26475 Cancelled 5340.4C

Federal Aviation Agency

AC NO: AC 150/5345-30A
AIRPORTS
EFFECTIVE: 2/3/67

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 for electrical wire and is published for the guidance of the public.

2. CANCELLATION. AC 150/5345-30, Specification for L-846 Electrical Wire for Lighting Circuits to be Installed in Airport Pavements, is cancelled.

3. APPLICABLE PUBLICATIONS. The following publications of the issue in effect on date of application for qualification (see paragraph 11) apply to this circular. This circular shall govern in case of conflict.

   a. American Society for Testing and Materials Specifications.

      (1) B 3 - Soft or Annealed Copper Wire.

      (2) B 8 - Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

      (3) D 789-62T - Nylon Injection Molding and Extrusion Materials.

   b. Insulated Power Cable Engineers Association Standards Publication. IPCEA Standards Publication is No. S-61-402 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

4. SOURCE OF APPLICABLE PUBLICATIONS.

   a. Obtain copies of ASTM specifications from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania, 19103.

   b. Obtain copies of IPCEA Standards Publication from the Insulated Power Cable Engineers Association, 283 Valley Road, Montclair, New Jersey 07042.

5. EXPLANATION OF REVISIONS. The requirements for the jacket covering the wire and abrasion test have been revised to conform with industry standards.

6. SCOPE OF SPECIFICATION. The specification requirements presented are for small diameter, thermoplastic-insulated electrical wire with an overall nylon jacket. The wire is to be installed in slots in pavements for circuits supplying in-runway lighting fixtures.

7. 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.

8. TYPE. The type wire considered under this specification shall be single conductor wire with 600-volt thermoplastic insulation and an overall jacket of nylon.

9. DETAIL REQUIREMENTS.

   a. Conductors.

      (1) Stranded Conductors. All AWG sizes of conductors covered by this specification 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.

   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 the values shown in Table 1.

c. Insulation Covering. No filler, braid, tape, or other covering between insulation and jacket shall be used.

d. Jacket. The polyvinyl-chloride insulation shall be covered with a tight, continuous, extruded black weather-resistant, nylon jacket. The insulation and jacket shall conform to the dimensional requirements of Table 1. The nylon resin for the jacket shall conform to ASTM D 789-62T, Type III, Grade 2 with the additional requirement that it shall contain finely divided carbon black as defined in Table 2. The test procedures for the properties listed in Table 2 are contained in paragraph 10b(3).

TABLE 1. PHYSICAL CHARACTERISTICS

Wire Size AWG	Insulation Thickness In Inches		Jacket Thickness In Inches		Maximum Outside Diameter In Inches
	Min. Avg.	Min. Spot	Min. Avg.	Min. 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

TABLE 2. PROPERTIES TO BE TESTED

Melting Point	210°C. - 225°C.
Elongation at Break	150 Percent Minimum at 73°F.
Chemical Resistance, 4.2 molar HCL, minimum time to dissolve	1 hour minimum
Carbon Content	1.90 - 2.25 Percent
Absorption	.23 Percent Minimum

e. Wire Surface Marking. All wire produced under this specification shall be identified by markings continuously spaced. The markings shall be permanent and shall be 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:

(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.

10. SAMPLES AND TESTS.

a. Samples. Samples of insulated conductors and completed wire shall be supplied in lengths and quantities as required for the tests performed at the testing laboratory.

b. Tests. The wire and its constituent parts shall be subjected to the electrical and physical tests described below and the applicable detail requirements under paragraph 9.

(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 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 therein.

(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 percent
7 to 14 days	1.5 percent
14 to 28 days	1.5 percent

(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 p.s.i.
Elongation at Rupture, Minimum	200 percent

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

Tensile Strength, Minimum	90 percent of original value
Elongation at Rupture, Minimum	85 percent of original value

3 Cold Bend. The wire shall be bent around a mandrel twice the insulated diameter for six turns at the rate of one turn every three seconds while the temperature is at -25°C. ±1°C.

(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 1/2 inch per minute until the conductor is grounded to the steel plates. A 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.

1 Six specimens of completed wire shall be cut to length of approximately 9 inches. The specimens shall be laid flat and parallel on a reciprocating table which operates at the rate of 30 cycles per minute traveling about 8 inches. On the jacket of each specimen there shall be a steel plunger weighted to 3 pounds. Each plunger shall have three parallel serrated edges, each pair forming a "V", as indicated in Figure 1. The edges shall be at right angles to the axis of the specimen during tests.

2 The specimens shall be in contact with the plunger while the motion of the table is operating at approximately 30 cycles per minute. One back and forth motion shall be considered one cycle. Considering 6 trials, the number of cycles required to wear through the outer jacket and insulation to expose the copper conductor shall be not less than 300 cycles.

(3) Jacket.

(a) Melting Point. This test shall be performed in accordance with ASTM D 789-62T. The melting point of the jacket shall be within the range of 210°C. to 225°C.

(b) Elongation at Break. Specimens of nylon jackets are removed from the wire construction. The specimens are elongated in a tensile tester at a rate of 2 inches per minute. The minimum percent elongation at 73°F. shall be 150.

(c) Chemical Resistance. A sample of the nylon jacket is placed in 4.2 molar hydrochloric acid at room temperature to determine visually whether the resin dissolves or remains unaffected by the acid. The minimum time for the jacket to dissolve shall be one hour.

(d) Carbon Content. The method of test shall be based on the hydrolysis of nylon resin to soluble products with nitric acid with subsequent removal of carbon from the solution by filtration. The carbon content shall be within the range of 1.90 - 2.25 percent.

(e) Absorption. A dispersion of carbon black in phenol shall be obtained by dissolving carbon-filled nylon in 85 percent phenol. The amount of light scattered by the carbon black dispersion shall be measured in a 1 centimeter (cm) Pyrex absorption cell at 578 millimicrons in a spectrophotometer. The minimum absorption is 0.23 percent.

11. QUALIFICATION.

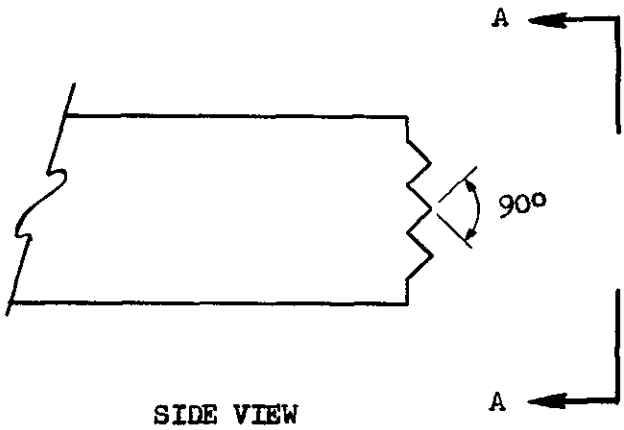
a. The manufacturer shall furnish a sample, or samples, to a disinterested testing laboratory to be tested as described in paragraph 10 to obtain certification regarding the ability to manufacture wire meeting the requirements of this specification. The disinterested testing laboratory shall be a laboratory 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 AC 150/5345-1A, Approved Airport Lighting Equipment. 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.

12. HOW TO GET THIS CIRCULAR. Obtain additional copies of this circular, AC 150/5345-30A, Specification for L-846 Electrical Wire for Lighting Circuits to be Installed in Airport Pavements, from the Federal Aviation Agency, Distribution Unit, HQ-438, Washington, D.C. 20553.

Director,
Airports Service



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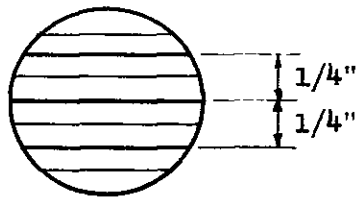
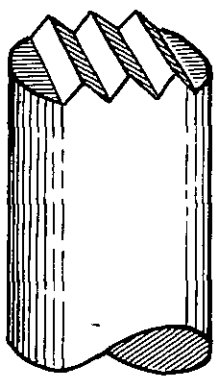


VIEW A-A



TOOL FOR
ABRASION TEST

NOTES:

1. The blades are three sharp chiseled edges formed from 90° cuts in the plunger head.

2. The metal is tool steel alloy hardened to Rockwell C62 after machining.

FIGURE 1. ABRASION TEST