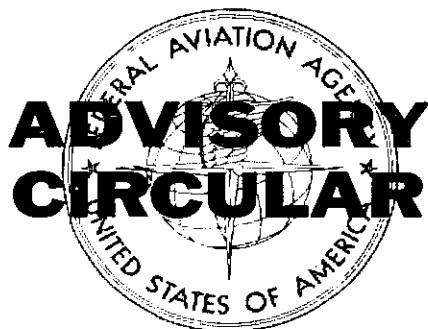


Cancelled by 150/5345-46

Federal Aviation Agency



AC NO: AC 150/5345-16

AIRPORTS

EFFECTIVE :

1/20/64

SUBJECT : SPECIFICATION FOR L-843 AIRPORT
IN-RUNWAY TOUCHDOWN ZONE LIGHT

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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 a semiflush unidirectional light for installation in airport runway pavements. It may be used for lighting in the touchdown zone area or other lighting applications as recommended by this Agency. The receptacle may be built for either inset installation in pavement or for mounting on a large-size light base and transformer housing.
 3. APPLICABLE SPECIFICATIONS. The following specifications, as referred to hereinafter, of the issues in effect on date of application for qualification (paragraph 9) are applicable to this specification. In case of conflict between this specification and the applicable specifications, this specification shall govern.
 - a. FAA Specifications. Copies of the FAA specifications may be obtained from the Federal Aviation Agency, Distribution Section, HQ-438, Washington, D. C. 20553.
 - (1) L-823 - Plug and Receptacle, Cable Connectors.
 - (2) L-837 - Large-Size Light Base and Transformer Housing.
 - b. Federal Specifications. Copies of the Federal specifications may be obtained from the appropriate Regional General Services Administration Office.
 - (1) QQ-P-416 - Plating, Cadmium (Electrodeposited).
 - (2) QQ-Z-325 - Zinc Coating, Electrodeposited, Requirements for.
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- c. Military Specification. Copies of the Military specification may be obtained from the Armed Services Electro-Standards Agency, Fort Monmouth, New Jersey.

(1) MIL-C-7989 - Covers, Light-Transmitting, for Aeronautical Lights, General Specification for.

4. MATERIAL AND WORKMANSHIP. All components and materials shall be of industrial quality or better. Workmanship shall be in accordance with high-grade commercial practice.
5. TYPES. The light shall be made in either of two types as follows:
- a. Type "A" - With receptacle for inset installation.
 - b. Type "B" - With receptacle for base-mounted installation.
 - c. If both types are made, the top fittings shall be built to fit either type of receptacle without modifications.
6. PERFORMANCE REQUIREMENTS.
- a. The semiflush lights shall be designed to provide a light distribution not less than the minimum candela values shown on Figure 1.
 - b. All current carrying parts of the light shall be capable of carrying at least 10 amperes at fixture operating temperatures.
 - c. The light shall be designed and constructed for continuous outdoor operation under all conditions including:
 - (1) Temperature. Any ambient temperature from a minimum of -45° F. to a maximum of 120° F. at sea level.
 - (2) Service. The light unit shall be designed and constructed to withstand normal maintenance and/or aircraft operations.
7. DETAIL REQUIREMENTS.
- a. Optical Systems. The optical system shall consist of a clear glass lens, or lenses, and may include a reflector or baffle shield that will redirect the light from the lamp into a beam which will meet the specified candela requirements. The lenses shall be fabricated from heat-resistant glass conforming to Military Specification MIL-C-7989, Class B, except that the glass shall be tempered to withstand the following shock test. Samples shall be heated in an oven at 150° C. +5° C. for 1 hour. They shall then be immersed in water at a temperature of 5° C., or less, without cracking. The lenses shall be cemented or gasketed and securely held in place so that excessive

stresses are not imposed on the glass during any of the specified load, stress, or service conditions. The lens sealer shall be installed so that a satisfactory waterproof seal is maintained under conditions specified in paragraph 6c. The external surface of the lenses, when installed, shall be smooth. Reflectors shall be either silvered glass or aluminum with a highly specular finish similar to "ALZAK" or an approved equal. The reflectors shall be designed and installed to perform satisfactorily under all conditions specified in paragraph 6c.

b. Top Fitting.

- (1) The top fitting shall be designed to meet the test loading requirements and to mount on the receptacle. The top fitting may be constructed so as to form a watertight self-contained, sealed unit, even when removed from the receptacle. When it is not a self-contained sealed unit, the top fitting shall be designed to form a watertight unit when assembled and tightened to the receptacle with the correct torque. The top fitting shall be designed so that it does not project more than 1/2 inch above the adjacent pavement when the unit is properly installed. All edges above the pavement and on the outside of the top fitting shall be rounded. All outside surfaces projecting above the pavement shall slope upward from the pavement at an angle not exceeding 10° above the horizontal.
- (2) The top fitting shall be made of a suitable material capable of meeting the loading requirements. The material shall have a minimum tensile strength of 50,000 psi and a hardness of at least 163 Brinell.
- (3) The top fitting may contain the optical system, including the lens, or lenses, lampholder, and contacts for connection to contacts in the receptacle. Bolts, screws, clips, and similar parts shall be made of 18-8 stainless steel. Electrical contacts shall be fine silver (99.9% Ag minimum). As required, the top fitting shall be provided with an external rib, or other suitable means, in the area of the glassware to permit aircraft arrestment tailhooks to ride over the light without damaging the light or the tailhooks.
- (4) Any wire utilized in the top fitting shall be suitably insulated for the temperatures involved and positioned or secured so as to prevent damage and contact with the receptacle when assembled.
- (5) The top fitting shall be designed with respect to the receptacle so that it will be properly oriented with the pavement centerline when installed. In addition, suitable provisions shall be made for prying or jacking the top fitting free of the receptacle when installed in the pavement.

- (6) The top fitting shall be secured to the receptacle with 18-8 stainless steel bolts, screws, studs, or other means of fastening.
- (7) The top fitting shall be suitably protected to prevent rust from deteriorating it.

c. Lamp and Lampholder. A quartz tube, 6.6 ampere series lamp having a rating of 4400 lumens, 500-hour life, and 200 watts shall be used in the light fixtures. An assembly consisting of the above lamp and its holder shall be designed to position and hold the quartz lamp in the designed location with respect to the lens and reflector under the service conditions specified in paragraph 6c(2). This assembly (lamp and lampholder) shall be so designed that consistent optical performance of the fixtures can be guaranteed in accordance with specification requirements. The above performance requirements shall be obtained when the units are furnished with these components or when any part of the installed assembly is replaced.

d. Receptacle.

- (1) The receptacle, or base part of the fixture, shall be designed to hold the top fitting in place by means of bolts, studs, screws, nuts, or other suitable means of fastening. Where the top fitting is a self-contained sealed unit, no gasketing will be required between the top fitting and receptacle except as required to seal the electrical contacts. In such a case, the ungasketed voids between the top fitting and the base receptacle shall be held to a minimum to prevent damage by ice formation in these voids. Where the top fitting is not a self-contained unit, gasketing must be provided to prevent entrance of moisture. The gasket shall be installed in a position to assure a leakproof fixture. The receptacle shall contain contacts to provide power to the top fitting and two attached leads to connect the light to the system power supply. The contacts shall be constructed so as to be removable after installation of the receptacle in a paved area. All edges above the pavement shall be rounded. The receptacle shall have no part which projects more than 1/2 inch above the adjacent pavement when properly installed.
- (2) The receptacle shall be suitably protected to prevent rust from deteriorating the unit.
- (3) Type "A" Receptacle.
 - (a) The Type "A" receptacle shall be designed for installation in a recess in the pavement. The receptacle shall have a total depth of no more than 3 inches at the periphery and an overall diameter of 11-15/16 inches +0 inch, -1/16 inch. Any portion of the receptacle rising above the pavement shall

conform to the material, tensile strength, hardness, and shape requirements of paragraphs 7b(1) and 7b(2). All portions of the receptacle below the pavement level shall be made of the same material or other suitable ferrous or nonferrous metal.

- (b) The bottom of the receptacle shall have sufficient channels or slots so that the pigtail leads from the body can be brought out side-by-side from any one of four slots at the circumference of the bottom. The slots shall extend up the sides of the main body so that the pigtail leads can be brought out within 1-1/2 inches of the top edge of the main body. The slots shall be located on lines parallel and perpendicular to the axis of the beam emitted by the light.
- (c) An arrow pointing in the direction of the horizontal beam axis and the words "parallel with centerline" shall be cast or stamped into the upper surface of the receptacle.

(4) Type "B" Receptacle.

- (a) The Type "B" receptacle shall be designed for mounting on a base conforming to FAA Specification L-837. The top surface of this base is to be installed 1-3/8 inches below the surface of the surrounding pavement. The receptacle shall be so designed that the top fitting can be correctly oriented with respect to the centerline when the receptacle is mounted on an L-837 base whose bolt holes are randomly oriented with respect to the centerline.
- (b) The receptacle shall be cast from a suitable material such as malleable iron. The material shall have a yield strength of at least 32,500 psi and a hardness of at least 163 Brinell. It shall have an outside diameter of 17 inches and a central area identical with that of the Type "A" receptacle. When the receptacle is installed on the base and properly gasketed, its outer edge shall be designed to be flush with the pavement. The upper surface of the receptacle, from its outer edge to a central 11-15/16 inch diameter circle, shall lie in the plane established by the upper edge of the periphery of the receptacle.
- (c) The upper surface of the receptacle inside the central 11-15/16 inch diameter circle shall be identical with the inside surface of the Type "A" receptacles designed to be furnished under paragraph 7d(3) above, and shall receive and properly orient the same top fitting as designed for use in the Type "A" receptacle.

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- (d) The lower portion of the receptacle shall have a diameter of 12.188 inches (+.020, -.040) extending at least 1/4 inch down into the base to prevent excessive side motion when the light is struck. An arrow pointing in the direction of the horizontal beam axis and the words "parallel with centerline" shall be cast or stamped into the upper surface of the receptacle.
- (e) Bolts and gasketing for mounting the receptacle on the base shall be furnished with the assembly. All bolts shall be stainless steel and capable of easy removal with a standard socket wrench. The gasket for mounting the receptacle on the base shall be silicone rubber, 1/8 inch in thickness, and punched for the fixture mounting bolts.

e. Receptacle Leads.

- (1) Type "A" Receptacle. Two pigtail leads shall be suitably and permanently connected to contacts through insulating sleeves extending through the bottom of the receptacle. The insulating sleeves shall be made of nylon or of an equally suitable material. The leads for the Type "A" receptacle shall be single conductor, 600 volt, No. 12 AWG, with suitable plastic insulation rated for operation at 105° C. or higher. The leads shall have at least 19 strands. Each lead shall be not less than 24 inches long nor more than 0.2 inch in overall diameter, and its connection to the contact shall be sealed with a high heat-resistant insulating material.
- (2) Type "B" Receptacle. The leads for the Type "B" receptacle shall be supplied as an integral part of the receptacle and shall terminate in a plug for connection to the secondary electrical receptacle of the insulating transformer. The leads shall consist of two single conductors, 16 inches in length, 600-volt minimum, No. 12 AWG standard cord conforming to the provisions of the Underwriters' Laboratories, Incorporated, requirements for Type SO cord. These leads shall terminate in a molded plug conforming to Figure 1a of FAA Specification L-823, "Plug and Receptacle, Cable Connectors."

- f. Finishes. Ferrous castings shall be zinc plated in accordance with Federal Specification QQ-Z-325, Class 2, Type I; or cadmium plated in accordance with Federal Specification QQ-P-416, Class 1, Type I.
- g. Parts List and Installation Instructions. A complete parts list and installation instructions shall be furnished with each new installation. The parts list and installation instructions shall also be furnished with individual assemblies shipped for maintenance or replacement purposes. Sufficient drawings or illustrations shall be provided to indicate clearly the method of assembly and installation.

8. TESTING.

- a. Qualification Testing. One sample unit of each type of lighting fixture submitted for approval shall be subjected to and checked for compliance with the electrical and physical tests described below and in paragraph 8b. If desired, more than one fixture may be subjected to the test series. This may be done to avoid interruption to the testing in the event of accidental damage to a fixture in the course of the series.

(1) Photometric Tests.

- (a) The optical performance of the unit shall be determined by photometric readings with a clear lens and the type lamp for which the unit is designed. The lamp shall be operated at its rated lumen output, or readings shall be corrected to its rated lumen output. The photometric axis of the fixture shall be established in relation to a fixture properly installed in the pavement with the horizontal axis lying in the plane of the pavement, passing through the center of the fixture, and parallel to the centerline. The vertical axis shall lie on a line passing through the center of the fixture, perpendicular to the pavement plane.
- (b) The light shall meet the requirements shown in Figure 1. The horizontal candela distribution shall be measured at least through elevation angles of 0°, 2°, 3-1/2°, 5°, and 7°; and the vertical candela distribution shall be measured along the lateral axis.

- (2) High Temperature Test. The light shall be subjected to a high temperature of 55° C. \pm 2° C. for a period of 7 hours with the lamp operating at rated current. Any abnormal bulb blackening, blistering, smoking, corrosion, or other evidence of heat damage to any part shall be cause for rejection.

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- (3) Leakage Test. The light unit shall be submerged in water and subjected to an internal air pressure of 10 psi for a minimum of one minute. Any air leakage shall be cause for rejection.
- (4) Cycling Test. The light unit shall be assembled and the receptacle sealed in a test block to simulate an installation in a runway. The fixture shall be subjected to a cycling test by operating the unit at room temperature (dry) for a period of not less than 4 hours. At the expiration of the "ON" part of the cycle, the fixture shall be de-energized and immediately submerged under at least 1 foot of water. The temperature of the water before submersion shall be 5° C. or lower. The unit shall remain under water for at least 4 hours. At the expiration of the "OFF" part of the cycle, the fixture shall be subjected to a repetition of the above tests until a total of three "ON-OFF" cycles have been completed. The fixture shall be immediately opened at the completion of the third cycle and inspected. Any evidence of glass breakage, penetration of water into the lamp compartment, damage to any part of the unit, or equipment failure during the test shall be cause for rejection.
- (5) Insulation Resistance Test. The assembled light shall be operated at 6.6 amperes in distilled water, at room temperature, until the voltage across the pigtail leads has reached a stable value for at least 10 minutes. The stabilized value of voltage at 6.6 amperes shall be measured and recorded. The light, except for the ends of the leads, shall then be completely submerged in a bath containing a saturated salt solution and operated continuously. The salt water bath shall be adequately grounded. A uniform temperature between 60° to 80° F. shall be maintained throughout the solution by occasional stirring. The current through the pigtail leads shall be maintained at 6.6 amperes during this immersion. After 3 hours or more of operation in the bath, the voltage across the pigtail leads shall be adjusted to, and maintained at, the recorded value, and current readings shall be taken under the conditions specified in paragraphs 8a(5)(a), 8a(5)(b), and 8a(5)(c) below.
- (a) With one pigtail lead grounded.
 - (b) The ground removed from the first lead and the other pigtail lead grounded.
 - (c) With neither of the pigtail leads grounded.
 - (d) If any of the three current readings exceeds 6.7 amperes, the light shall be rejected.

- (6) Low Temperature Test. The light fixture shall be totally immersed in water and, while immersed, subjected to a low temperature of -45° F. for a period of 24 hours. This shall result in a total encasement of the fixture with a minimum of 1 inch of ice on all exposed surfaces. Immediately following the 24-hour period, the fixture shall be operated for 30 minutes or until free of ice. This test shall be repeated for a total of three cycles. Any evidence of damage shall be cause for rejection.
- (7) Accelerated Life Test. The light shall have an accelerated life test performed on it after it has successfully passed all the above tests. The fixture shall be set in dry sand simulating its installation in pavement. The sand shall be at least 3 inches thick around the sides and bottom of the receptacle. Fine sand shall be spread over the fixture to fill any openings in the assembled fixture which would be below pavement level. The unit shall then be operated for at least 360 hours at rated current and at room temperature. After this, all sand shall be removed and the photometric performance of the unit shall be measured as described in paragraph 8a(1). Light values must at least equal 80 percent of those specified in Figure 1. After this test, the unit shall be taken apart and thoroughly examined. Any deformation, blistering, evidence of heat damage, or corrosion shall be cause for rejection.
- (8) Load Test. The load test shall be the final test.
- (a) The Type "A" light shall be subjected to the following static load test. The assembled fixture with top fitting, lamp, and receptacle shall be placed on a flat steel plate mounted in a standard testing machine. This test mounting shall simulate the actual fixture installation. The load shall be applied on the center of the fixture through a block of rubber, 11 inches in diameter and 1-1/2 inches thick, having a Shore A hardness of 55 to 70. A total load of 100,000 pounds shall be applied uniformly over the area of the fitting at a rate not greater than 10,000 pounds per minute. The light shall be considered unsatisfactory if there is any permanent deformation, cracking of material or finish, breaking, or damage to any part of the light.
- (b) The Type "B" light shall be subjected to the same static load tests as prescribed above for the Type "A" light except for the following:
- 1 The assembled Type "B" fixture shall be placed on a flat steel ring having essentially the same dimensions as the top flange of the L-837 base.

2 The rubber block shall be 16 inches in diameter.

3 A total load of 150,000 pounds shall be applied.

- b. Production Test. Each production unit shall be subjected to the leakage test specified in paragraph 8a(3).
- c. Additional inspection and tests shall be made as deemed necessary by the Federal Aviation Agency, Airports Service, Washington, D. C. 20553, to determine compliance with this specification.

9. QUALIFICATION.

- a. The manufacturer shall furnish lighting fixtures to a disinterested testing laboratory to be tested as described in paragraph 8a to obtain certification regarding the ability to manufacture equipment 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 2 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 equipment in Advisory Circular No. 150/5345-1, "Approved Airport Lighting Equipment." The cost of the testing shall be borne by the manufacturer offering the material for qualification.
- b. The manufacturer shall provide certification from the lens manufacturer that the lens assembly meets the transmissivity, color, and ware requirements of referenced specifications under paragraph 7a.
- c. Parts lists and installation instructions shall be submitted to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553, for review.
- d. 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 equipment 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.

10. HOW TO GET THIS PUBLICATION.

- a. Order copies of this advisory circular from:

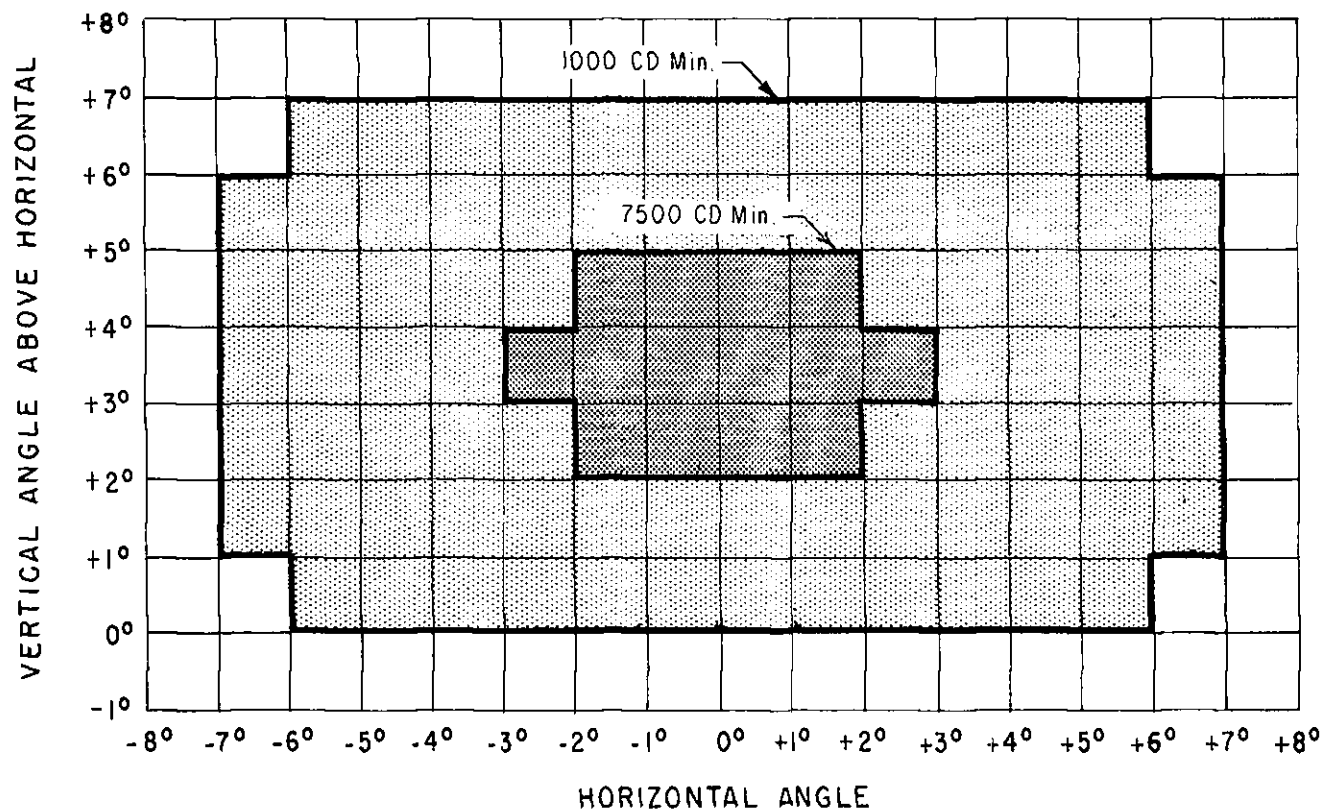
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Specification for L-843 Airport In-Runway Touchdown Zone Light
Dated 1/20/64

- c. There is no charge for this publication.


for Cole Morrow, Director
Airports Service



NOTE: A $\pm 1/2^\circ$ vertical shift and a $\pm 1^\circ$ horizontal shift is permitted for qualification.

FIGURE 1. - ISOCANDELA CURVE