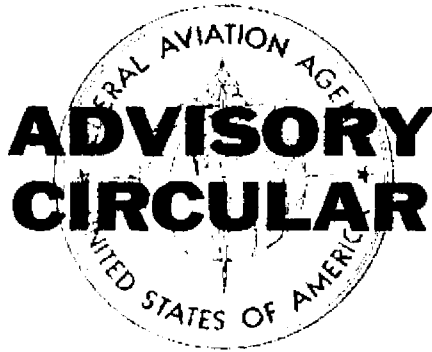


Federal Aviation Agency



AC NO : AC 150/5345-15

AIRPORTS

EFFECTIVE :

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SUBJECT : SPECIFICATION FOR L-842 AIRPORT CENTERLINE LIGHT

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. **CANCELLATION.** This advisory circular cancels and replaces FAA Specification L-842, "Airport Centerline Light," dated July 31, 1961. The substantive changes in this advisory circular are the revision of the optical requirements for the light fixture and the addition of new qualification and production tests.
3. **DESCRIPTION OF PUBLICATION.** The specification requirements presented are for a semiflush light for use on airport pavement centerlines. The fixture shall consist of two major parts, a metal top fitting and a metal receptacle. The receptacle may be built either for inset installation in pavement or for mounting on a light base and shall incorporate leads for attachment to the external circuit.
4. **APPLICABLE SPECIFICATIONS.** The following specifications, as referred to hereinafter, of the issues in effect on the date of application for qualification (paragraph 10) 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) Specification for L-809 Airport Light Base and Transformer Housing, AC 150/5345-6.
 - (2) L-834 - Individual Lamp Series-to-Series Type Insulating Transformer for 5000 Volt Series Circuit.

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- 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.

- c. Military Specifications. Copies of the Military specifications 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.

(2) MIL-C-25050(ASG) - Colors, Aeronautical Lights and Lighting Equipment, General Requirements for.

5. MATERIALS AND WORKMANSHIP. All components and materials shall be of industrial quality or better. Workmanship shall be in accordance with high grade commercial practice.

6. TYPES AND STYLES.

- a. The light shall be made in either of 2 types as follows:

(1) Type I - Unidirectional.

(2) Type II - Bidirectional.

- b. The light shall be made in either of 2 styles as follows:

(1) Style "A" - With receptacle for inset installation.

(2) Style "B" - With receptacle for base mounted installation.

- c. If both styles are made, the top fitting shall be built to fit on either type receptacle.

7. PERFORMANCE REQUIREMENTS.

- a. The semiflush lights shall be designed to provide a light distribution corresponding to the candela values shown on Figure 1.

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- b. All current carrying parts of the light shall be capable of carrying at least 10 amperes at fixture operating temperature.
- 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.

8. DETAIL REQUIREMENTS.

- a. Optical System. The optical system shall consist of a glass lens, or lenses, and may include a reflector or baffle shield that will redirect the light from the lamp into beams which will meet the specified candela requirements. The lenses shall be clear glass fabricated from heat-resistant glass conforming to Military Specification MIL-C-7989, Class B. 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 loads, stresses, or service conditions. The lens sealer shall be installed so that it will not be damaged by aircraft operations and so that a satisfactory waterproof seal will be obtained. 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 or equal to "ALZAK". They shall be designed and installed to perform satisfactorily under all conditions specified in paragraph 7c.
- b. Color Filters.
 - (1) Color filters, when required, shall be fabricated from heat-resistant glass conforming to Military Specification MIL-C-7989, Class B, except that the filters shall be tempered to withstand the following shock test. Samples, as specified, shall be heated in an oven at 200° C., $\pm 5^{\circ}$ C., for 1 hour. They shall then be immersed in water at a temperature of 5° C. or less without cracking.
 - (2) Glass used for the filters shall comply with the requirements for nondiffusing ware, Type I, Grade B, in accordance with Military Specification MIL-C-25050.
- c. 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

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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 3/8 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.

- (2) The top fitting shall be made of a suitable material capable of meeting the loading requirements. Where malleable iron is used, it shall have a minimum tensile strength of 50,000 psi and a hardness of at least 163 Brinell.
- (3) The top fitting shall contain the optical system, consisting of lens, or lenses. It may contain the lampholder, bypass device, filter holder, and contacts for connection to contacts in the receptacle. Bolts, screws, clips, and similar parts shall be made of stainless steel. Electrical contacts shall be fine silver (99.9% Ag minimum). Filter holders shall be designed to minimize heat or mechanically induced stresses in the filters.
- (4) Any wire utilized in the top fitting shall be suitably insulated for the temperatures involved and positioned or secured so as to prevent 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 stainless steel bolts, screws, studs, or other means of fastening.
- (7) The top fitting shall be suitably protected to prevent rust from deteriorating it.

- d. Lamp and Lampholder. A quartz tube, 6.6 ampere series lamp having a rating of 630 lumens, 1,000 hours life, and 45 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 an exact location with respect to the lens or lenses under the service conditions specified in paragraph 7c(2). This assembly (lamp and lampholder) shall be identified by the fixture manufacturer with specific parts numbers in order 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.

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- e. Lamp Bypass Devices and Holder. A film disc cutout or other suitable device which, when the lamp fails, will immediately close an auxiliary circuit around the lamp, shall be furnished with each fixture. A holder shall be provided to contain the bypass device. Where a film disc cutout is utilized, it shall be clamped in place with pressure as specified by the manufacturer. Necessary wires or current carrying members shall be installed to provide a path for the current to flow through the bypass device when the circuit through the lamp has been opened.
- f. Receptacle. The receptacle, or base part of the fixture, shall be designed to hold the top fitting in place by means of adequate stainless steel 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 un-gasketed 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 receptacle shall contain contacts to provide power to the top fitting and 2 pigtail wires to connect the light to the system power supply. These contacts shall be constructed so as to be removable after installation of the receptacle in a paved area. The receptacle may also contain the lamp, bypass device, and its holders. All edges above the pavement shall be rounded. The receptacle shall have no part which projects more than 3/8 inch above the adjacent pavement when properly installed.

(1) Style "A" Receptacles.

- (a) The receptacle shall be designed for installation in a recess of suitable depth in the pavement. The receptacle shall have a total thickness of not more than 1-1/2 inches (+1/32 inch) at the periphery and an overall diameter of 7-15/16 inches (+0, -1/16 inch). Any portion of the receptacle rising above the pavement shall conform to the material, tensile strength, hardness, and shape requirements of paragraph 8c. All portions of the receptacle below pavement level shall be made of the same material or of suitable ferrous or nonferrous metal. If nonferrous metal is used, threaded corrosion-resistant steel inserts shall be provided to receive securing hardware as required.
- (b) Provisions shall be made for the leads to exit flush with the bottom of the receptacle at 4 locations--2 perpendicular to, and 2 parallel with, the beam axis. An arrow pointing in the direction of the horizontal beam and the words "parallel with centerline" shall be cast or stamped into the upper surface of the receptacle.

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(2) Style "B" Receptacles.

- (a) The receptacle is to be designed for mounting on a base conforming to AC 150/5345-6. The top surface of the base is to be installed $3/4$ inch 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 a light 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 tensile strength of at least 50,000 psi and a hardness of at least 163 Brinell. It shall have an outside diameter of 12 inches and a central area identical with that of the Style "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 7-15/16-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 7-15/16-inch diameter circle, shall be identical with the surface of Style "A" receptacles designed to be furnished under paragraph 8f(1) and shall receive and properly orient the same top fitting as designed for use in the Style "A" receptacle.
 - (d) The bottom portion of the receptacle shall have an outside diameter of 7.812 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) Adequate stainless steel bolts and gasketing for mounting the receptacle on the base shall be furnished with the assembly. All bolts shall be capable of easy removal with a standard socket wrench.
- g. Leads. Two pigtail leads shall be suitably and permanently connected to insulated silver plated contacts extending through the bottom of the receptacle. Insulating sleeves shall be made of teflon or of an equally suitable material. The leads for the recess mounting shall be single conductor, 600 volt, No. 12 AWG, with suitable plastic insulation (105° C.) and at least 19 strands. Each lead shall be not

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less than 18 inches long, nor more than 0.20 inch in overall diameter. The connection between the wire and its contact shall be sealed with a high heat-resistant insulating material.

- h. 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. Aluminum castings shall be painted overall with a suitable finish equal to clear, high, heat-resistant acrylic baked enamel.
- i. 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.

9. TESTING.

- a. Approval Testing. One sample unit of each type and style of lighting fixture submitted for approval shall be subjected to and checked for compliance with the electrical and physical tests described below. If desired, more than 1 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. Prior to beginning tests, and when the light is re-assembled after inspection, the screws, bolts, or nuts holding the unit together shall be tightened to the required torque (using a torque screwdriver or torque wrench) as specified by the manufacturer to insure that the light is properly assembled.

(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 on 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.

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- (b) Horizontal candela distributions shall be measured at elevation angles of 0° , 1° , 2° , 3° , 4° , and 5° , and the light shall meet the candela requirements of Figure 1.
 - (c) If the fixture is so designed that when assembled it presents below-pavement level cavities in front of a lens, it shall be additionally tested as follows. The cavities shall be filled with sand. The photometric output of the light shall be measured at vertical angles of 0° and 2° within a $\pm 5^{\circ}$ horizontal angle. The distribution at these angles shall be in accordance with Figure 1.
- (2) Vibration Test. The light unit receptacle shall be mounted and securely fastened in a test box or clamping device without confining the cover or lamp compartment. The top unit containing the lamp shall be installed in the receptacle with an oscilloscope, a galvanometer, or other means connected into the lamp circuit to determine whether continuity of the electrical circuit is maintained during the test. Failure to maintain continuity shall be cause for rejection. The lamp shall be continuously operated at 6.6 amperes while the light unit is vibrated in the specified positions and at the frequencies and amplitudes indicated below. A photometric test shall be made before the fixture is vibrated and at the completion of the final vibration test. The results of the final photometric test shall be in accordance with Figure 1. Also, a physical examination of the unit shall be made at the conclusion of the vibrating period in each position to determine whether the failures indicated in paragraph (a) below occur.
- (a) Physical inspection shall be made to determine whether any of the following faults occur:
 - 1 Contact arcing during test.
 - 2 Mechanical failure of any component part.
 - 3 Loosening of any parts or screws.
 - (b) Vibration Planes. The fixture shall be vibrated in the following orthogonal positions:
 - 1 With the fixture mounted in a horizontal position and the lenses aimed parallel with the direction of motion.

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- 2 With the fixture mounted in a vertical position and the thickness of the fixture perpendicular to the direction of motion. The lenses shall be aimed in a vertical plane.
 - 3 With the fixture rotated 180° from step 1 above so that it will be in an inverted position. The direction of motion shall be perpendicular to the aiming of the lenses.
- (c) The light shall be vibrated in each position through frequency ranges of 5 to 2,000 cps at the following specified amplitudes or G's, shown in Table 1, whichever is less. Duration of each sweep shall be 10 minutes.

Table 1

<u>Double Amplitude</u>	<u>Acceleration G's</u>	<u>Frequency cps</u>
0.040	--	5 to 10
0.030	10	10 to 500
0.030	15	500 to 2000

- (d) Any evidence of failure during this test shall be cause for rejection.
- (3) High Temperature Test. The light shall be subjected to a high temperature of 55° (+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.
 - (4) Leakage Test. The light unit shall be submerged in water and subjected to an internal air pressure of 5 psi for a minimum of one minute. Any air leakage shall be cause for rejection.
 - (5) 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 one foot of water. The temperature of the water before submersion will 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 3 "ON-OFF" cycles have been completed. The fixture shall be immediately opened at the completion of the third cycle and inspected. Any evidence of

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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.

- (6) 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° F. 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. Current readings shall be taken under the conditions specified in paragraphs 9a(6)(a), 9a(6)(b), and 9a(6)(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.
- (7) 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.
- (8) 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 500 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 applicable paragraph. 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.

- (9) Lamp Bypass Test. The light unit shall be subjected to a test to determine if the lamp bypass device (incorporated in the fixture) will immediately close an auxiliary circuit around the lamp when its filament opens.
- (a) Four light units shall be assembled to simulate actual operating temperatures, and connected across the secondary of a 200 watt, Specification L-834 transformer. The primary of the 200-watt transformer shall be connected to a constant current supply. An open lamp filament shall be simulated under the following conditions:
- 1 With 6.6 amperes flowing through the primary of the transformer for a minimum of 3 hours, disconnect a lamp in one fixture. The bypass device shall operate immediately. Without de-energizing the circuit, reduce the current to 3.4 amperes and disconnect a lamp in one of the remaining fixtures. The bypass device shall operate immediately.
 - 2 With the circuit de-energized, disconnect the lamp in one fixture and set constant current supply for 3.4 amperes output level. Then energize the circuit. The bypass device shall operate immediately. Repeat the above procedure with the constant current supply set for 6.6 amperes.
- (10) Load Test. The final test shall be to subject the light fixture to the following static load test. The assembled fixture with 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 through a block of rubber, 7 inches in diameter and 1-inch thick, having a Shore A hardness of 55 to 70. A total load of 35,000 pounds shall be applied uniformly over the area of the fitting at a rate of not more 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.

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- b. Production Testing. Ten light units picked at random from every lot of 100 units shall be assembled and equipped with non-selected stock lamps. These units shall be checked and certified through each lens aperture for conformance with the photometric requirements of this specification. Whenever less than 90 percent of the test units conform to specification requirements, the entire lot shall be checked and only those units meeting the requirements will be acceptable. Records of these tests shall be retained for 2 years and be made available for FAA inspection upon request.
- 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.

10. QUALIFICATION.

- a. The manufacturer shall furnish the light fixtures to a disinterested testing laboratory to be tested as described in paragraph 9a 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 8.
- c. Parts lists and installation instructions shall be submitted to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553, for review.
- d. At anytime 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.

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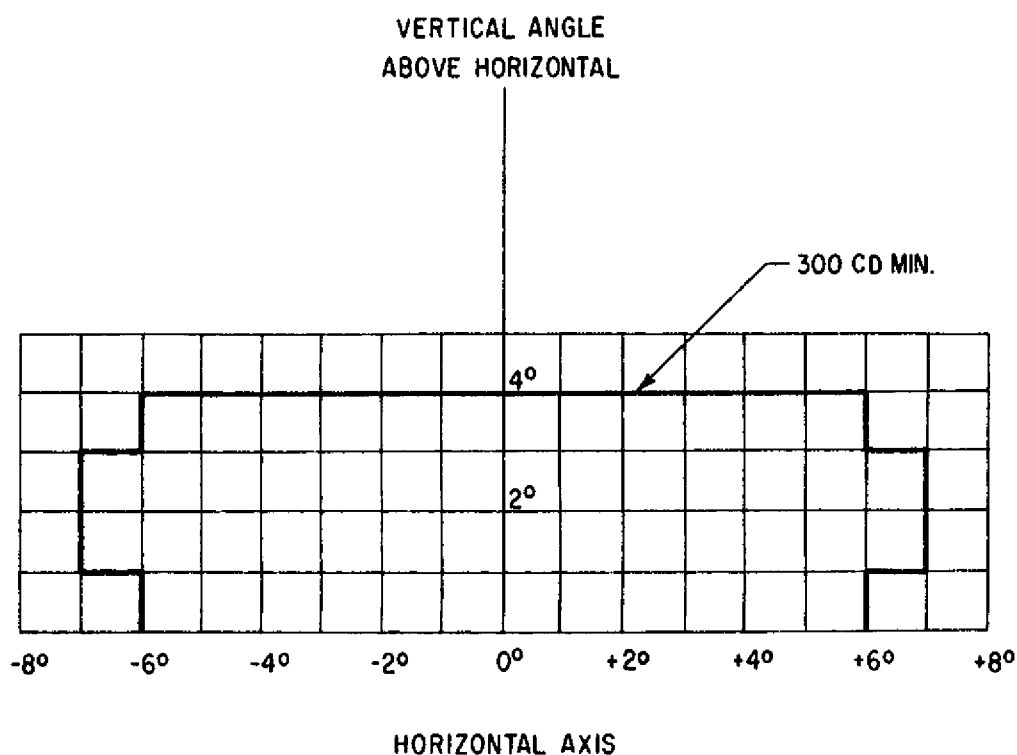
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Specification for L-842 Airport Centerline Light
Dated 1/6/64

- c. There is no charge for this publication.


Cole Morrow, Director
Airports Service



NOTES:

1. A $\pm 1/2^\circ$ Vertical Shift And A $\pm 1^\circ$ Horizontal Shift Is Permitted For Qualification .
2. The 300 CD Curve Of The Fixture Under Test May Infringe The 300 CD Curve Of This Figure By No More Than 3.00 Square Degrees .

FIGURE 1. ISOCANDELA CURVE