CHAPTER 8
INSTALLATION OF AVIATION LIGHTING SYSTEMS

8-1. Coverage

This chapter describes the design details and methods used for the installation of permanent airfield, heliport, and helipad lighting Systems, including the installation of the system components called for in other sections of this manual. Installation will comply with NFPA 8-2. Underground materials and equipment.

8-2. Underground material and equipment

The materials and equipment of airfield, heliport, and helipad lighting systems, such as wire, cable, isolating transformers, lightning protection, and other system components, are designed to be installed in a direct manner or in a system of conduits (ducts), handholes, and manholes.

a. Cables. Where there is a multiplicity of cables, such as from the vault to runways, helipads, and taxiways, or to the control tower, cables will be installed in ducts. Where only a few cables are involved and there are no foreseeable maintenance problems in replacing such cables without disturbing others, direct burial cables will be installed. Conduits will be installed under paved areas or other stabilized areas regardless of the number of cables. Conduits will be as noted in b, below. Direct buried cables will be installed so that all requirements of the applicable criteria will be met. Either the plug and receptacle system or cable-splicing kits will be used for joining cable leads between lights. The plug and receptable system only will be used for connecting isolating transformers to lights. Where the plug and receptacle system is used, plastic tape will be wrapped around each connection to prevent the intrusion of foreign materials into the connection. For additional information on airfield lighting cable systems, see AFM 88-14. Cables for helipad lighting systems, where the lights are of the multiple type, should be connected directly to the lighting fixtures.

b. Conduits. Conduits (ducts) for transverse crossings under traffic area paving at new installations will not be a part of the airfield or heliport lighting work, as these ducts will normally be provided as part of the paving operation. However, caution should be taken to clarity this in both the paving and lighting contracts and the layout of the ducts clearly shown in both contracts. The ducts should be noted as existing in the lighting contract when they are installed in the paving contract. However, at existing installations where it is necessary to install additional ducts under existing pavements, the work may be considered as part of the lighting system. Typical cross-section layouts for ducts may be found in TM 5-811-1. Additional criteria and information may be found, as required for the particular layout, by reference to applicable criteria contained in AFM 88-14. Ducts under paved traffic areas will be concrete encased. Ducts away from paved areas maybe direct burial, Type II, where most economical and practicable. An adequate number of ducts will be installed in a duct bank to allow for future construction. Conduits stubbed up through concrete for connection to equipment or devices will be either PVC, bituminous coated rigid steel or immediate metal conduit.

c. Cable splices. Cable splices will be of the following type**:**

(1) Cast splice with kit.
(2) Vulcanized splice with mold.
(3) Plug-in splice with cable connector kit.
(4) Taped splice with vinyl tape.

(a) In addition to the splicing of wires and cables, cable splices may be required in runway lighting systems at visual glide slope indicators, if such are authorized. For information on splices at glide angle indicators see FAA Advisory Circular AC 150/5340-14.

(b) For detailed information on above types of cable splices, see AFM 88-14.

d. Isolating transformer. Series-to-series isolating transformers of the rating required will be buried in the earth at a minimum depth of 24 inches, or located in the handholes or light bases of the concrete pads, as appropriate.

8-3. Lights in concrete pads

Runway, threshold, taxiway, and, where authorized, approach lights, will be mounted in concrete pads. Concrete pads will be located so that the lights are on the centers required for proper spacings as noted elsewhere in this manual for the system of lights being installed. Pads may be with or without reinforcing, as considered necessary. Handholes with covers will be provided in the concrete pads only where required for the installation. Covers will be of reinforced concrete when located in the traffic pattern, and will be of 1/4-inch thick steel plate when located outside the traffic pattern. All concrete pads will be painted with nonreflective yellow paint, conforming to Fed. Spec. *TT-P-85*. During simulated combat conditions, pads may be painted olive drab, if desired, to provide maximum security for the airfield or heliport. All lights must be level. To ensure that elevated marker lights will be level, the conduit and coupling must be plumb and held firmly in place during concrete pouring operations. For flush fixtures, the top of the light bases must be held firmly in place in a level position while the concrete pad is poured. See figures 2-3 and 2-4 for details on medium intensity light fixture installations. Concrete bases as shown on figures 2-3 and 2-4 are normally maximum in size and may be smaller where soil

and frost problems will not be encountered. For information on high intensity lighting installations, see AFM 88-14.

8-4. Lightning protection

In lightning prevalent areas having isokeraunic incidence of 60 or more, a counterpoise network will be used throughout medium intensity airfield, heliport and helipad lighting systems. The counterpoise may be used where the isokeraunic incidence is 30 or more where local conditions and experience indicate the need for such a requirement. The counterpoise will be installed for all high intensity lighting systems (AFM 88-14). Where it is determined that a counterpoise will be installed, the following procedures will be followed. A No.4 AWG stranded bare copper wire will be laid continuously for the entire length of all circuits supplying the lighting systems. The counterpoise will be laid approximately 6 inches above the uppermost layer of direct burial cables or direct burial ducts, or on top of the concrete envelope of a concrete-encased duct bank. Under paved areas such as runways, taxiways, and aprons, a spare duct should be installed in each duct bank for the counterpoise. The duct for the counterpoise will be located above the ducts for the lighting system cables. In instances where a duct bank exists under a paved area, the counterpoise may be placed in a duct above the duct containing the lighting circuit conductor. Only one counterpoise will be installed for all cables in the same trench or duct bank. All counterpoise wires leading to a trench or duct bank will be connected to the counterpoise wire in the trench or duct bank. Where located parallel to a paved area, the counterpoise will be installed on the pavement side of the conductors. The counterpoise will be grounded at the vault, at the feeder connection to the light circuit, at the panel connection to the grounding electrode conductors, at the midpoint of the light circuit, at each light station, power station, and control station of a MALS or MALSF, and at one point at taxiway and runway intersections. Ground resistance at each ground connection should be 25 ohms or less. The counterpoise will be connected by No.8 AWG bare copper wire to the metal base (or metal mounting structure) of each light unit except for high intensity lighting system narrow gauge and centerline lights mounted in holes drilled in the pavement. Mechanical connectors or exothermic welding process will be used for all connections to the counterpoise network. Solder connections will not be used.

8-5. Decisions regarding continued use of obsolete lighting equipment

Continued use of obsolete airfield and heliport equipment and materials at an existing Army installation will be determined at each particular installation, after due consideration of all pertinent factors. Some factors to consider include age and condition of the obsolete equipment and materials; suitability, reliability, and safety of continued use; economics; cost of replacement and funding; operational requirements of the airfield or heliport in connection with functional requirements of the equipment; and availability of new equipment and materials.

8-6. Testing and maintenance of Army airfield and heliport lighting systems

Reference data for acceptance testing and for use as a guide for preventive maintenance and troubleshooting of Army airfield and heliport lighting systems may be obtained in accordance with the applicable parts of AFM 88-14. Appropriate portions of these data will be included in installation contracts as an acceptable testing specification. Tests, procedures, and technical data outlined therein generally are acceptable for equipment and materials installed for Army airfield and heliport lighting systems. Backfilling of trenches will be held in abeyance pending visual inspection and testing of cables in the presence of the authorized representative of the Contracting Officer. When conducting electrical tests required in AEM 88-14 for underground cables, connectors, and transformers, such tests will be made with approximately 6 inches of compacted select backfill over the cables. Necessary arrangements may be made with the appropriate Air Force Regional Civil Engineer for loan of the type MD-1 Insulation Breakdown Test Set during acceptance testing, and type MM-I Airfield Lighting Test Set during checking and testing of the Army airfield and heliport lighting systems. The helipad lighting system will be tested in accordance with the applicable portion of AFM 88-14 for low voltage installations.

8-7. Electrical supply

The source of electrical energy will normally be the base electrical distribution system. When specifically approved for the installation, a standby generating plant will be furnished at the electrical vault. The generator set, sized for the airfield or heliport lighting system including beacon; obstruction lights in the immediate vicinity of the installation; and power requirements of the vault necessary for operation of equipment in the vault, will be approved for the particular installation by the Army command or technical service concerned with operation of the airfield or heliport. Electrical energy normally will be fed through a transformer or transformer bank to the electrical equipment vault. The primary of the transformer will match the voltage of the base distribution feeder. Output of the transformer or transformer bank and output of the emergency generator will be designed for input voltage of the regulators and the electrical characteristics of equipment other than regulators, in the vault. This will normally be 120/240-volts, single phase, or 120/208-volts, three phase, 60 hertz. For high intensity runway and approach lighting systems for long runways, see AFM 88-14.