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Federal Aviation Agency

ADVISORY CIRCULAR

AC NO: AC 150/5340-16A

AIRPORTS

EFFECTIVE: 12/19/67

SUBJECT: MEDIUM INTENSITY RUNWAY LIGHTING SYSTEM

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1. PURPOSE. This advisory circular describes the recommended standards for design, installation, and maintenance of a medium intensity runway lighting system.

2. CANCELLATION. AC 150/5340-16, Medium Intensity Runway Lighting System, dated October 28, 1966, is cancelled.

3. REFERENCES. Technical publications listed under Bibliography, Appendix 1, provide further guidance and detailed information as may be required.

4. EXPLANATION OF REVISION. In addition to minor changes in the text, the following additions have been made:

   a. Electrical operating characteristics for components used in the 120-volt AC.

   b. A new circuit diagram has been added.

   c. A curve for estimating length of AC control cable has been added.

5. HOW TO GET THIS PUBLICATION. Obtain additional copies of this circular, AC 150/5340-16A, Medium Intensity Runway Lighting System, from the Department of Transportation, Distribution Unit, TAD-434.3, Washington, D.C. 20590.

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1. INTRODUCTION. A medium intensity lighting system consists of elevated, omnidirectional, fixed (i.e. steady burning) lights with clear lenses outlining the lateral limits of the runway or landing strip and a symmetrical pattern of green lights (threshold lights) outlining the longitudinal limits of the runway or landing strip.

2. CONFIGURATION. The following basic design requirements for medium intensity runway lighting and threshold lighting are used for runways and landing strips.

   a. Runway Edge Lighting. Install the edge-of-runway lights along the full length of the runway equidistant from and parallel to the runway centerline on each side. Locate the light fixtures no more than 10 feet laterally from the full strength pavement designated for runway use and spaced longitudinally not more than 200 feet. Locate each light on one side of the runway with respect to its companion light on the opposite side so that a line joining the two will be at right angles to the runway centerline. Uniformly space the elevated lights within the individual sections of the runway resulting from consecutive intersections and the runway ends and intersections. Add single elevated lights to avoid gaps in excess of 400 feet where the matching of lights on opposite sides of the runway cannot be accomplished. See Appendix 2, Figure 1.

   b. Strip Lighting. Install the lines or rows of landing strip lights along the edge of the designated landing and takeoff path within the strip. The lateral distance between the lines or rows of landing strip lights shall not exceed 250 feet.

   c. Threshold Lights.

      (1) Inboard Threshold.

         (a) Runways and Landing Strips at Least 100 Feet Wide. This configuration of lights consists of 2 groups of 4 lights located symmetrically about the runway centerline at each end of the runway. Laterally space these lights to form a line of lights at right angles to the runway centerline. Locate the outermost light in each group of lights in line with the corresponding row of edge-of-runway lights on each side. The innermost light of each group of lights is at least 40 feet from the runway centerline. Locate the line of inboard threshold lights not less than 2 feet nor more than 10 feet from the designated threshold of the runway. See Appendix 2, Figure 1.

(b) Runways and Landing Strips Less Than 100 Feet Wide. This configuration is the same as that described in 2c(1)(a) above, except that each group of lights consists of 3 or 4 lights and the distance between the innermost light of each group of lights and the centerline may be reduced to 20 feet.

(2) Displaced Threshold.

(a) General. The lighting of displaced thresholds is more than simply relocating lights. Consider all phases of operations on the runway before reaching a conclusion as to the desired lighting.

(b) Lighting. This configuration of lights consists of the same number of lights and groups as specified in paragraph 2c(1) and is located outboard at right angles to the rows of runway lights with the innermost light of each group of lights in line with its corresponding row of edge-of-runway lights on each side. Laterally space the lights in each group to form a line of lights not less than 40 feet. If the area created by a displaced threshold is usable for specific operations and denied for others, it should be lighted to indicate the correct signal to the pilot for the intended operation. Light these usable areas by adding split colored lenses and/or blank shields to the fixtures. See Appendix 2, Figure 1 for a typical displaced threshold lighting configuration and for lighting color schemes used for the operational areas back of the displaced threshold based on the service intended for specific conditions.

3. DESIGN.

a. Light Installation. Either of two types of runway edge light installation is acceptable. The same fixture is used in both.

(1) Base Mounted. Mount the fixture on a base as described in AC 150/5345-6. This method provides access to transformer and primary connections in the base. Install the base with a concrete backfill. The base mounted method is desirable from a maintenance standpoint and provides added protection for the equipment.

(2) Stake Mounted. Mount the fixture on a metal stake with associated transformers, primary cables, and cable connectors buried in the ground adjacent to the stakes. Stakes may require concrete anchors where soil is unstable. This method costs less to install; since the transformers, cables, and connectors are designed for direct earth burial, it should render many years of fault-free service if specified procedures are followed in the initial installation.

b. Power Supply Equipment and Circuits. Provide a 4KW or 7½KW constant current regulator having a primary rating of 240 volts, single phase, 60 cycle and a secondary rating of 6.6 amperes, designed for remote control, with or without provisions for varying the output current to a lower value. Brightness control is achieved by varying the output current and provides the desired light intensity for different visibility conditions. Use three brightness steps, 6.6 amperes, 100 percent; 5.5 amperes, 30 percent; and 4.8 amperes, 10 percent on runway circuits. Determine the KW size and the number of regulators for a specific 6.6 ampere series lighting circuit by use of the curves in Appendix 2, Figure 2.

(1) Cable for Primary Circuits. Use 3KV, No. 8 AWG, stranded, single conductor, direct burial cable for medium intensity lighting systems designed for 6.6-ampere series circuits with a constant current regulator.

(2) Lamp Load Supply Circuits. Supply the lamp load for fixtures through a 6.6/6.6 ampere, 45-watt insulating transformer. This isolates the lamp from the high primary voltage of the series circuit. In the event of a single lamp burnout in the runway series circuit, the series circuit continuity will not be broken.

c. Control Systems.

(1) General. Where possible, use simple switching circuits to energize and de-energize the circuits or to control lamp brightness.

(2) Direct Control. Direct control systems are controlled directly at the power supply by switching the branch circuits supplying their power. This type control system is normally used for control of runway lighting systems at utility airports and is frequently used for control of miscellaneous circuits where needed. Medium intensity lighting systems at utility airports may be controlled directly where a constant current regulator as specified in AC 150/5345-18 is used. This regulator includes a panel as an integral part with brightness control and a runway selector switch, as well as circuit breaker switches, to control miscellaneous associated lighting circuits. For automatic control, use a photoelectric or astronomic time switch with provisions for switching from automatic to manual control. For typical applications of direct control for utility airports, see Appendix 2, Figure 3.

(3) Remote Control. Remote control systems are controlled from a remote control panel located in the cab of the tower or at some other location. The control panel recommended for this purpose conforms to AC 150/5345-3A. This control panel contains switches and other devices which control operating relays located in the vault from which the power is supplied through the relay contacts to the runway regulator. Use the following two systems of control circuit voltages for remote control of runway circuits:

(a) 120 Volts AC. Where the distance between the remote control panel and the vault is not great enough to cause an excessive voltage drop in the control leads, use the standard control panel switches to operate the power supply relays directly. Operating relays supplying power to the medium intensity runway lighting regulators should have coils rated for 120 volts AC. Use No. 12 AWG control cable to connect the control panel to the power supply equipment in the vault. Calculate the maximum permissible separation between control point and vault by determining the control circuit line loss. The operating characteristics of the electrical components to be used in the calculations are shown below. Use special pilot low burden auxiliary relays having proper coil resistance to reduce control current to obtain additional separation distance with 120-volt AC control circuits. It may be advantageous to use these relays for expanding existing 120-volt AC control systems. See Appendix 2, Figures 3 and 6.

FIGURE 1. ELECTRICAL COMPONENT OPERATING CHARACTERISTICS

Coil	Regulator Size	Coil Resistance	Operating Volts	In Rush Current	Pull In Volts	Holding Current	Drop Out Volts
Primary Contactor	4KW		120	1.4	99	0.22	77
Brightness Relay	4KW		120	0.92	99	0.20	77
Primary Contactor	7½KW		120	5.0	99	0.78	77
Brightness Relay	7½KW		120	0.93	99	0.38	77
Auxiliary Relay	SPDT	5000 ohms	120	----	100	0.024	70

(b) 48 Volts DC. Use a low voltage (48 volts DC) control system where the distance between the control panel and the vault would cause excess voltage drop with 120 volt AC control system. In such a system, sensitive pilot relays are activated by the remote control panel switches and, in turn, control the regulator relays. Normally, a 25 pair, No. 19 AWG telephone cable is used to connect the control panel and the pilot relays. The DC control system is adequate for up to 7900 feet separation between control point and vault. See Appendix 2, Figure 3 and AC 150/5345-3A.

d. Duct and Conduit System.

(1) General. Make a thorough study of the runway lighting layout prior to designing a duct or conduit system to determine the following.

(a) Exact location of the duct or conduit crossings under pavements so that connection for cable runs through other transverse duct or conduit can be made.

(b) Where to provide a reasonable number of spare ducts and conduits in each bank for maintenance and future expansion of facilities.

(c) Where to avoid routing ducts or conduits through areas which may be excavated for future facilities.

(2) Cable Installation. Install cable runs for underground power supply and control circuits in ducts or conduits in areas that are to be surfaced or stabilized. This will provide ready access for maintenance, modification of circuits, and protection for cables during repairs of the surface or stabilized areas.

(3) Duct and Conduit Size. Assure that duct and conduit dimensions meet National, State, or Local Electrical Codes.

4. EQUIPMENT AND MATERIAL.

a. General.

(1) Equipment and material are covered by FAA specifications listed in "Bibliography" in Appendix 1. Where L-108 and L-110 are mentioned in succeeding paragraphs, they refer to installation specifications of AC 150/5370-1, Standard Specifications for Construction of Airports, with Change 1, Supplement No. 2.

(2) The vault should be the type shown on the plans. Construct it of reinforced concrete, concrete masonry, or brick as specified. Use distribution transformers, oil switches, cutouts, relays, terminal blocks, transfer relays, circuit breakers, and other regularly used commercial items of equipment not covered by FAA specifications which conform to the rulings and standards of the electrical industry.

b. Light Fixtures. Use runway lighting units which conform to the requirements of AC 150/5345-20. Each lighting unit is furnished complete with an optical system, lamp, connecting leads, and a mounting assembly.

c. Lamps. Use one of the lamps specified below for the runway fixture.

(1) Series lamp, 30 watt, 6.6 amperes as specified in AC 150/5345-20 for runway edge fixtures.

(2) Series lamp, 45 watt, 6.6 amperes as specified in AC 150/5345-20 for threshold fixtures.

d. Cables. Use primary cables conforming to the requirements of AC 150/5345-7 of the type, AWG size, and voltage as specified on the plans.

e. Counterpoise Wire. Use bare copper counterpoise wire conforming to the requirements of L-108, paragraphs 108-2.3 and 108-3.9.

f. Insulating Transformers. Use runway light insulating transformers conforming to the requirements of AC 150/5345-31 on 6.6 ampere series circuits.

g. Regulators. Use constant current regulators of 4KW and 7½KW capacity with brightness control, with standard input voltage of 240 volts, single phase, 60 cycle and output of 6.6 amperes. Regulators for remote operation conform to the requirements of AC 150/5345-11. For direct operation, regulators conform to the requirements of AC 150/5345-18.

h. Bases. Where required, use bases conforming to the requirements of AC 150/5345-6.

i. Metal Stakes. Where required, use metal stakes conforming to the requirements of Figure 6 of AC 150/5345-20.

j. Primary Cable Connectors. Primary connectors, if specified, conform to the requirements of AC 150/5345-26.

k. Squeeze Connectors. Use squeeze connectors, if specified, which are similar and equal to Crouse-Hinds Type CGB cable connector with neoprene rubber bushing.

l. Ducts and Conduits. Design ducts and conduits to conform to the requirements of L-110, paragraphs 110-2.2 through 110-2.7.

m. Concrete. Use concrete backfill and stake anchoring concrete portioned not leaner than a 1-3-6 mix and have a compressive strength of not less than 2,000 psi. Use an approved clean aggregate to produce the concrete.

n. Tape. Use plastic electrical insulating tape conforming to the requirements of L-108, paragraph 108-2.4e.

o. Control Panel. Use control panels conforming to the requirements of AC 150/5345-3A.

p. Auxiliary Relay Cabinet. Where required, use an auxiliary relay cabinet assembly for 48-volt DC control which conforms to the requirements of AC 150/5345-13. The auxiliary relay, where used in a 120-volt AC control circuit, should be a hermetically sealed relay having a Single Pole Double Throw (SPDT) contact arrangement rated for 5 amperes at 120-volt AC and a coil resistance of 5,000 ohms. The relay connections may be either solder terminals or plug-in.

q. Control Cables.

(1) When using control cables (multiple conductors) containing No. 12 AWG wires it should conform to the requirements of AC 150/5345-7.

(2) When using control cable containing No. 19 AWG wires, it should comply with Rural Electrification Administration (REA) Bulletin 345-14 REA Specification for Fully Color-Coded, Polyethylene Insulated, Double Polyethylene-Jacketed Telephone Cable for Direct Burial.

5. INSTALLATION.

a. General. Install vault equipment, conduit, cables, bus bars, grounds, and supports necessary to insure a complete and operable electrical distribution center for runway lighting systems as specified and shown on the plans. When specified, provide and install an emergency power supply and transfer switch. Install and mount the equipment to comply with the requirements of the National Electrical Code and local code agencies having jurisdiction. A typical vault layout for 48-volt DC remote control of runway lighting equipment is shown in Appendix 2, Figure 4.

b. Installation Procedures. Installation procedures for base mounted and stake mounted elevated lighting units using series circuits are as follows:

(1) General. Assemble the light unit using the manufacturer's instructions. Connect the secondary leads to the fixture leads by means of an L-823 disconnecting plug and receptacle without taping the joint. Install a lamp of the proper rating in the fixture. Do not extend the shearing groove of the breakable coupling more than 3½ inches above the finished grade. Level each fixture as recommended by the manufacturer to within 1 degree. Assign each unit an identification number in accordance with the plans to identify the unit by one of the following methods:

(a) Stencil numbers of 2-inch minimum height with black paint on the runway side of the base plate.

(b) Install a noncorrosive disc of 2-inch minimum diameter with numbers permanently stamped, cut out, or engraved under the head of the base plate bolt.

(c) Impress numbers of a 3-inch minimum height on a visible portion of the concrete backfill.

(2) Base Mounted. Encase light bases conforming to AC 150/5345-6 in concrete backfill at the locations indicated on the plans and mount runway light fixtures 14 inches above the ground plane on the bases. See Appendix 2, Figure 5 for additional details.

(3) Stake Mounted. Install runway light fixtures 14 inches above ground plane on metal stakes which have been installed at a depth of 30 inches in 6-inch holes at the locations indicated on the plans. Do not install the stake by driving. Backfill with thoroughly compacted earth passing a 1-inch sieve. The stake should be vertical within 3 degrees.

(4) Frost Area Installation. In areas having extreme frost conditions, installation procedures are as follows:

(a) Install all runway lights on bases which are installed in concrete backfill with conduit hubs sealed.

(b) Where base mounted units cannot be installed, install stake mounted units in the following manner:

1 Where the frost line depth exceeds the minimum cable installation depth as specified in L-108, the installation of the cable, transformers, and connectors should be increased to a maximum of 2 feet in depth.

2 Do not use connector clamps on the stakes.

3 Install primary cable connectors, splices, and transformers at the same depth and in the same horizontal plane as the primary cable with adequate slack provided.

4 Place the secondary leads from the transformer to the lamp socket in a loose spiral with excess slack at the bottom.

5 Concrete anchor, if specified, for the stake should be the size adequate for the location.

6 Eliminate backfill material which will hold moisture and substitute permeable backfill material, such as sand, around the primary connectors, transformer, and secondary leads; then cover the top surface with impervious material to reduce moisture penetration.

c. Bases. Install light bases in undisturbed soil with a concrete backfill having a diameter of at least 24 inches. Place the concrete while holding the base level to within 2 degrees of finished grade. The top of the concrete should slope away from the flange portion of the base so that a minimum of concrete is exposed above the leveled soil around the base.

d. Cable Installation.

(1) Install all primary cables and control cables by direct burial in trenches where the routing is under other than paved or stabilized areas.

(2) Trenching, the installation of cable, backfilling trenches, and the installation of cable markers should conform to L-108.

(3) Install cables in ducts and conduit to conform to L-108, paragraph 108-3.2.

(4) Install bare counterpoise wire for lightning protection, if specified, in the same trench for the entire length of the insulated cable it is to protect as specified in L-108, paragraph 108-3.9.

(5) When telephone control cable in excess of 500 feet is installed underground, install terminal junction boxes where the cable enters the vault and control tower. Use lightning arresters in each junction box. Terminal junction boxes at these points will facilitate circuit testing.

e. Cable Connections.

(1) Make in-line splices on the primary and secondary underground cable to conform to L-108, paragraph 108-3.8. Use connectors conforming to AC 150/5345-26. Splices in ducts, conduits, or in circuits between runway light fixtures are not permitted.

(2) Where crimp connectors and field attached plug-in connectors conforming to AC 150/5345-26 are employed, use crimping tools designed for the specific type connector to assure crimps or detents meeting the necessary tensile strength.

f. Duct and Conduit. Trenching, installation of ducts and conduits, concrete backfilling, trench backfilling, installation of duct markers, testing of a complete duct system, and the type of material to be used should conform with L-110. A typical 4-way duct is shown in Appendix 2, Figure 5.

6. TESTING.

a. General.

(1) Check the installation and alignment of all lighting fixtures of the completed system to determine if the equipment has been installed as designed.

(2) Check and test all electrical circuits to determine that:

(a) All circuits are continuous and free of short circuits and unspecified grounds.

(b) All circuits are properly connected in accordance with applicable wiring diagrams.

(c) The resistance to ground of all ungrounded conductors in all circuits is not less than 50 megohms.

b. Primary and Control Cables. Test the primary and control cables as specified in the applicable sections of L-108.

c. Operational.

(1) Before connecting and energizing the regulator, make a 24-hour recording of the primary input voltage to determine which regulator voltage tap to use. If the maximum recorded voltage exceeds the 240-volt maximum tap, the input voltage should be corrected.

(2) Install lamps in all fixtures for checkout. Operations with excessive open insulating transformer loads can damage a monocyclic type resonant circuit regulator.

(3) Check the open circuit protective device only once, then allow a five-minute cooling period before rechecking. Continuous cycling of the protective device can overheat and burn out the thermal relay.

(4) Test the installation by continuous operation for not less than one-half hour as a complete system including the functioning of each control not less than ten times. Test the completed circuit in accordance with the applicable provisions of Item L-108.

7. MAINTENANCE.

a. General.

(1) Runway lighting systems and auxiliary equipment normally operate with a minimum of attention. However, maintenance of runway lighting systems should take a prominent place in the maintenance schedule of the airport.

(2) Adopt a systematic maintenance schedule to insure maximum efficiency by detecting faults and avoiding deterioration of the system. If maintenance is not performed, the airport lighting system may become ineffective for many periods during the year.

(3) Proper maintenance should consist of a regular schedule of testing, cleaning, adjusting, repairing, and replacing worn-out or damaged parts. Dirty equipment contributes greatly to operational failures; therefore, keep all equipment free of dust, sand, surplus grease and oil, and other foreign material. Lamps must be replaced, glassware and reflectors must be cleaned, broken glassware replaced, and the insulation resistance of wires and cables must be maintained.

b. Personnel. The men entrusted with making periodic inspections of lighting equipment and with the actual maintenance of the airport lighting system should be experienced and reliable electricians who have had experience with high voltage and series lighting circuits. An inexperienced man should not be assigned to these duties because the high voltages that may be encountered could be fatal.

c. Operational Test. Make a daily check of the lighting system and test the equipment operation at least one hour before sunset. This check includes a driving patrol to visually check for dimly burning lamps and burned-out lamps. Record these for later maintenance check and for replacement of defective and burned-out lamps. The daily operational test of equipment should be assigned to a reliable and competent person stationed at the airport during the evening hours and who has been fully checked out on procedures to follow. These procedures should consist of turning on all airport runway lighting circuits to determine that each circuit is functioning normally. If any lighting circuit is malfunctioning, notify the maintenance electrician immediately.

d. Test Equipment, Material, and Instruction Material. To properly maintain and effect quick repairs on runway lighting systems and equipment, provide the following test equipment, material, and instruction material:

(1) Test equipment required for preventive maintenance and trouble shooting:

(a) Split-core Type Ammeter

(b) Ohmmeter

(c) Voltmeter

(d) Potential Transformer

(e) Ammeter

(f) Current Transformer

(g) Cable Fault Test Detecting Set

(h) Low Voltage Insulation Resistance Tester

(i) Station Type Neon Glow Lamp

(2) An adequate supply of cable, lamps, glassware, cutouts, fuses gaskets, and spare runway light fixtures.

(3) As-built runway lighting plans showing location of all runway cable runs, control circuits, and wiring diagrams of each piece of equipment. Modifications or extensions made in connection with the above plans should be kept up to date by the chief electrician.

(4) A maintenance instruction book and descriptive parts list for each piece of installed equipment and test equipment.

(5) Storage space and workshop where the above material and information will always be available to maintenance personnel.

8. INSPECTION.

a. Inspect each light fixture to determine that it is installed erect, at the proper height, and in line with the other fixtures.

b. Check the light fixture lenses to determine that the glassware is properly oriented with respect to the runway sides.

c. Check the identification number of each light to determine that the number of each location is as assigned in the plans.

d. Check equipment covered by FAA specifications to determine if the manufacturers are approved suppliers. Check the equipment for conformance with specification requirements.

e. Inspect all cables, wiring, and splices to obtain assurance that the installation is in accordance with AC 150/5370-1 and Supplement No. 2. Inspect underground cables before the installation is completed.

f. Inspect all ducts and duct markers to determine that the installation is in accordance with AC 150/5370-1 and local codes. Inspect underground ducts before the installation is completed.

g. Check the input voltage at the regulator's power and control circuits to determine that the voltage is within the specified limits.

h. Check fuses and circuit breakers to determine that they are of proper rating.

APPENDIX 1. BIBLIOGRAPHY

1. Obtain copies of the following Federal Aviation Administration publications from the Department of Transportation, Distribution Unit, TAD-434.3, Washington, D.C. 20590.

   a. AC 150/5345-1A, Approved Airport Lighting Equipment.

   b. AC 150/5345-3A, Specification for L-821 Airport Lighting Panel for Remote Control of Airport Lighting.

   c. AC 150/5345-6, Specification for L-809 Airport Light Base and Transformer Housing.

   d. AC 150/5345-7, Specification for L-824 Underground Electrical Cables for Airport Lighting Circuits.

   e. AC 150/5345-11, Specification for L-812 Static Indoor Type Constant Current Regulator Assembly; 4KW and 7½KW; With Brightness Control for Remote Operation.

   f. AC 150/5345-13, Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits.

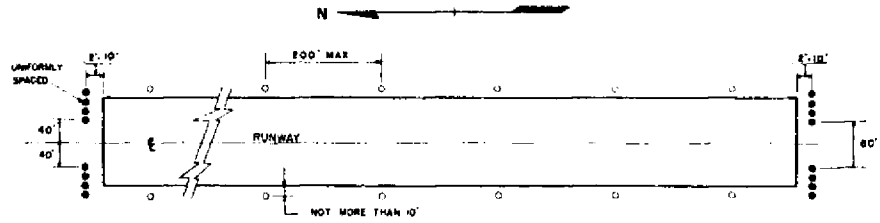
   g. AC 150/5345-18, Specification for L-811 Static Indoor Type Constant Current Regulator Assembly, 4KW; With Brightness Control and Runway Selection for Direct Operation.

   h. AC 150/5345-20, Specification for L-802 Runway and Strip Light.

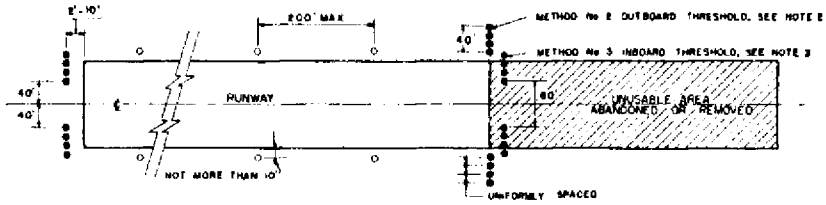
   i. AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors.

   j. AC 150/5345-31, Specification for L-833 Individual Lamp Series-To-Series Type Insulating Transformer for 600 Volt or 3,000 Volt Series Circuits.

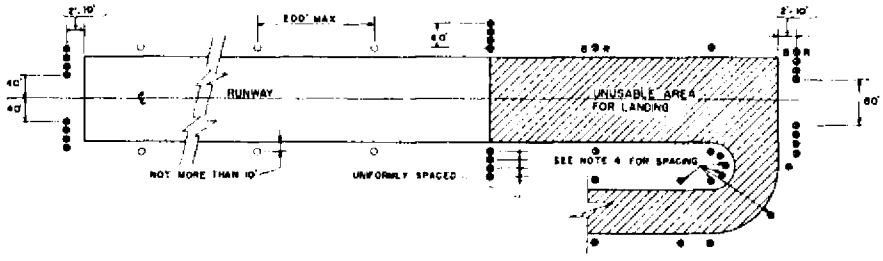
2. Obtain copies of Rural Electrification Administration (REA) Bulletin 345-14, REA Specification for Fully Color-Coded, Polyethylene Insulated, Double Polyethylene-Jacketed Telephone Cable for Direct Burial from the U.S. Department of Agriculture, Rural Electrification Administration, Information Services Division, Washington, D.C. 20250.



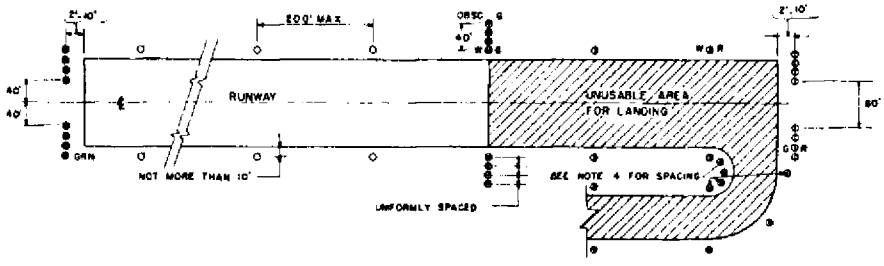
(a) TYPICAL MEDIUM INTENSITY RUNWAY LIGHTING CONFIGURATION



(b) NO AIRCRAFT OPERATIONS IN AREA BEYOND DISPLACED THRESHOLD



(c) AIRCRAFT OPERATIONS IN AREA BEYOND DISPLACED THRESHOLD AREA ARE TAXIING AND TAKE-OFF FROM SOUTH



(d) AIRCRAFT OPERATIONS IN AREA BEYOND DISPLACED THRESHOLD ARE TAXIING AND TAKE-OFF FROM NORTH AND SOUTH

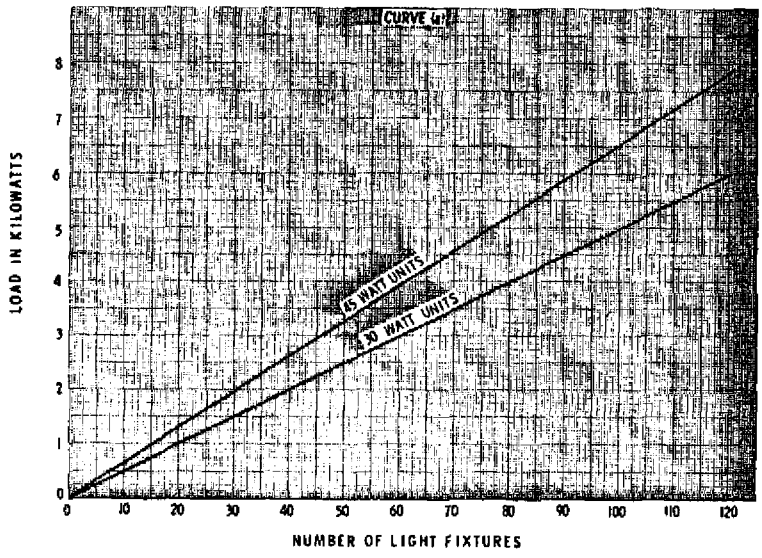
NOTES

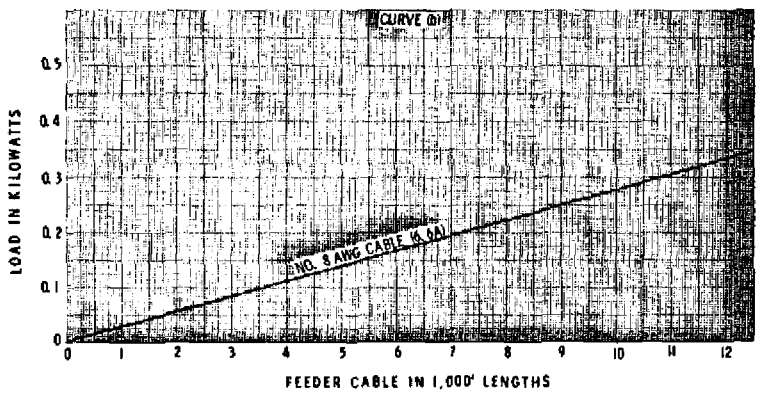
1. Color schemes based on study and interpretation as to service intended.
2. Use method No 2 threshold installation procedure for abandoned area where paved surface is left in place.
3. Use method No. 3 threshold installation procedure for abandoned area where paved surface has been removed.
4. All spacing of lights shall be in accordance with AC 150/5340-15A

LEGEND

- White 360°
- Blue 360°
- Green 360°
- Blue 180° and Red 180°
- White 180° and Red 180°
- Green 180° and Red 180°
- White 180° and Green 180°
- Obscured 180° and Green 180°

FIGURE 1. RUNWAY EDGE AND THRESHOLD LIGHTING CONFIGURATIONS





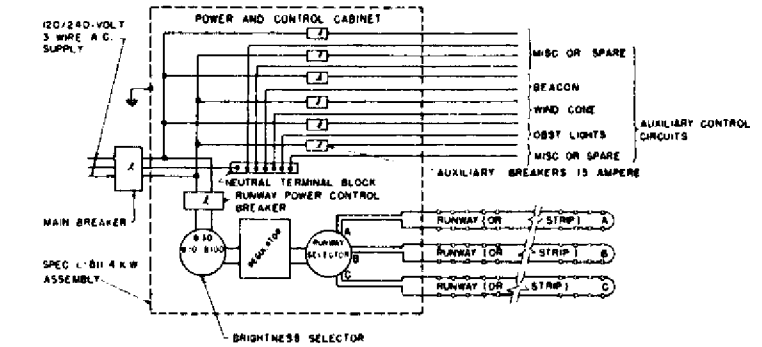
NOTES:

1. Computations based on actual circuit load tests.
2. In Curve (a) figure K. W. load using total number of 45 watt or 30 watt fixtures connected in circuit.
3. Basis for computing unit loads in Curve (a):

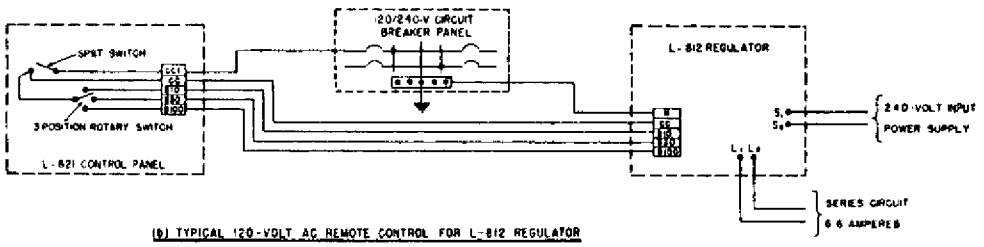
30/45 watt transformer with 45 watt lamp	54.7 watts
Cable loss, lamp tolerance, etc.	10.3 watts
Total estimated load per 45 watt unit	65.0 watts
30/45 watt transformer with 30 watt lamp	40.4 watts
Cable loss, lamp tolerance, etc.	9.6 watts
Total estimated load per 30 watt unit	50.0 watts

4. Basis for computing load per 1,000' of No. 8 AWG cable in Curve (b): $I^2R = (6.6A)^2 \times 0.6405$ ohms/1,000' = 27.9 watts/1,000'
5. Obtain total K. W. load per runway circuit by adding K. W. loads obtained from Curves (a) and (b).

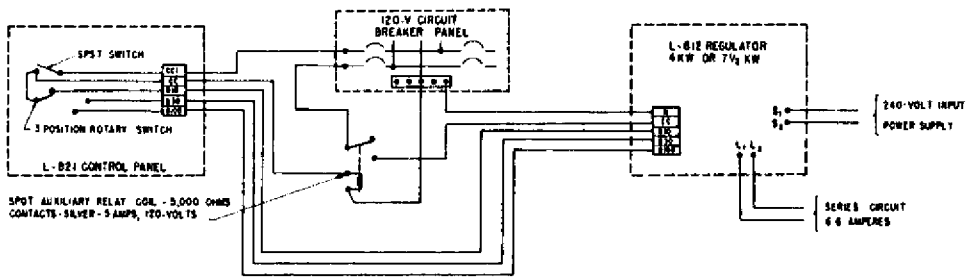
FIGURE 2. CURVES FOR ESTIMATING KILOWATT LOADS FOR MEDIUM INTENSITY RUNWAY LIGHTING CIRCUITS



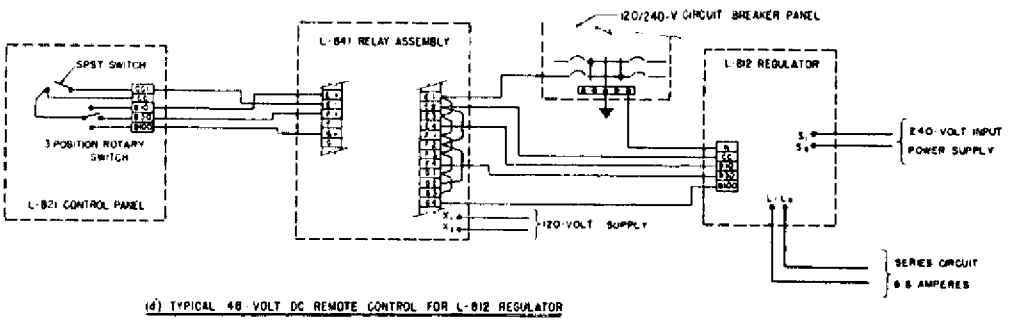
(a) TYPICAL 120-VOLT AC DIRECT CONTROL FOR L-811 REGULATOR



(b) TYPICAL 120-VOLT AC REMOTE CONTROL FOR L-812 REGULATOR

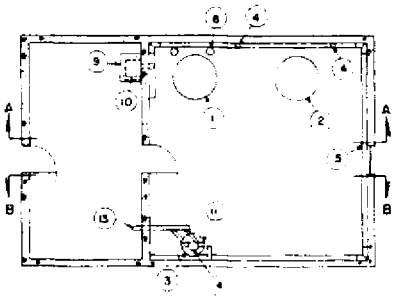


(c) TYPICAL 120-VOLT AC CONTROL CIRCUIT UTILIZING AN AUXILIARY RELAY FOR L-812 REGULATOR

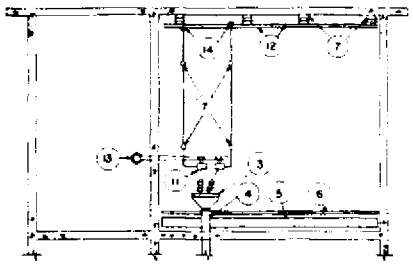


(d) TYPICAL 48 VOLT DC REMOTE CONTROL FOR L-812 REGULATOR

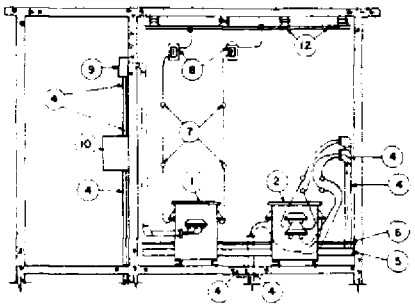
FIGURE 3. TYPICAL CONTROL WIRING DIAGRAMS FOR L-811 AND L-812 REGULATORS



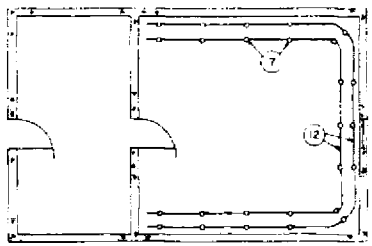
PLAN



SECTION B-B



SECTION A-A



BUS SUPPORT ARRANGEMENT

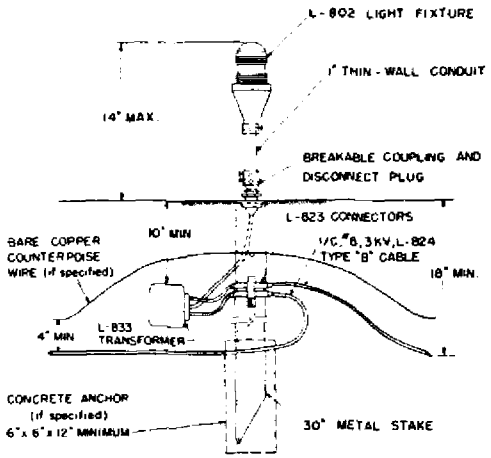
EQUIPMENT LIST

1. DISTRIBUTION TRANSFORMER - 2400-120/240 VOLTS.
2. L-812 REGULATOR 240 V./6.6 AMPERES (4 KW OR 7½ KW)
3. POTHEAD
4. CONDUIT (SIZE AS REQUIRED)
5. SQUARE DUCT
6. GROUND BUS
7. BUS SUPPORTS.
8. CUTOUTS (WHEN REQUIRED BY LOCAL CODE).
9. 120/240 V. CIRCUIT BREAKER PANEL
10. L-841 AUXILIARY RELAY CABINET ASSEMBLY
11. CUTOUTS (GANG OPERATED)
12. BUS BAR
13. DISCONNECT HANDLE FOR GANG OPERATED PRIMARY VOLTAGE CUTOUTS.
14. BUS CONNECTORS

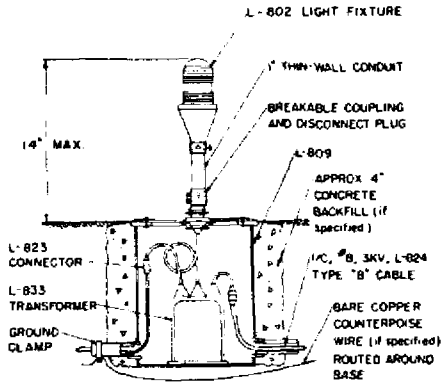
NOTES

1. All equipment and material not covered by FAA specifications are subject to acceptance through manufacturer's certification of compliance with the applicable specifications and should conform to applicable rulings and standards of Institute of Electrical and Electronic Engineers or National Electrical Manufacturers Association.
2. All equipment to be installed in accordance with Item L-109 and with electrical code having jurisdiction.
3. The construction of the vault is in accordance with L-109

FIGURE 4. TYPICAL VAULT LAYOUT DETAILS FOR 48-VOLT DC REMOTE CONTROL



(a) TYPICAL STAKE MOUNTED FIXTURE DETAIL



(b) TYPICAL BASE MOUNTED FIXTURE DETAIL

NOTES

1 Breaking groove of breakable coupling shall be not over 3½" above ground line.

2 Splices shall be in accordance with Item L-108 of Standard Specifications for Construction of Airports.

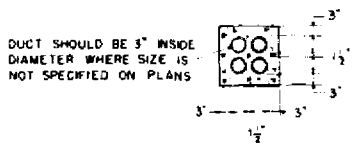
3 The bare copper counterpoise wire shown in Figures (a),(b) and (e) should be No. 8 AWG or larger and should be specified for all locations having frequent electrical storms.

4 Refer to paragraph 5 of this advisory circular for additional instructions of fixture installation.

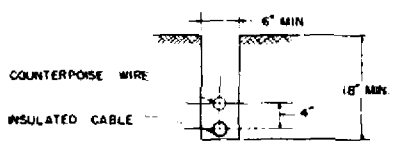
5 If specified, watertight squeeze bushing may be used to seal conduit entrance hubs of the L-809 base shown in Figure (b).

6 See paragraph 5b(4) for installational procedures for areas having extreme frost conditions.

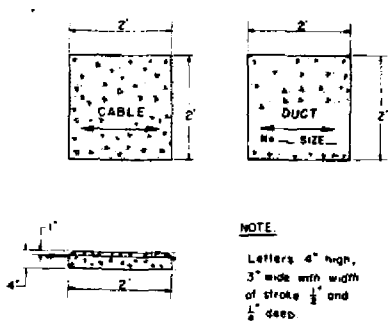
7 Refer to Items L-108 and L-110 for additional installation details for cable, duct, conduit, markers and trenching.



(c) TYPICAL 4-WAY DUCT DETAIL



(e) TYPICAL TRENCH DETAIL AND WIRE PLACEMENT



(d) TYPICAL CABLE AND DUCT MARKER DETAIL

FIGURE 5. TYPICAL FIXTURE, DUCT MARKER, AND TRENCH DETAILS

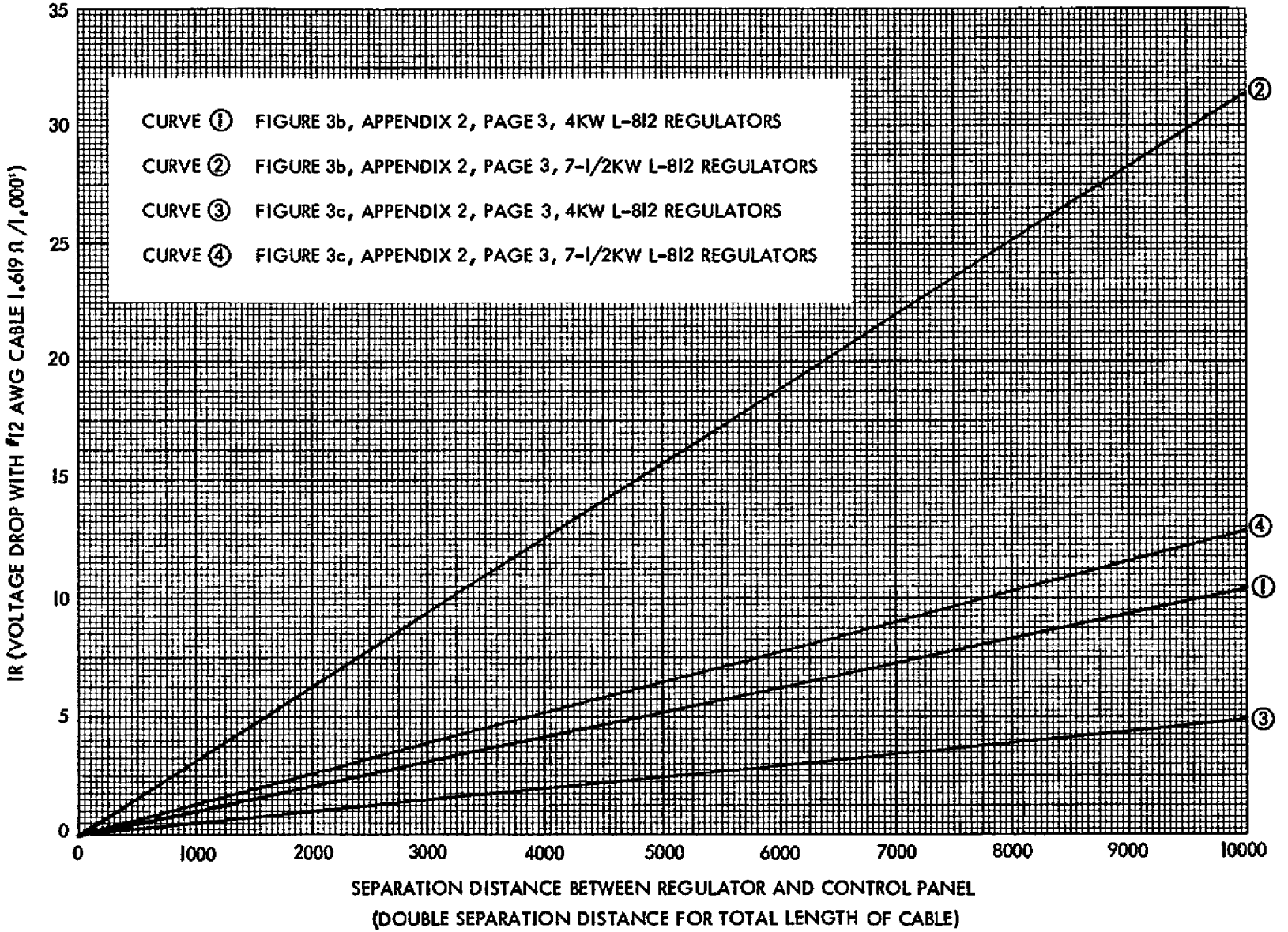


FIGURE 6. CURVE FOR ESTIMATING LENGTH OF AC CONTROL CABLE

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