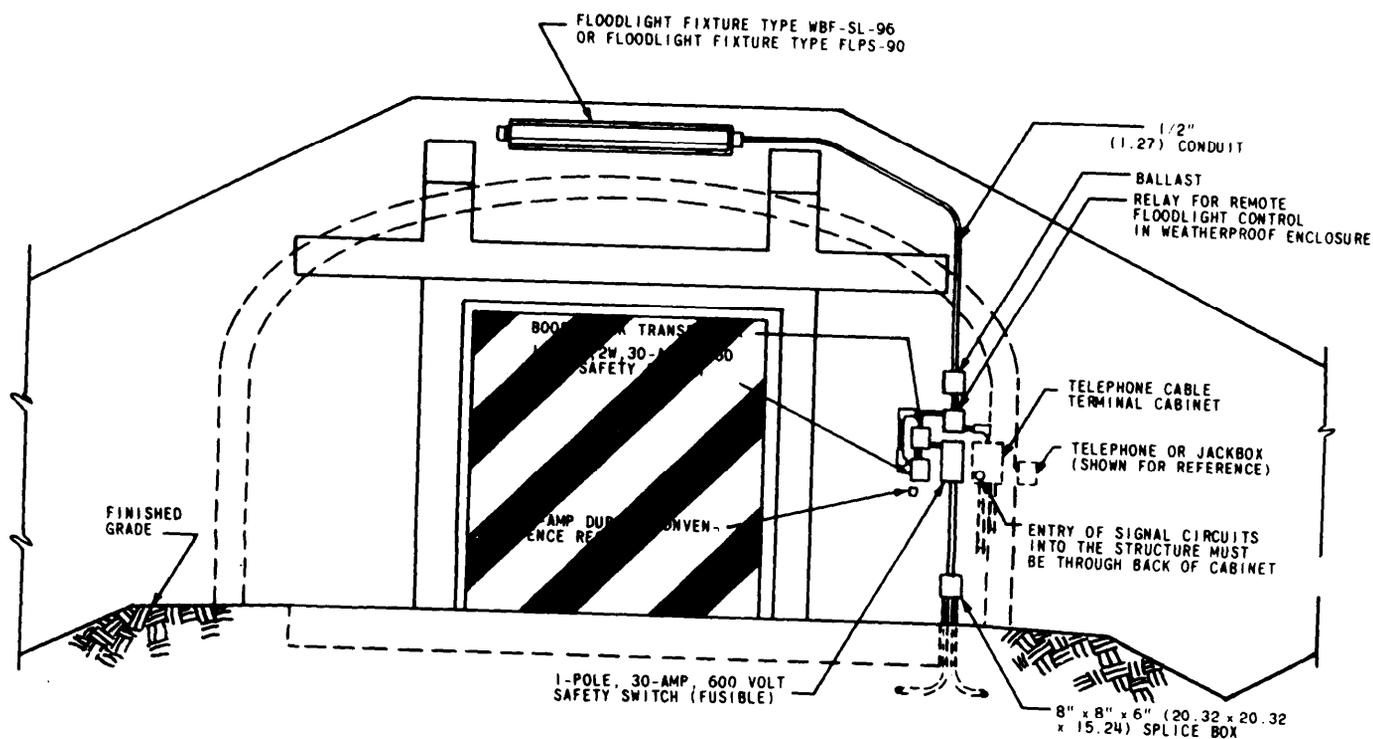


# Protective Lighting



**P**rotective lighting provides a means of continuing, during hours of darkness, a degree of protection approaching that maintained during daylight hours. This safeguard also has considerable value as a deterrent to thieves and vandals and may make the job of the saboteur more difficult. It is an essential element of an integrated physical security program.

## 6-1 Requirements

a. Protective or security lighting needs at installations and facilities depend upon each situation and the areas to be protected. Each situation requires careful study to provide the best visibility practicable for such security duties as identification of badges and people at gates (chapters 4 and 5), inspection of vehicles, prevention of illegal entry, detection of intruders outside and inside buildings and other structures, and inspection of unusual or suspicious circumstances.

b. When such lighting provisions are impractical, additional security posts, patrols, sentry dog patrols, or other security means will be necessary.

c. Protective lighting should not be used as a psychological deterrent only. It should be used on a perimeter fence line only where the fence is under continuous or periodic observation. Protective lighting may be unnecessary where the perimeter fence is protected by a central alarm system.

d. Protective lighting maybe desirable for those sensitive areas or structures within the perimeter, which are under specific observation. Such areas or structures include pier and dock areas, vital buildings, storage areas, and vulnerable control points in communications, power, and water distribution systems. In interior areas where night operations are conducted, adequate lighting of the area facilitates detection of unauthorized persons approaching or attempting malicious acts within the area.

## 6-2 Characteristics

fighting is inexpensive to maintain and, when properly employed, may reduce the need for security forces. It may also provide personal protection for forces by reducing the advantages of concealment and surprise for a

determined intruder. security forces thus relieved may be used to better advantage elsewhere.

Protective lighting usually requires less intensity than working light, except for identification and inspection at authorized portals and in emergencies. Each area of an installation or facility presents its particular problem based on physical layout, terrain, atmospheric and climatic conditions, and the protective requirements. Data are available from the manufacturers of lighting equipment and from the Army Corps of Engineers, which will assist in designing a lighting system. Included in these data are:

- Descriptions, characteristics, and specification of various incandescent, arc, and gaseous discharge lamps.
- Lighting patterns of the various luminaries.
- Typical layouts showing the most efficient height and spacing of equipment.
- Minimum protective lighting intensities required for various applications.

## 6-3 Commander's Responsibility

a. Each commander must determine perimeter lighting needs dependent upon the threat, perimeter extremities, surveillance capabilities, and the available guard forces.

b. He must insure that protective lighting is designed and employed to discourage unauthorized entry and to facilitate detection of intruders approaching or attempting to gain entry into protected areas.

c. The commander must insure that protective lighting operates continuously during periods of reduced visibility, and that standby lighting is maintained and periodically tested for use during times of emergency and mobilization alerts.

## 6-4 Planning Considerations

In planning a protective lighting system, the physical security manager must give specific consideration to the following areas:

**a. Cleaning and replacement of lamps and luminaries**, particularly with respect to costs and means (such as ladders, mechanical buckets, etc.) required and available.

**b. Advisability of including mercury and photoelectric controls.** These may be desirable in a peacetime situation, but undesirable when blackout is a possibility.

**c. The effects of local weather conditions** on various types of lamps and luminaries.

**d. Fluctuating or erratic voltages** in the primary power source.

**e. Requirement for grounding of fixtures** and the use of a common ground on an entire line to provide a stable ground potential.

**f. Establishment of a ledger to maintain a burning-time (80 percent) record** based on the life expectancy of the lamp. The ledger should contain as a minimum the following:

- Type and wattage of lamp.
- Area, facility, or utility pole used.
- Date of insertion.
- Programed date (based on life expectancy) for extraction and where used (admin area).

### **g. Limited and exclusion areas.**

**(1)** All limited and exclusion areas must have protective lighting on a permanent basis at perimeter and access control points. The lighting must be positioned to:

- (a)** Prevent glare that may temporarily blind the guards.

**(b)** Avoid silhouetting or highlighting the guards.

**(2)** Lighting in these areas must be under the control of the security force.

**(3)** The perimeter band of lighting must provide a minimum intensity of 0.2 foot candles, measured horizontally 6 inches (15.2 cm) above ground level, at least 30 feet (9.1 m) outside the exclusion area barrier. Lighting inside exclusion areas or on structures containing nuclear weapons must be of sufficient intensity to enable detection of persons in the area or at structure entrance(s). Lighting at entrance control points must be of sufficient intensity to enable guards to compare and identify bearers and badges.

**(4)** Protective lighting systems will be operated continuously during hours of darkness.

**(5)** Protective lights should be employed so that the failure of one or more lights will not affect the operation of remaining lights.

**h. Interior and exterior arms storage lighting.** Interior and exterior security lighting must be provided as follows for all arms storage facilities, buildings in which arms storage rooms are located, arms storage rooms, motor pools, hangars, and outdoor parking areas for vehicles or aircraft that have weapons stored on board:

**(1)** During hours of darkness, exterior entrances of arms buildings and motor pool bays and hangars where vehicles or aircraft are parked with weapons aboard must be illuminated to an intensity of not less than 1.0 foot candle at any point to a height of 8 feet on their vertical surfaces and to a horizontal distance of 8 feet from the entrance.

**(2)** Interior entrances of arms rooms must be illuminated a minimum of 0.10 foot candle at any point within a 20-foot radius of the entrance.

(3) Vehicles and aircraft parked outside with weapons aboard must be illuminated 0.10 foot candle at any point within a 30-foot radius of the vehicle or aircraft.

(4) Switches for exterior lights must be installed so they are not accessible to unauthorized individuals. Exterior lights must be covered with wire mesh screen or other material that will prevent their being broken by thrown objects.

(5) New construction lighting requirements must conform to ammunition and explosive safety requirements of appendix C, TM 9-1300-206.

(6) Lighting requirements on existing facilities should be programed for and upgraded as needed.

#### **i. Other Suitable Employment Locations:**

- (1) Warehouses
- (2) Motorpools/parks
- (3) Commissaries
- (4) Post exchanges/annexes
- (5) Clubs (EM, NCO, Officer, Country)
- (6) Bank/finance and accounting office
- (7) Medical/dental facilities
- (8) Salvage yards
- (9) Helipads and hangars
- (10) Museums
- (11) Gasoline dispensing areas
- (12) Recreational areas (isolated/administrative areas)
- (13) Troop billet areas
- (14) Individual troop movement areas
- (15) Housing areas
- (16) Perimeter entrances/exits (isolated/used)

(17) Troop working areas.

### **6-5 Principles Of Protective Lighting**

Protective lighting should enable guard force personnel to observe activities around or inside an installation without disclosing their presence. Adequate lighting for all approaches to an installation not only discourages attempted unauthorized entry, but also reveals persons within the area. However, lighting should not be used alone. It should be used with other measures such as fixed security posts or patrols, fences, and alarms. Other principles of protective lighting are listed next.

**a.** Good protective lighting is achieved by adequate, even light upon bordering areas, glaring lights in the eyes of the intruder, and relatively little light on security patrol routes. In addition to seeing long distances, security forces must be able to see low contrasts, such as indistinct outlines of silhouettes, and must be able to spot an intruder who may be exposed to view for only a few seconds. All of these abilities are improved by higher levels of brightness.

**b.** In planning protective lighting, high brightness contrast between intruder and background should be the first consideration. With predominantly dark dirty surfaces or camouflage type painted surfaces, more light is needed to produce the same brightness around installations and buildings than when clean concrete, light brick, and grass predominate. When the same amount of light falls on an object and its background, the observer must depend on contrasts in the amount of light reflected. The ability of the observer to distinguish poor contrasts is significantly improved by increasing the level of illumination.

c. When the intruder is darker than his background, the observer sees primarily the outline or silhouette. Intruders who depend on dark clothing and even darkened face and hands may be foiled by using light finishes on the lower parts of buildings and structures. Stripes on walls have also been used effectively, as they provide recognizable breaks in outlines or silhouettes. Good observation conditions can also be created by providing broad lighted areas around and within the installation, against which intruders can be seen.

d. Two basic systems, or a combination of both may be used to provide practical and effective protective lighting. The first method is to light the boundaries and approaches. The second is to light the area and structures within the general boundaries of the property.

e. To be effective, protective lighting should:

(1) Discourage or deter attempts at entry by intruders. Proper illumination may lead a potential intruder to believe detection is inevitable.

(2) Make detection likely if entry is attempted.

## 6-6 Types of Lighting

The type of lighting system to be used depends on the overall security requirements of the installation concerned. Lighting units of four general types are used for protective lighting systems—continuous, standby, movable, and emergency.

**a. Continuous lighting (stationary luminary).** This is the most common protective lighting system. It consists of a series of fixed luminaries arranged to flood a given area continuously during the hours of darkness with overlapping cones of light. Two primary methods of employing continuous

lighting are glare projection and controlled lighting:

(1) **The glare projection lighting** method is useful where the glare of lights directed across surrounding territory will not be annoying nor interfere with adjacent operations. It is a strong deterrent to a potential intruder because it makes it difficult for him to see the inside of the area. It also protects the guard by keeping him in comparative darkness and enabling him to observe intruders at considerable distance beyond the perimeter. (See figure 23 for installation details.)

(a) Glare projection or other protective perimeter lighting may not be appropriate in some instances. In combat, tactical perimeter security considerations are given first priority over security against pilferage. Generally, the tightening of tactical perimeter security strengthens other physical security efforts. A blending of tactical and physical security principles is required—especially true with regards to perimeter lighting.

(b) Glare projection is not appropriate where security troop emplacements may be silhouetted or illuminated for the enemy to see from the enemy's approach to the secured site. Where glare projection is desired, security troops placed in front of the perimeter fence should be moved, but still be able to take up effective fields of fire for defense of the perimeter. If such blending of protective lighting and tactical security cannot be accomplished, perimeter lighting should not be used. Floodlights that provide a band of light with great horizontal angular dispersal and which directs the glare at a possible intruder while restricting the downward beam, is preferred in this application.

(2) **Controlled lighting** is best when it's necessary to limit the width of the lighted strip outside the perimeter because of adjoining property or nearby highways,

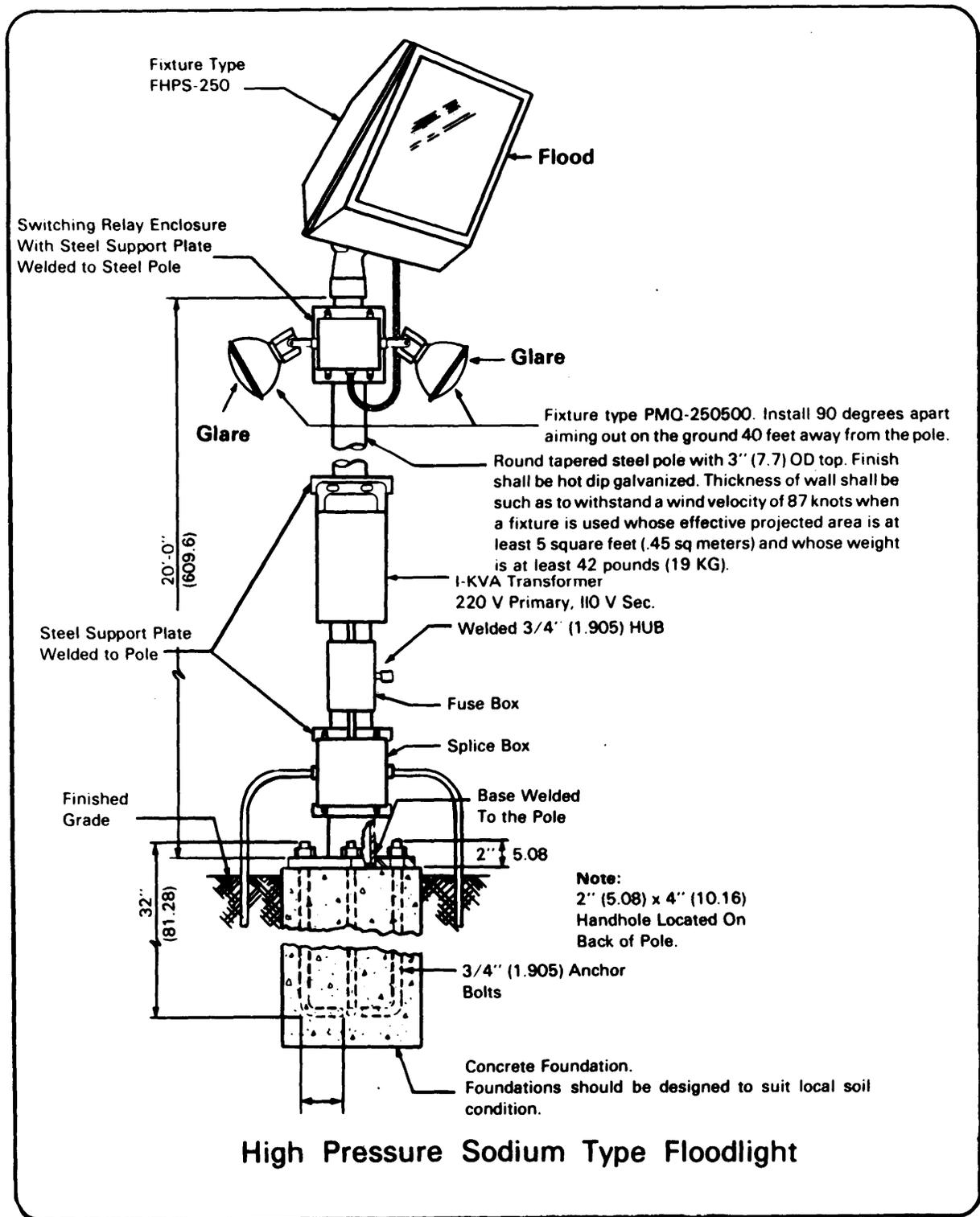
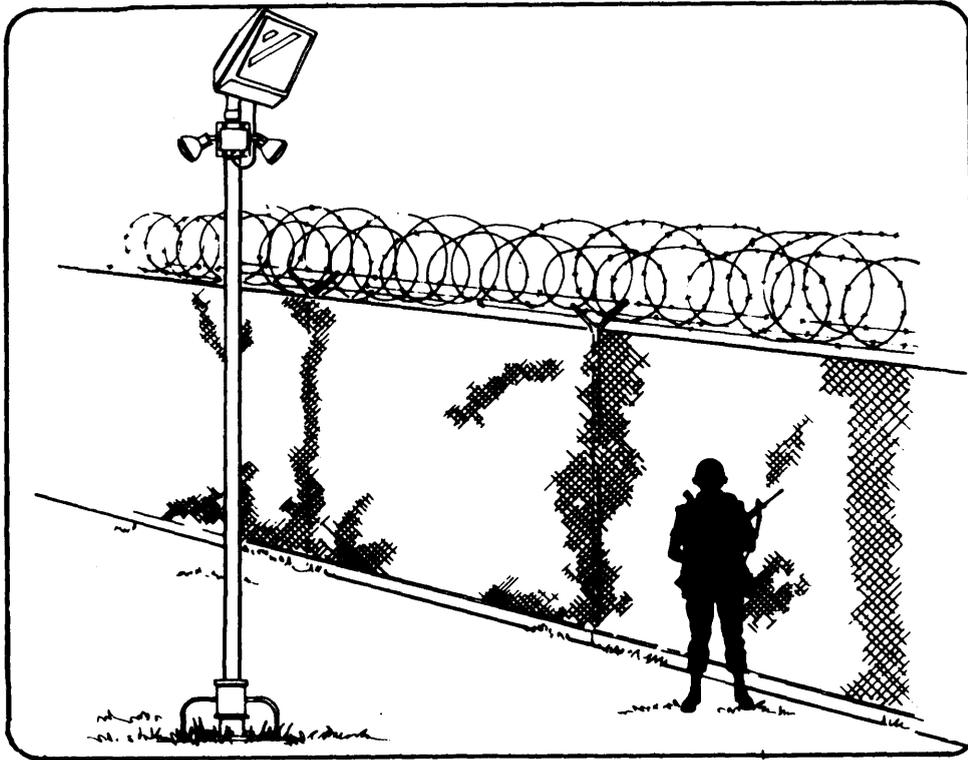


Figure 23—Typical perimeter security lighting details.



**Figure 24—Example of boundary lighting near adjoining property (controlled lighting).**

railroads, navigable waters, or airports. In controlled lighting, the width of the lighted strip can be controlled and adjusted to fit the particular need, such as illumination of a wide strip inside a fence and a narrow strip outside; or floodlighting a wall or roof. This method of lighting often illuminates or silhouettes security personnel as they patrol their routes (figure 24 shows controlled lighting).

**b. Standby lighting (stationary luminary).** The layout of this system is similar to continuous lighting. However, the luminaries are not continuously lighted, but are either automatically or manually turned on only when suspicious activity is detected or suspected by the security force or alarm systems.

**c. Movable lighting (stationary or portable).** This type of system consists of manually operated movable searchlights which may be either lighted during hours of

darkness or lighted only as needed. The system normally is used to supplement continuous or standby lighting. (The 18-inch 2.2 KW Xeon searchlight, using a 106 Recoilless Rifle mount on a 1/4-ton truck is excellent for this purpose).

**d. Emergency lighting.** This system may duplicate any or all of the above systems. Its use is limited to times of power failure or other emergencies which render the normal system inoperative. It depends on an alternative power source, such as installed or portable generators, or batteries.

## 6-7 Other Lighting

### a. Fenced perimeters.

**(1) Isolated fenced perimeters** are fence lines around areas where the fence is 100 feet or more from buildings or operat-

ing areas, plus the approach area is clear of obstruction for 100 or more feet outside the fence and is not used by other personnel. Both glare projection and controlled illumination are acceptable for these perimeters. Patrol roads and paths should be kept unlighted.

**(2) Semi-isolated fenced perimeters** are fence lines where approach areas are clear of obstruction for 60 to 100 feet outside the fence and the general public or installation personnel seldom have reason to be in the area. Patrol roads and paths should be kept in relative darkness.

**(3) Nonisolated fence perimeters** are fence lines immediately adjacent to operating areas within the installation, other installations or to public thoroughfares, where outsiders or installation personnel may move about freely in the approach area. The width of the lighted strip in this case depends on the relative clear zone inside and outside the fence. It may not be practicable to keep the patrol area dark.

**b. Building face perimeters** consist of faces of buildings on or within 20 feet of the property line or area line to be protected, and where the public may approach the buildings. Guards may be stationed inside or outside of the buildings. Doorways or other insets in the building's face should receive special attention for lighting to eliminate shadows.

**c. Active entrances** for pedestrians and vehicles should have two or more lighting units with adequate illumination for recognition of persons and examination of credentials. All vehicle entrances should have two lighting units located to facilitate complete inspection of passenger cars, trucks, and freight cars as well as their contents and passengers. **Semiactive and inactive entrances** should have the same degree of continuous lighting as the remainder of the perimeter, with standby lighting of sufficient illumination to be used when the entrance becomes active. Gate houses at entrances should have a low level of interior illumina-

tion to enable guards to see better, increase their night vision adaptability and avoid making them targets.

**d. Areas** and structures within the installation property line consist of yards, storage spaces, large open working areas, piers, docks, and other sensitive areas and structures.

**(1)** Open yards (defined as unoccupied land only) and outdoor storage spaces (defined as material storage areas, railroad sidings, motor pools, and parking areas) should be illuminated as follows:

**(a)** An open yard adjacent to a perimeter (between guards and fences) should be illuminated in accordance with the illumination requirements of the perimeter. Where lighting is deemed necessary in other open yards, illumination should not be less than 0.2 foot candle at any point.

**(b)** Lighting units should be placed in outdoor storage spaces to provide an adequate distribution of light in aisles, passageways, and recesses to eliminate shadowed areas where unauthorized persons may conceal themselves.

**(2)** Piers and docks located on an installation should be safeguarded by illuminating both water approaches and the pier area. Decks on open piers should be illuminated to at least 1.0 foot candles and the water approaches (extending to a distance of 100 feet from the pier) to at least 0.5 foot candle. The area beneath the pier floor should be lighted with small wattage floodlights arranged to the best advantage with respect to piling. Movable lighting capable of being directed as required by the guards is recommended as a part of the protective lighting system for piers and docks. The lighting must not in any way violate marine rules and regulations (must not be glaring to pilots). The US Coast Guard should be consulted for approval of proposed protective lighting adjacent to navigable waters.

(3) Critical structures and areas should be the first consideration in designing protective fencing and lighting. Power, heat, water, communications, explosive materials, critical materials, delicate machinery, areas where highly classified material is stored or produced, and valuable finished products need special attention. Critical structures or areas classified as vulnerable from a distance should be kept dark (standby lighting available), and those that can be damaged close at hand should be well lighted. The surroundings should be well lighted to force an intruder to cross a lighted area, and any walls should be lighted to a height of 8 feet to facilitate silhouette vision.

## 6-8 Wiring Systems

Both multiple and series circuits may be used to advantage in protective lighting systems, depending on the type of luminary used and other design features of the system. The circuit should be arranged so that failure of any one lamp will not leave a large portion of the perimeter line or a major segment of a critical or vulnerable position in darkness. Connections should be such that normal interruptions caused by overloads, industrial accidents, and building or brush fires will not interrupt the protective system. In addition, feeder lines should be located underground (or sufficiently inside the perimeter in the case of overhead wiring) to minimize the possibility of sabotage or vandalism from outside the perimeter. The design should provide for simplicity and economy in system maintenance and should require a minimum of shutdowns for routine repairs, cleaning, and lamp replacement. It is necessary in some instances to install a duplicate wiring system.

## 6-9 Maintenance

a. Periodic inspections should be made of all electrical circuits to replace or

repair worn parts, tighten connections, and check insulation. Luminaries should be kept clean and properly aimed.

b. Replacement lamps can be used in less sensitive locations. The actuating relays on emergency lines, which remain open when the system is operating from the primary source, need to be cleaned frequently since dust and lint collect on their contact points and can prevent their operation when closed.

c. The intensity of illumination and specification for protective lighting for fences or other antipersonnel barriers should meet the minimum requirements (next page).

## 6-10 Power Sources

Power sources should meet the following criteria:

a. **Primary**— usually a local public utility.

b. **Alternate**— the following should be provided:

(1) Standby batteries or gasoline-driven generators may be used.

(a) If cost effective, a system should start automatically upon failure of outside power.

(b) Must insure continuous lighting.

(c) May be inadequate for sustained operations, therefore, additional security precautions must be considered.

(d) Tested to insure efficiency and effectiveness. The frequency and duration of tests depend on:

■ Mission and operational factors.

■ Location, type and condition of equipment.

■ Weather (temperature affects batteries very strongly).

(2) Located within a controlled area for additional security.

(3) Generator or battery-powered portable and/or stationary lights.

Location	Foot-candles on horizontal plane at ground level
Perimeter of outer area	0.15
Perimeter of restricted area	0.4
Vehicular entrances	1.0
Pedestrian entrances	2.0
Sensitive inner area	0.15
Sensitive inner structure	1.0
Entrances	0.1
Open yards	0.2
Decks on open piers	1.0

Type of area	Type of lighting	Width of lighted strip (ft)	
		Inside fence	Outside fence
Isolated perimeter	Glare	25	200
Isolated perimeter	Controlled	10	70
Semi-isolated perimeter	Controlled	10	70
Non-isolated perimeter	Controlled	20-30	30-40
Building face perimeter	Controlled	50 (total width from building face)	
Vehicle entrance	Controlled	50	50
Pedestrian entrance	Controlled	25	25
Railroad entrances	Controlled	50	50
Vital structures	Controlled	50 (total width from structure)	

**Lighting Specification Table**

- (a) For use in a complete power failure
- (b) Includes alternate power supply
- (c) Available at designated control points for security personnel.

**c. Security— a must.**

(1) Starts at the points where power feeder lines enter the installation or activity.

(2) Security emphasis goes to sources in terms of mission essential/vulnerable activity, IAW AR 190-13.

(3) Continual physical security inspections of power sources is required to determine security measures and replacement of equipment (transformers, lines, etc.).