. for 168 Hours.

Tensile Strength, Minimum ----- 90% of Original Value
Elongation at Rupture, Minimum --- 85% of Original Value

3 Cold Bend. At -25° C. ±1° C., 6 turns (one every 3 seconds) around a mandrel twice the insulated diameter, no cracks.

(b) Crushing Test. A sample of completed wire shall be placed in a compression machine between two 2-inch wide flat steel plates mounted parallel. The plates shall be closed at the rate of ½ inch per minute until conductor is grounded to steel plate. Low voltage buzzer circuit may be employed. Considering 10 trials the average force required to cause failure shall be not less than 3000 pounds.

(c) Abrasion Test. A sample of completed wire shall be subjected to an abrasion test on a horizontal reciprocating table under steel plungers. The plungers, V-shaped, smoothly finished, and positioned at right angles to the axis of the sample, shall exert a pressure of three (3) pounds on the wire while the motion of the table is approximately 30 cycles per minute. One back and forth motion shall be considered one cycle. Considering 6 trials the minimum average number of cycles required to wear through the outer jacket and insulation to expose the copper conductor shall be not less than 300 cycles.

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8. QUALIFICATION.

- a. The manufacturer shall furnish a sample, or samples, to a disinterested testing laboratory to be tested as described in paragraph 7 to obtain certification regarding the ability to manufacture wire meeting the requirements of this specification. The disinterested testing laboratory shall be a laboratory acceptable to the Federal Aviation Agency, Airports Service, Washington, D.C. 20553. The manufacturer shall furnish two copies of the testing laboratory's reports to the Airports Service for review and approval consideration. Upon approval of test reports which show satisfactory certification of compliance, the Airports Service will list the name of the qualified manufacturer and a description of their wire in the "Approved Airport Lighting Equipment" publication. The cost of the testing shall be borne by the manufacturer offering the material for qualification.
- b. Qualification of one AWG size conductor will be acceptable as proof of compliance for all other AWG sizes of conductors having the same type insulation and the same voltage rating. Adequate lengths of samples, plainly marked as to voltage and conductor size, shall be forwarded to the testing laboratory.
- c. At any time after approval has been granted under the above conditions, a certified copy of factory test reports on the latest production run of any size of wire produced under this specification shall be made available by the manufacturer upon written request by the Federal Aviation Agency, Airports Service, Washington, D.C. 20553.

9. HOW TO GET THIS PUBLICATION.

- a. Order additional copies of this circular from:

Federal Aviation Agency
Distribution Unit, HQ-437
Washington, D.C. 20553

- b. Identify the publication in your order as:

FAA Advisory Circular No. 150/5345-30
Specification for L-846 Electrical Wire for Lighting Circuits
to be Installed in Airport Pavements
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- c. There is no charge for this publication.


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