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AC NO: 150/5345-28A

DATE: 3/17/70

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

SUBJECT: SPECIFICATION FOR L-851 VISUAL APPROACH SLOPE INDICATORS

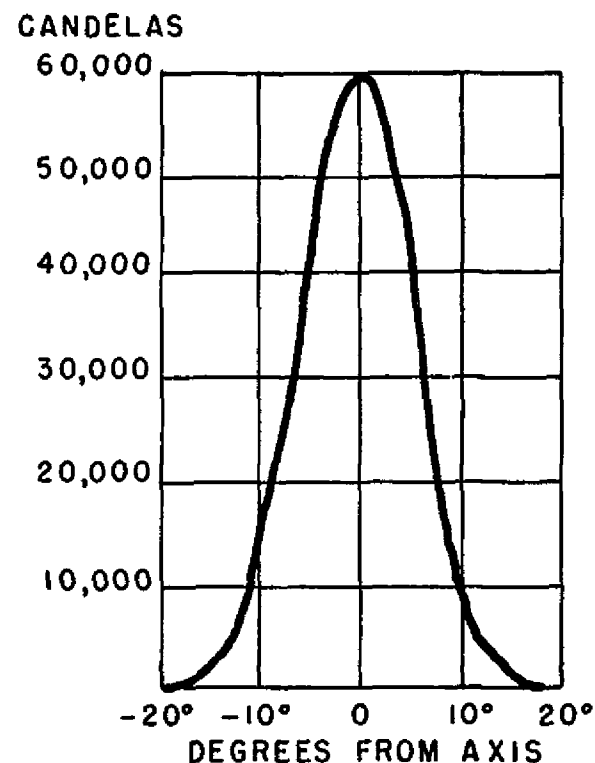
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1. PURPOSE. This advisory circular describes the subject specification requirements for visual approach slope indicator (VASI) equipment.
 2. CANCELLATION. AC 150/5345-28, Specification for L-851 Abbreviated Visual Approach Slope Indicator, dated 28 October 1966, is cancelled.
 3. APPLICABLE PUBLICATIONS. The following publications of the issue in effect on the date of application for qualification (see paragraph 7) apply to this circular. This circular governs in case of conflict with referenced publications.
 - a. FAA Specification. Obtain copies of Specification FAA-E-1328b, Visual Approach Slope Indicator Lamp Housing Assembly, from the Federal Aviation Administration, Systems Research and Development Service, Systems Standards Branch, RD-420, Washington, D.C. 20590.
 - b. FAA Advisory Circulars.
 - (1) Obtain copies of AC 150/5340-14A, Economy Approach Lighting Aids, from the Department of Transportation, Distribution Unit, TAD-484.3, Washington, D.C. 20590.
 - (2) Obtain copies of AC 150/5300-4A, Utility Airports, from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, at the price of \$1.75. (No c.o.d. orders are accepted. Enclose with your request a check or money order made payable to the Superintendent of Documents.)
 4. EXPLANATION OF REVISION.
 - a. Details were added for equipment for a new system known as the Simple Abbreviated Visual Approach Slope Indicator (SAVASI). This system is to be used only at utility airports. See AC 150/5300-4A for details concerning these airports.
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Initiated by: AS-580

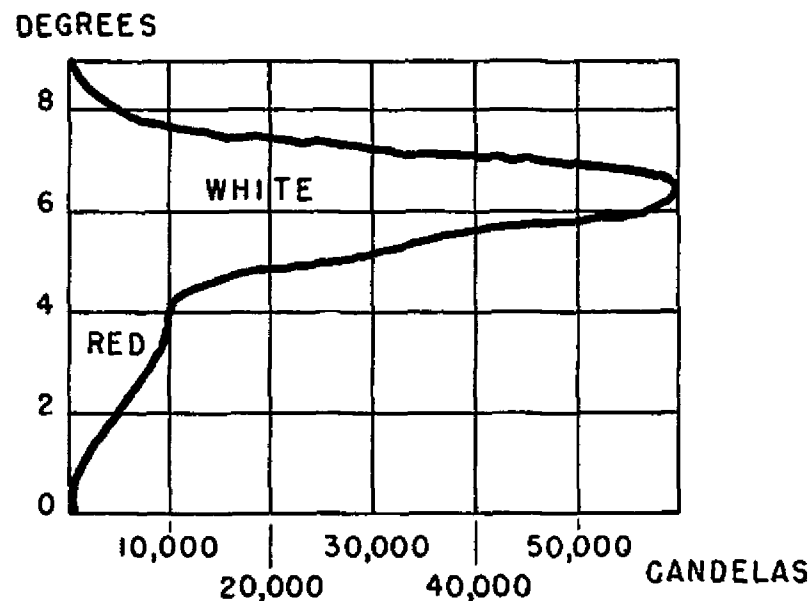
- b. The designation for the abbreviated visual approach slope indicator (AVASI) referred to in cancelled AC 150/5345-28 was changed to two-box visual approach slope indicator (VASI-2). The VASI-2 is for installation at locations referred to in AC 150/5340-14B.
- c. Requirements were added for use of halogen cycle lamps in visual approach slope indicator lamp housings.
- d. Photometric curves were added for VASI-2 and SAVASI light units.

5. REQUIREMENTS.

- a. VASI-2. See AC 150/5340-14B for a description of the VASI-2 installation.
 - (1) Lamp Housing. Design the lamp housing tilt switches and other accessories to meet the applicable requirements in FAA-E-1328b and the photometric requirements in Figure 1.
 - (2) Input Power. Limit the input power to each VASI-2 light unit to 750 watts at a 0.78 power factor (PF).
 - (3) Lamps. Use halogen cycle lamps with a rated life of at least 2,000 hours. The PAR 64 halogen cycle lamp is acceptable.
 - (4) Operation. Make provisions to permit the operation of four VASI-2 light units in a 4.8-6.6 ampere series circuit or a 120-volt or 240-volt ± 5 percent multiple circuit.
 - (a) Adapter Unit. Provide a commercial adapter unit to permit the operation of at least four VASI-2 lamp housings from a 120-volt or 240-volt ± 5 percent source. The installation in AC 150/5340-14B requires the installation of two VASI-2 lamp housings; however, provide the capacity in the adapter unit for future expansions of a 2-box system to a 4-box system. Include adjustments in the adapter unit, if required, to permit lamps to be operated at rated values. Make provisions for an optional feature to isolate each lamp. The isolating device prevents one lamp outage from causing the remaining lamps to be out. Delete this feature if it is not specified to be furnished with the adapter unit. Design and construct the adapter unit for outdoor service during the environmental conditions specified in FAA-E-1328b.



(a) HORIZONTAL DISTRIBUTION



(b) VERTICAL DISTRIBUTION ACROSS THE BEAM

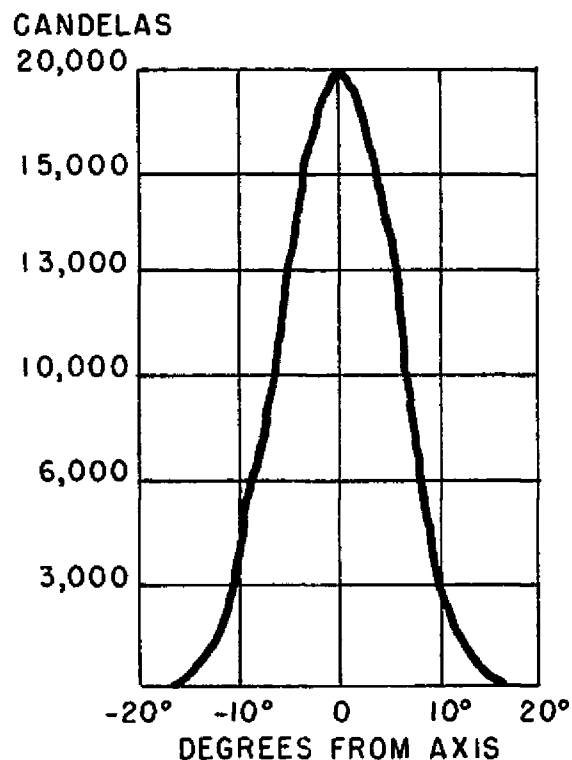
NOTES:

1. THE PHOTOMETRIC CURVES SHOWN ARE THE OPTIMUM.
2. A QUALIFICATION TOLERANCE OF -25% IS PERMITTED ON CANDELA REQUIREMENTS AND BEAM COVERAGES IN HORIZONTAL AND VERTICAL PLANES.
3. USE AVIATION RED FILTERS FOR RED LIGHT AND AVIATION WHITE FILTERS FOR WHITE LIGHT.

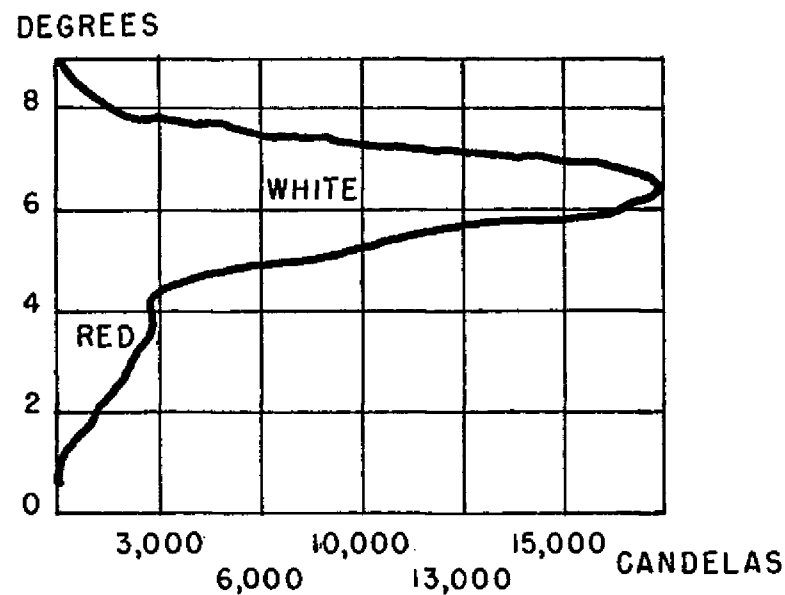
FIGURE 1. CANDELA REQUIREMENTS FOR VASI-2

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- (b) Photoelectric Switching Device. Provide a photoelectric switching device in conjunction with the adapter unit, paragraph (a) above, to permit changing the brightness of the VASI-2 from 100 percent to 10 percent intensity when the ambient lighting varies from day to night conditions, respectively. Select a high grade commercial device with adequate contact ratings to obtain reliable service.
- (5) Leveling Device. Provide a leveling device in accordance with FAA-E-1328b.
- (6) Nameplate. Provide a nameplate in accordance with FAA-E-1328b.
- b. SAVASI. See AC 150/5300-4A for a description of the SAVASI installation.
 - (1) Lamp Housing. The design and construction of the lamp housing are optional provided that performance, aiming, and test requirements in FAA-E-1328b are met. Design the optics to meet the requirements in Figure 2. Limit the overall length and front face of the housing to less than 3 feet. Provide accessories for mounting the lamp housing on two vertical 2.375-inch pipe supports. The vertical pipe supports are not a part of this specification.
 - (2) Input Power. Limit the input power to each SAVASI light unit to 200 watts at a 0.78 power factor (PF).
 - (3) Lamps. Use a halogen cycle lamp(s) with a rated life of at least 2,000 hours. The PAR 64 halogen cycle lamp is acceptable.
 - (4) Operation. Make provisions to permit the operation of four SAVASI light units in a 4.8-6.6 ampere series circuit or in a 120-volt ± 6 volt multiple circuit.
 - (a) Adapter Unit. Provide a commercial adapter unit to permit the operation of at least four SAVASI's from a 120 volt ± 6 volt source. Include adjustments, if required, in the adapter unit to permit lamps to be operated at rated values. Design and construct the adapter unit for outdoor service during the environmental conditions specified in FAA-E-1328b.
 - (b) Photoelectric Switching Device. Provide a photoelectric switching device with the adapter unit that is in accordance with paragraph 5b(4)(a) above.



(a) HORIZONTAL DISTRIBUTION



(b) VERTICAL DISTRIBUTION ACROSS THE BEAM

NOTES:

1. THE PHOTOMETRIC CURVES SHOWN ARE THE OPTIMUM.
2. A QUALIFICATION TOLERANCE OF -25% IS PERMITTED ON CANDELA REQUIREMENTS AND BEAM COVERAGES IN HORIZONTAL AND VERTICAL PLANES.
3. USE AVIATION RED FILTERS FOR RED LIGHT AND AVIATION WHITE FILTERS FOR WHITE LIGHT.

FIGURE 2. CANDELA REQUIREMENTS FOR SIMPLE AVASI

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(5) Leveling Device. Provide a leveling device meeting the performance requirements in FAA-E-1328b with the exception of the setting between the SAVASI light units. Provide a method to set the differential between the light units at $0.6^{\circ} \pm 2$ minutes in lieu of the $0.5^{\circ} \pm 2$ minutes referred to in FAA-E-1328b.

(6) Nameplate. A nameplate, permanently and legibly filled in with at least the following, shall be attached to the outside of the lamp housing:

(1) Simple AVASI Lamp Housing.

(2) Identification: FAA-L-851.

(3) Rating _____ Volts _____ Amperes, Single Phase, 60 H_z.

(4) Manufacturer's Part No.

c. Material and Workmanship. Use components and materials of industrial quality or better. Perform workmanship in accordance with high grade commercial practice.

d. Parts List and Installation Instructions. Furnish a complete parts list, which includes the manufacturer's name and identifying part number, for each item listed, together with installation instructions for each installation. Provide a parts list and installation instructions with individual assemblies when shipped for maintenance or replacement purposes. Furnish sufficient drawings and instruction to indicate clearly the method of assembly and installation.

6. TESTS.

a. Subject at least one sample unit of the equipment to the applicable tests described in FAA-E-1328b.

b. Make additional inspections and tests as deemed necessary by the FAA, Airports Service, Washington, D.C. 20590, to determine compliance with this specification.

7. QUALIFICATION. Furnish sample lighting equipment to an independent testing laboratory acceptable to the FAA, Airports Service, Washington, D.C. 20590. Test the equipment as described in paragraph 5 to obtain certification regarding the ability to manufacture lighting equipment meeting the requirements of this specification. Furnish two copies of the testing laboratory's report to the Airports Service for review and approval consideration. The manufacturer offering the material for qualification bears the cost of tests.

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- a. In addition to the test reports by the independent testing laboratory, the manufacturer furnishes parts lists, installation instructions, and drawings to the FAA, Airports Service, Washington, D.C. 20590, for review and approval.
 - b. Upon approval of the independent testing laboratory's test reports and the additional data required in paragraph 6a, which have shown satisfactory conformance to specification requirements, the Airports Service will list the name of the qualified manufacturer and a description of his light fixture in Advisory Circular 150/5345-1B, Approved Airport Lighting Equipment.
 - c. If the manufacturer has satisfactory laboratory facilities, the tests may be performed at the factory; and such tests witnessed by a representative of the FAA, Airports Service, Washington, D.C. 20590. The manufacturer furnishes written reports of these tests to Airports Service, Washington, D.C. 20590.
 - d. The furnishing of products for Federal-aid Airport Program projects, which prove to be unequal to the approved equipment, will be sufficient cause for removal of the equipment and the manufacturer's name from the list of approved equipment.
 - e. At any time after approval has been granted under the above conditions, make available, upon written request from FAA, Airports Service, a certified copy of factory test reports on the latest production run of equipment.
 - f. Manufacturers shall not make a change of materials or manufacturing methods or revision of catalog numbers of approved equipment without prior approval of FAA, Airports Service, Washington, D.C. 20590.
8. HOW TO OBTAIN THIS CIRCULAR. Additional copies of this circular, AC 150/5345-28A, Specification for L-851 Visual Approach Slope Indicators, may be obtained from the Department of Transportation, Distribution Unit, TAD-484.3, Washington, D.C. 20590.



Chester G. Bowers
Director, Airports Service

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
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1. APPLICABLE PUBLICATIONS. The following publications of the issue in effect on the date of application for qualification (see paragraph 8) apply to this circular. This circular governs in case of conflict with referenced publications.
 - a. Military Specifications. Obtain copies of MIL-T-27535, Transformer, Power, Isolation; Series Circuit, Airport Lighting General Specification for, from the Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.
 - b. FAA Specifications. Obtain copies of FAA specifications from the Department of Transportation, Federal Aviation Administration, Facility Installation Service, Configuration Control Branch, FI-110, Washington, D.C. 20591.
 - (1) FAA-E-1328c, Visual Approach Slope Indicator Lamp Housing Assembly.
 - (2) FAA-E-2351a, Lamp, Par 64, VASI.
 - c. FAA Advisory Circulars. Obtain copies of advisory circulars and references from the Department of Transportation, Distribution Unit, TAD-484.3, Washington, D.C. 20590.
 - (1) AC 150/5340-14C, Economy Approach Lighting Aids.
 - (2) AC 150/5340-16C, Medium Intensity Runway Lighting System and Visual Approach Slope Indicators for Utility Airports.
2. EXPLANATION OF REVISIONS. In addition to minor changes in the text, the following changes have been made:
 - a. Mounting requirements for SAVASI revised.
 - b. Aiming and calibration requirements changed.
 - c. Details added for SAVASI and VASI-2 adapter units.
 - d. Details added for series operation of SAVASI.
 - e. Requirements added for tilt switch design.
 - f. Photometric requirements revised.
 - g. Typical system wiring diagrams added.

3. SYSTEMS SELECTION CONSIDERATIONS.

- a. Utility Airports. See Advisory Circular 150/5340-16B for selection considerations for VASI-2 and SAVASI, and configuration details for SAVASI. VASI-2 configuration details are contained in Advisory Circular 150/5340-14B.
- b. Other Than Utility Airports. See Advisory Circular 150/5340-14B for selection considerations and configuration details for VASI-2 and VASI-4.

4. SYSTEM COMPONENTS.

- a. SAVASI. The following components are furnished by the equipment manufacturer for each installation.
 - (1) Provide two SAVASI lamp housings per runway end installation. Each housing contains one Specification FAA-E-2351a, Type II 6.6 ampere, 200-watt halogen cycle lamp. Each housing also contains a filter lens assembly and the necessary accessories in the optical and electrical systems required to conform with this specification. Include mounting flanges and provisions for attaching the lamp housing to supporting legs in accordance with FAA-E-1328c, paragraph 3.4.13.1.
 - (2) Provide one adapter unit with each set of two SAVASI lamp housings. The adapter unit meets the requirements of paragraph 6b(3).
 - (3) Provide one tilt switch system for lamp housings. The tilt switch system meets the requirements of paragraph 6a(2).
 - (4) Provide at least one aiming bar and calibration bar with a storage and carrying case for use at each airport. Additional aiming bars, if required, should be specified when ordering equipment. The aiming bar and calibration bar with a storage carrying case meet the requirements of FAA-E-1328c, paragraphs 3.5, 3.5.1, and 3.5.2.
- b. VASI-2. The following components are furnished by the equipment manufacturer for each installation.
 - (1) Provide two VASI lamp housings per runway end. These two VASI lamp housings are called a VASI-2 installation. Furnish each lamp housing with three Specification FAA-E-2351a, Type II,

200-watt, 6.6 ampere halogen cycle lamps. Each housing also contains filter lens assemblies and the necessary accessories in the optical and electrical systems required to conform with this specification. Mounting flanges and provisions for attaching the lamp housing to the vertical supports specified in FAA-E-1328c are included. The lamp housing meets all requirements of FAA-E-1328c.

- (2) Provide adapter units in accordance with paragraph 6a(3).
- (3) Provide one tilt switch system per lamp housing. The tilt switch system meets the requirements of paragraph 6a(2).
- (4) Provide at least one aiming bar and calibration bar with storage and carrying case for use at each airport. Additional aiming bars, if required, should be specified when ordering equipment. The aiming bar and calibration bar with storage and carrying case meet the requirements in FAA-E-1328c, paragraphs 3.5, 3.5.1, and 3.5.2.

5. PERFORMANCE REQUIREMENTS.

- a. Design and construct the SAVASI light units to meet the photometric distribution in Figures 1 and 2.
- b. Design and construct the SAVASI and VASI lamp housing, accessories, and the adapter unit to meet the environmental requirements of FAA-E-1328c.
- c. Design the VASI and SAVASI lamp housings and mounting supports to withstand 150 mile per hour wind.

6. DESIGN REQUIREMENTS

a. VASI-2.

- (1) Lamp Housing Assembly. Design and construct the lamp housing assembly to meet all requirements of Specification FAA-E-1328c. Make the aiming line for the optical system, the bottom of the transition bar and the top of the bottom aperture plate. Glass, plastic, or other clear material in the aperture opening is not acceptable. Make the aperture an open space. Utilize terminal blocks in the lamp housing adequate for Number 12 AWG or Number 8 AWG wires.

- (2) Tilt Switch System. Design and construct the tilt switch system to deenergize the lamps in the VASI-2 when the optical pattern of the lamp housing is lowered between 1/4-degree and 1/2-degree or raised between 1/2-degree and 1 degree with respect to a preset approach angle.
- (a) Incorporate in the design of the tilt switch system a feature that would prevent intermittent tilt switch contact openings of durations one second or less from causing the lamps to flicker. Tilt switch contact openings in excess of 10 seconds causes an extinguishing of the lamp in the system.
 - (b) Provide the tilt switch or other sensor with normally closed contacts. Design and construct the tilt-switch system fail-safe in order to ensure that any malfunctioning such as switch failure, circuitry and/or components or tilt switch system power failure will cause lamp circuit to open.
 - (c) Provide adequate capacity and voltage rating for all current carrying parts of the tilt switch system or auxiliary power equipment used in conjunction with the tilt switch system.
 - (d) See Figure 3 for typical system wiring diagrams.
- (3) Adapter Unit. Provide an adapter unit to permit the operation of four of the lamp housings specified in paragraph 6a(1) in a VASI-4 configuration. Make provisions for the adapter unit to function properly with two lamp housings connected during the initial installation and the remaining two lamp housings added at a future time. Make the two circuits independent to prevent failure in one circuit affecting the performance of the second circuit.
- (a) Design and construct the adapter unit to meet the environmental requirements of FAA-E-1328c. Make provisions to mount the adapter unit on frangible supports.
 - (b) Design the adapter unit to operate with a 240-volt (60 Hz) +12-volt input power. Provide a minimum power rating of 2800 watts. Include provisions to permit two series circuits each with six Specification FAA-E-2351a, 200 watt, Type II lamps to be operated within a maximum current range of 6.4-6.6 amperes. The maximum current range is obtainable with the adapter unit separated at least 500 feet from the lamp housings and the two lamp housings are physically separated 1,000 feet. Make provisions to automatically switch