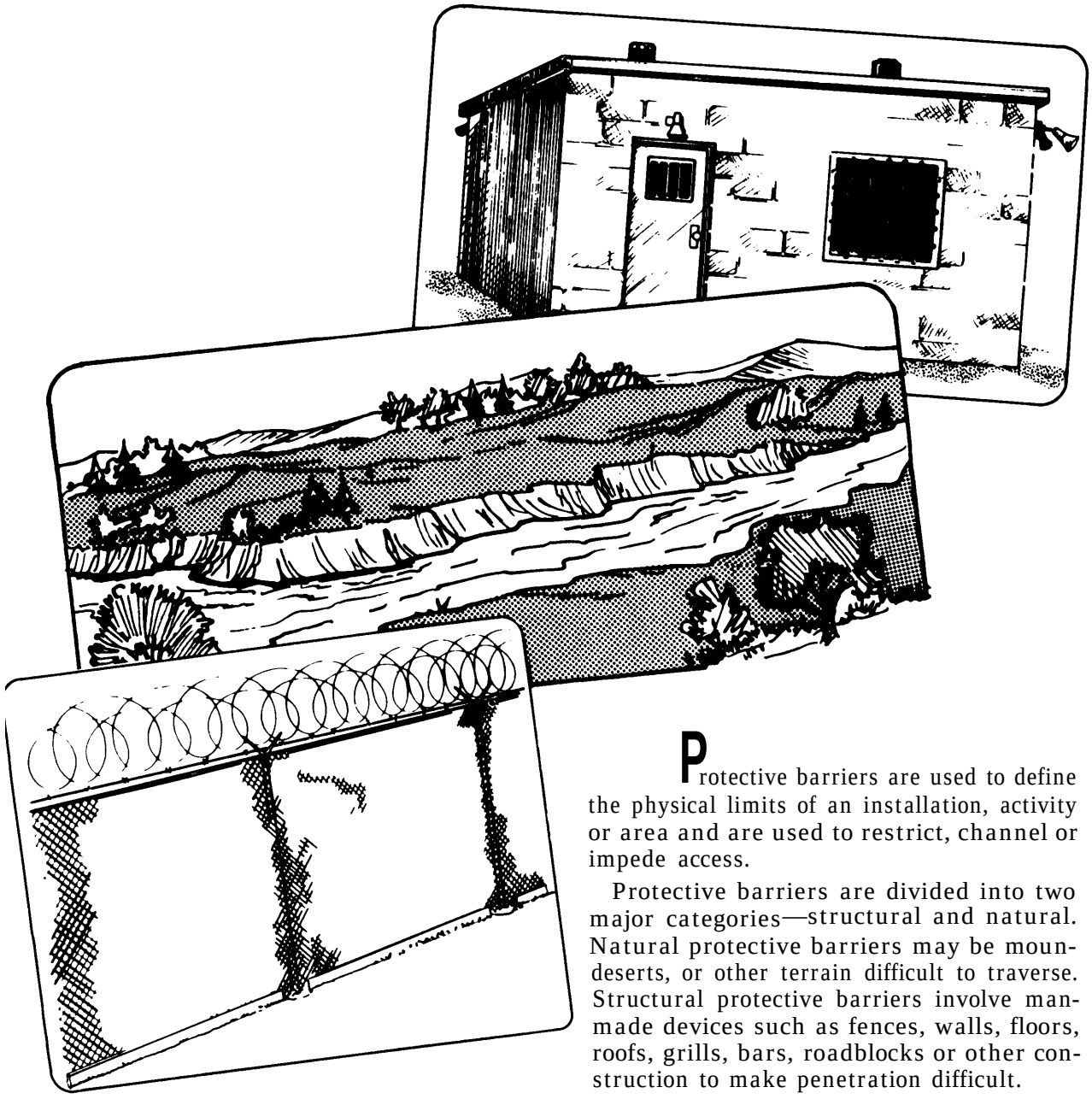
Chapter 5

Protective Barriers



Protective barriers are used to define the physical limits of an installation, activity or area and are used to restrict, channel or impede access.

Protective barriers are divided into two major categories—structural and natural. Natural protective barriers may be mountains, deserts, or other terrain difficult to traverse. Structural protective barriers involve man-made devices such as fences, walls, floors, roofs, grills, bars, roadblocks or other construction to make penetration difficult.

5-1 Benefits

The use of barriers offers two important benefits to a physical security posture. First, they create a psychological consideration for anyone thinking of unauthorized entry. Second, barriers have a direct impact on the number of security posts needed and on the frequency of use for each post.

5-2 Considerations

Protective physical barriers should be used in the protection of the entire installation or facility and in establishing restricted areas. The following guidance may be used for protective structural barriers and the types of areas they serve:

a. The size of an area, which in some cases may embrace extensive tracts of land, will depend upon the nature of the security considerations. These considerations will have a bearing on the essentiality and cost effectiveness of establishing structural barriers on the outer perimeter. You can define the outer perimeter of a restricted area by:

(1) Structural barriers at control points and other points of possible entrance and exit.

(2) Natural or structural barriers between control points that are sufficiently obstructive and difficult to traverse—to control and to preclude accidental intrusion.

b. The size of a restricted area will depend on the degree of compartmentalization required and the complexity of the area. As a rule, size should be kept to a minimum consistent with operational efficiency. Positive barriers should be established for:

(1) Controlling vehicular and pedestrian traffic flow.

(2) Checking identification of personnel entering or departing.

(3) Defining a buffer zone for more highly classified areas.

5-3 Positive Barriers

Positive barriers should be designed in view of the threat, to deter access to the maximum extent.

a. Positive barriers are required for the entire perimeter of controlled, limited, or exclusion areas (see chapter 5). Specific types of barriers cannot be predesignated for all situations; however, they should incorporate the following elements:

(1) Structural perimeter barriers, such as fences, walls, etc.

(2) Provisions at points of entrance and exit for identification checks by either pass and badge exchange or badge examination (chapter 4).

(3) Opaque barriers to preclude visual compromise by unauthorized personnel may be necessary in certain instances.

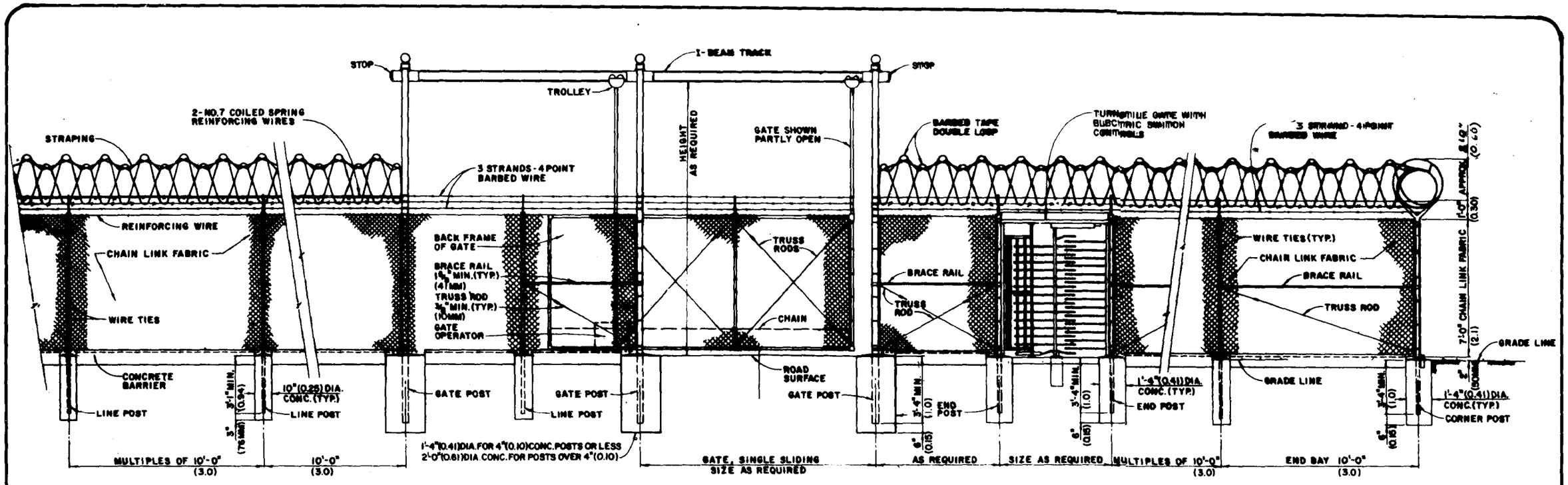
b. When the greatest degree of security is essential, additional structural barriers may be required. Two lines of structural barriers should be installed on the perimeter; such lines of barriers should be separated by not less than 15 feet and not more than 150 feet for optimum enforcement, protection, and control.

c. If the nature of a secure area dictates a requirement for a limited or exclusion area on a temporary or infrequent basis, you may not be able to use the types of physical structural perimeter barriers described in paragraph 5-3a. In such cases, a temporary limited area or exclusion area may be established in which the lack of proper physical barriers is compensated for by additional security posts, patrols, and other security measures during the period of restriction (chapter 4).

5-4 Fence Design Criteria

Four types of fencing authorized for use in protecting restricted areas are **chain-**

153-846 O - 94 - 4 (Fold-in No. 1)



ELEVATION-CHAIN LINK FABRIC FENCE/BARBED TAPE TOPPING & HORIZONTIAL SLIDING GATE

NOT TO SCALE

Figure 11—OCE drawing 40-16-10 of chain link fence construction.

link, barbed wire, concertina, and **barbed tape.** Choice of type depends primarily upon the degree of permanence of the installation, availability of materials, and time available for construction. Generally, chain-link fencing will be used for protection of permanent limited and exclusion areas. All four types of fencing maybe used to augment or increase the security of existing fences that protect restricted areas. Examples would be to create an additional barrier line, increase existing fence height, or provide other methods that add effectively to physical security.

a. Chain-link (Federal Spec. RR-F-191/1, Type I). Chain-link fence, including gates, must be constructed of 7-foot (approximately 2.13 m) material (6 foot or 1.83 m for controlled areas), excluding top guard. Fence heights for conventional arms/ammo security must be 6 feet for standard chain link, wire-mesh fencing. Chain-link fences must be of 9-gauge (.1508 inches or 3.77 mm) or heavier wire galvanized with mesh openings not larger than 2 inches (approximately 5.1 cm) per side, and a twisted and barbed selvage at top and bottom. It must be taut and securely fastened to rigid metal or reinforced concrete posts set in concrete. It must reach within 2 inches (5.1 cm) of hard ground or paving. On soft ground it must reach below the surface deeply enough to compensate for shifting soil or sand (OCE Guide Specification 02711). Security commensurate with FE-6 fence construction standards will be provided. Construction must be in accordance with specifications in Office, Chief of Engineers (OCE) drawing 40-16-10 (figure 11). For added resistance to climbing, optional top rail or taut wire may be omitted. Fencing may be painted with a nonreflective substance to reduce the glare to security forces (TM 5-830-3). Weaknesses in the chain link fence occur as a result of weather (rusting) and failure to keep fencing fastened to the post which affects the desired tightness.

b. Barbed Wire. Standard barbed wire is twisted, double-strand, 12-gauge wire, with four-point barbs spaced an equal distance apart. Barbed wire fencing, including gates, intended to prevent human trespassing should not be less than 7 feet (2.13 m) high,

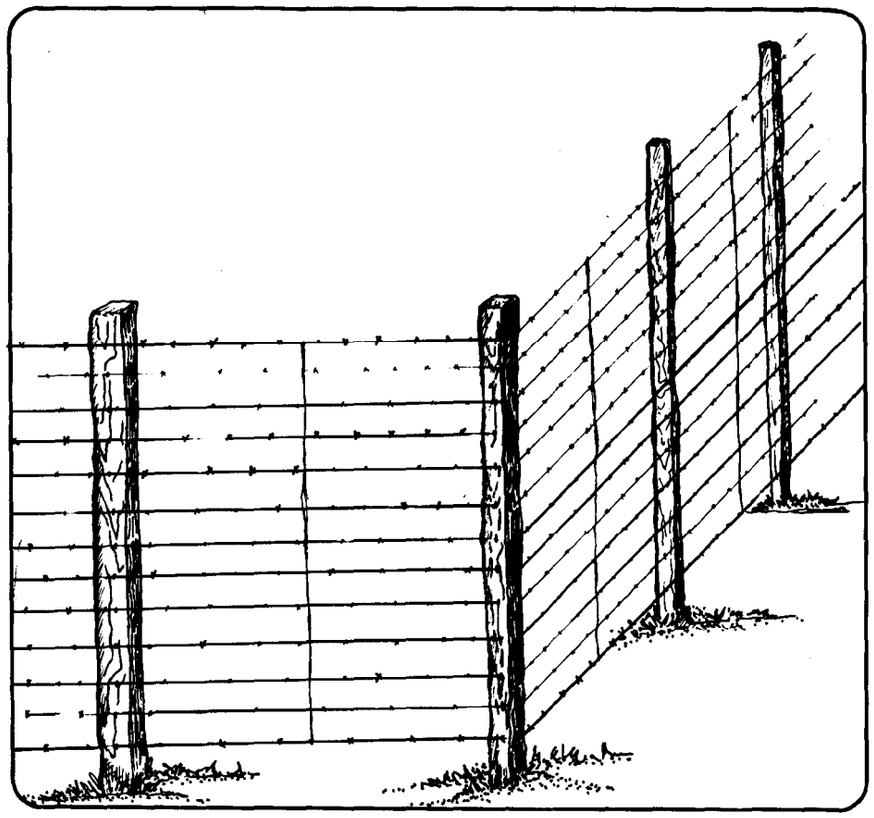


Figure 12—Example of properly constructed barbed wire fence.

Figure 12—Example of properly constructed barbed wire fence.

excluding the top guard, and must be firmly affixed to posts not more than 6 feet (1.82 m) apart. The distance between strands will not exceed 6 inches (approximately 15.3 cm) and at least one wire will be interlaced vertically and midway between posts (figure 12).

c. Concertina. Standard concertina barbed wire is a commercially manufactured wire coil of high-strength-steel barbed wire, clipped together at intervals to form a cylinder. Opened, it is 50 feet long and 3 feet in diameter. When used as the perimeter barrier for a restricted area, concertina must be laid between poles with one roll on top of another or in a pyramid arrangement (minimum of three rolls). The ends must be staggered or fastened together and the base wire picketed to the ground.

d. Barbed Tape (Mil Fed Spec. MIL-B-52775A) (figure 13).

(1) The barbed tape system is composed of three items—barbed tape, barbed tape dispenser, and concertina tape. These items were type classified "standard A type," 16 December 1965.

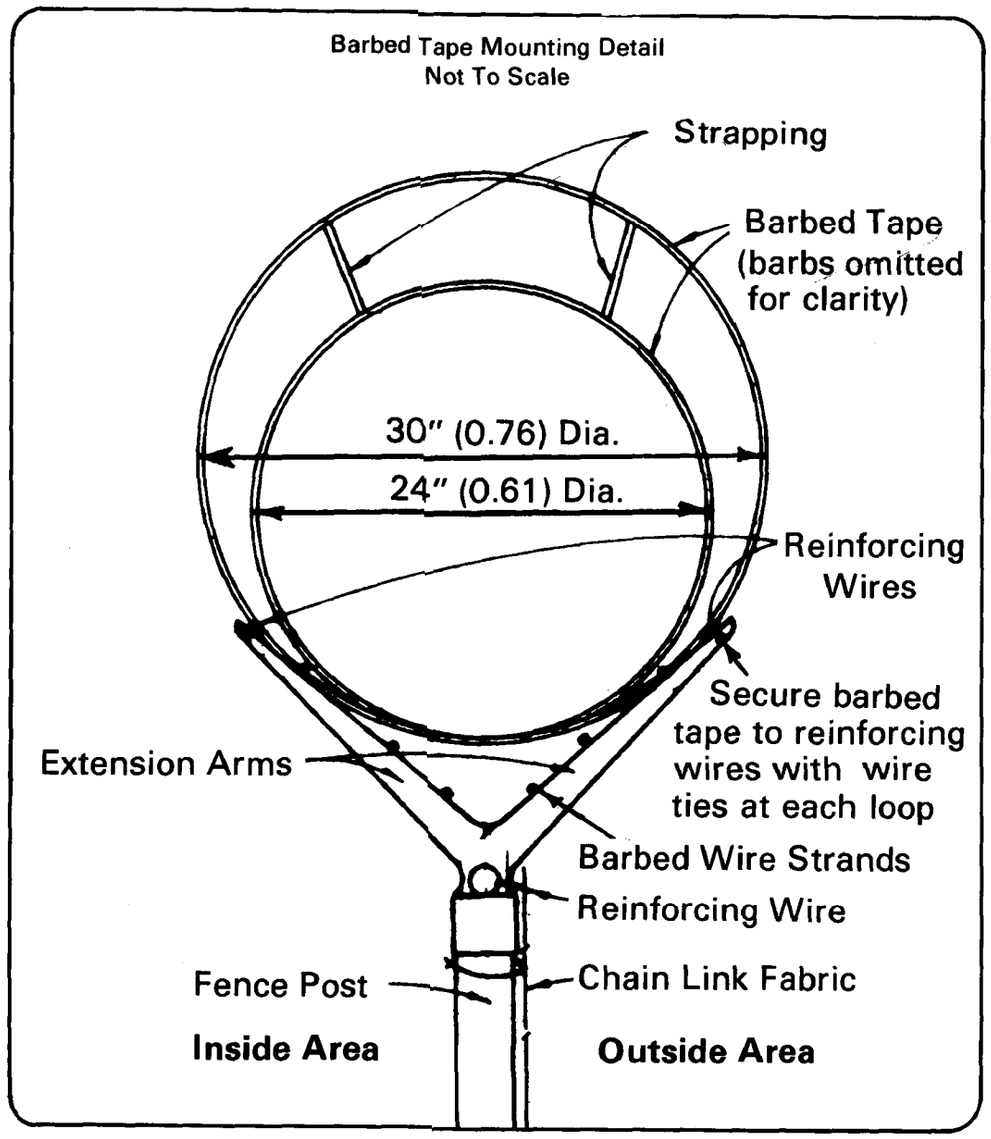


Figure 13—OCE drawing 40-16-10, barbed tape details.

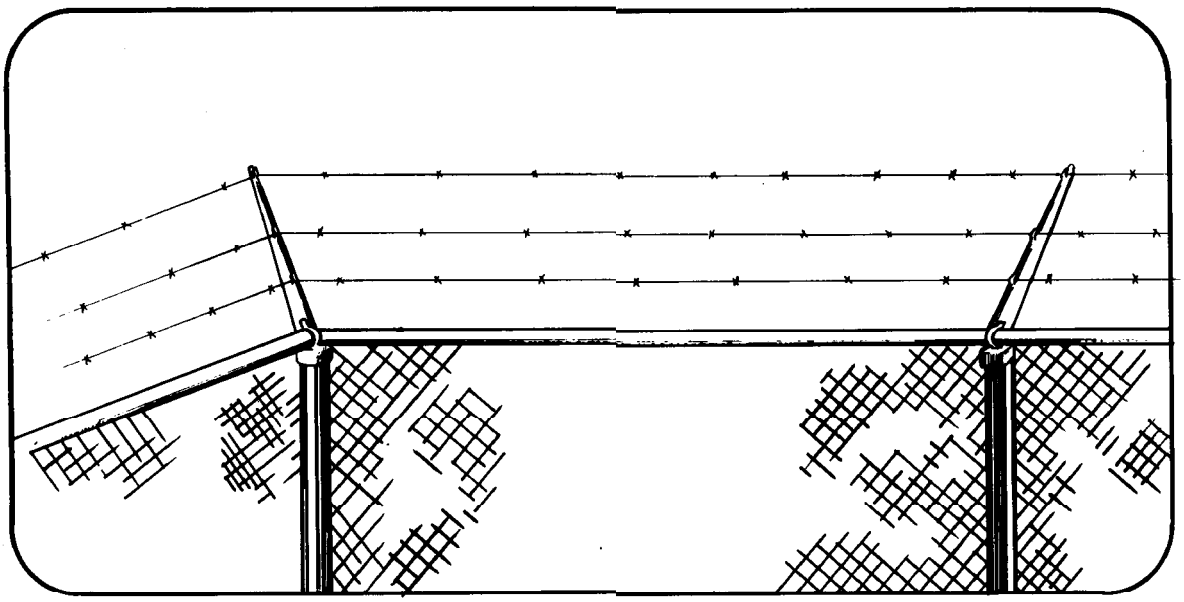


Figure 14—Supporting arms on top guard point outward.

(2) Barbed tape is fabricated from a steel strip (0.020 inches thick nominal) with a minimum breaking strength of 500 pounds. The overall width is 3/4 of an inch. The tape has 7/16-inch barbs spaced at 1/2 inch intervals along each side. Fifty meters of tape are wound on a plastic reel 8 3/4 inches in diameter and 1 inch thick. The finish is electro-galvanized 0.0001-inches thick on each side.

(3) Barbed tape concertina consists of a single strand of spring steel wire and a single strand of barbed tape. The sections between barbs of the barbed tape are securely clinched around the wire. Each coil is approximately 37 1/2 inches in diameter and consists of 55 spiral turns connected by steel clips to form a cylindrical diamond pattern when extended to a coil length of 50 feet. One end turn is fitted with four bundling wires for securing the coil when closed and each end turn is fitted with two steel carrying loops. The concertina extends to 50 feet without permanent distortion and when released, can be retracted into a closed coil.

(4) The handling of barbed tape requires the use of **heavy** barbed tape gauntlets (FSN 8415-926-1674) instead of standard barbed wire gauntlets.

e. Top Guard. A top guard must be constructed on all perimeter fences and may be added on interior enclosures for additional protection. A top guard is an overhang of barbed wire or barbed tape along the top of a fence, facing outward and upward at approximately a 45-degree angle (figure 14). Top guard supporting arms will be permanently affixed to the top of fence posts to increase the overall height of the fence at least 1 foot (approximately 30.5 cm). Three strands of barbed wire, spaced 6 inches (15.2 cm) apart, must be installed on the supporting arms. The number of strands of wire or tape may be increased when required. The top guard of fencing adjoining gates may range from a vertical height of 18 inches (45.7 cm) to the normal 45-degree outward protection, but only for sufficient distance along the fence to

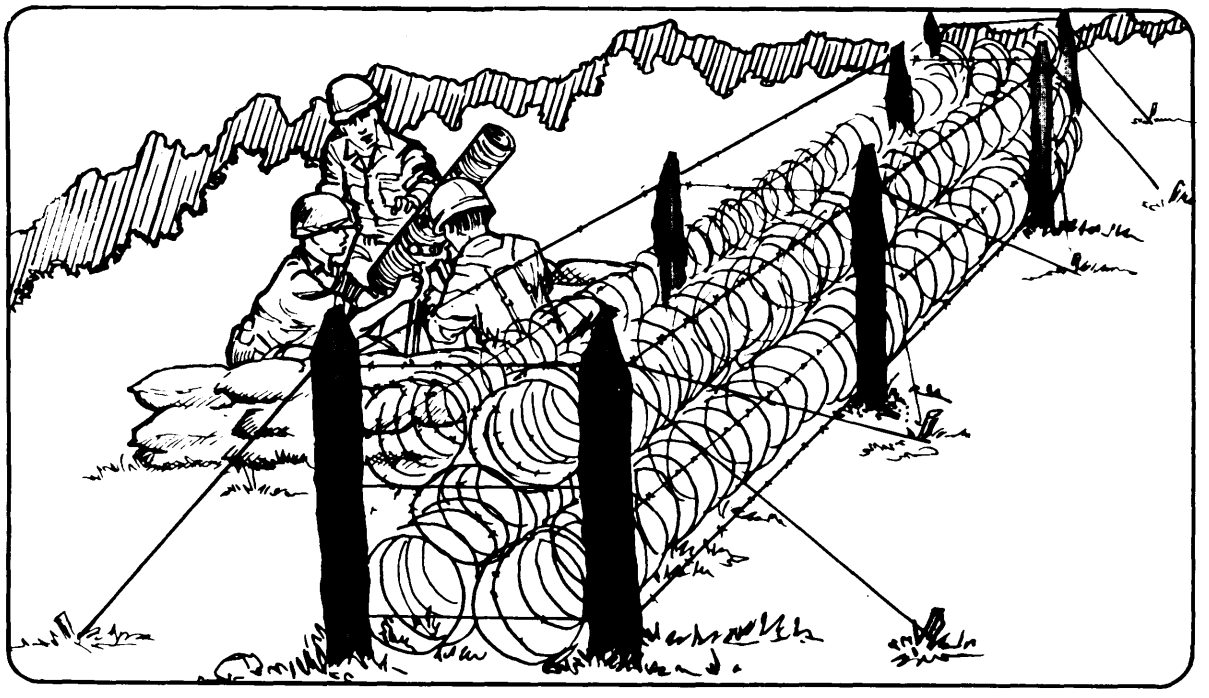


Figure 15—A type of field perimeter fence (cattle fence).

open the gate(s) adequately. Top fence rails should not be specified where protection is of utmost importance. Top rails will assist a climber. A bottom and top wire reinforcement should be used as a substitute (OCE-02711).

f. Gates and Entrances. The number of gates and perimeter entrances must be the minimum required for safe and efficient operation. Active perimeter entrances must be designed so that the guard force maintains full control. Semiactive entrances, such as infrequently used vehicular gates, must be locked on the inside when not in use. Gates and entrances, when closed, must provide a barrier structurally comparable to their associated barrier(s). Top guards, which may be vertical, are required for all gates.

g. Type Field Perimeter Fence. A combination of concertina fencing, developed in Vietnam, uses a double-barbed wire fence (the cattle fence described in FMs 5-15 and 100-50), with five rolls of concertina between the fences. This fence has, in many situations, been used in place of chain link fence, and has been found to be most effective (figure 15).

h. Tanglefoot Wire. Barbed wire or tape may be used in appropriate situations to construct a tanglefoot obstruction either outside a single perimeter fence or in the area between double fences, to provide an additional deterrent to intruders. The wire or tape should be supported on short metal or wood pickets spaced at irregular intervals of 3 to 10 feet, and at heights between 6 and 12 inches. The wire or tape should be crisscrossed to provide a more effective obstacle. Depth of the field is governed by the space and materials available.

5-5 Utility Openings

Sewers, air and water intakes and exhausts, and other utility openings of 10 inches (25.4 cm) or more in diameter that pass through perimeter barriers must have security equivalent to that of these barriers (TM 5-820-4).

a. Interior manhole covers 10 inches (25.4 cm) or more in diameter must be secured to prevent unauthorized opening.

b. Unavoidable drainage ditches, culverts, vents, ducts, and other openings having a cross-sectional area greater than 96 square inches (624 sq cm) and a smallest dimension greater than 6 inches (16.3 cm) will be protected by securely fastened welded bar grills (TM 5-280-4). As an alternative, drainage structures may be constructed of multiple pipes, each pipe having a diameter of 10 inches (25.4 cm) or less. Multiple pipes of this diameter also may be placed and secured in the inflow end of a drainage culvert to prevent intrusion into the area. (See examples in figure 16.)

5-6 Other Perimeter Barriers

a. Building walls and roofs, when serving as perimeter barriers, must be constructed and arranged to provide uniform protection equivalent to that provided by chain-link fencing. If a building less than two stories high forms part of the perimeter, a top guard must be used along the outside coping to deny access to the roof (figure 17).

b. Masonry walls, when used as perimeter barriers, must have a minimum height of 7 feet (approximately 2.13 m) and must have a barbed wire top guard, sloped outward at a 45-degree angle, carrying at least three strands of barbed wire and increasing the vertical

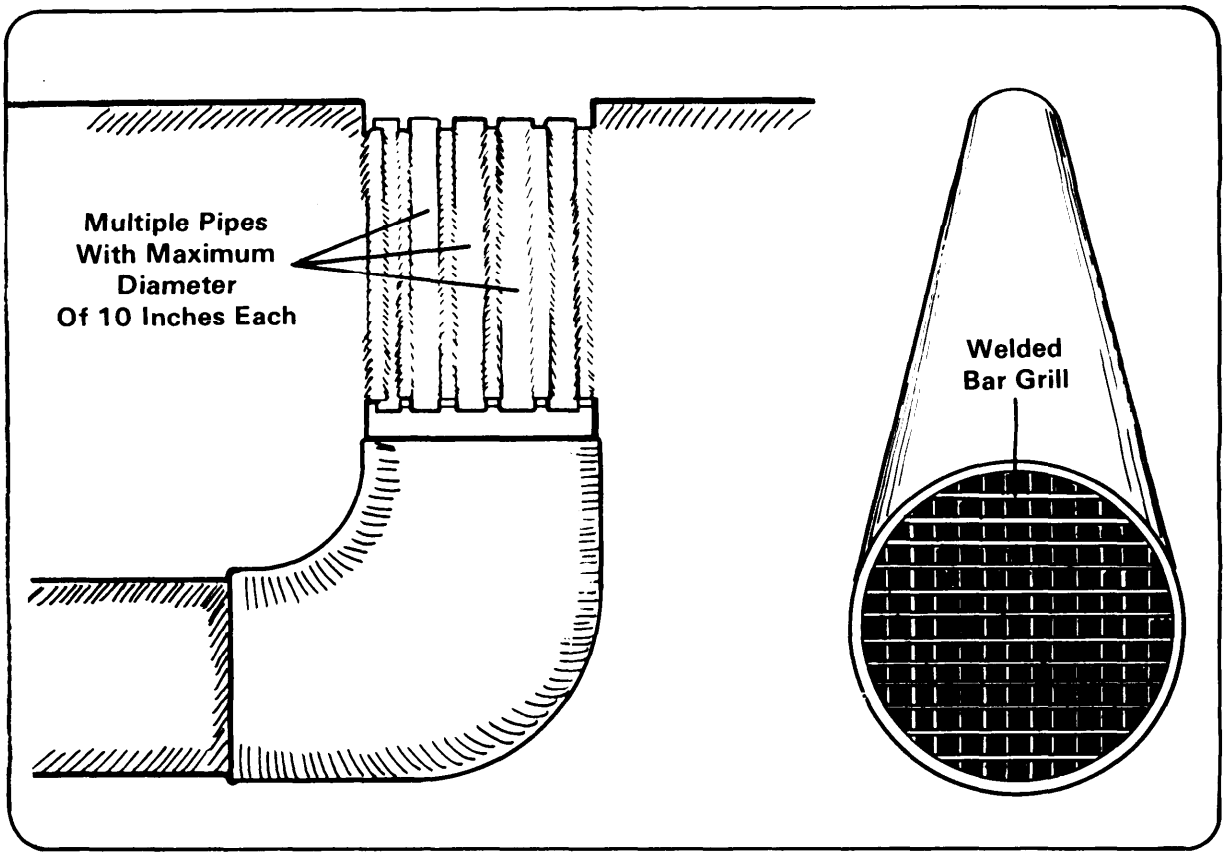


Figure 16—Examples of secured utility openings.

height of the barrier by at least 1 foot (approximately 30.5 cm); or they must have a minimum height of 8 feet (2.4 m) and have broken glass, set on edge and cemented to the top surface.

c. Windows, active doors, and other designated openings must be protected by securely fastened bars, grills, or chain-link screens. Window barriers must be fastened from the inside If hinged, the hinges and locks must be on the inside. If an instrusion detection system is used, consideration should be given to using the security screen detailed in OCE drawing DEF 40-26-01.

d. Construction Procedures. Detailed guidance on construction procedures, material and manpower requirements for field construction of barriers by small troops units is in FM 5-15.

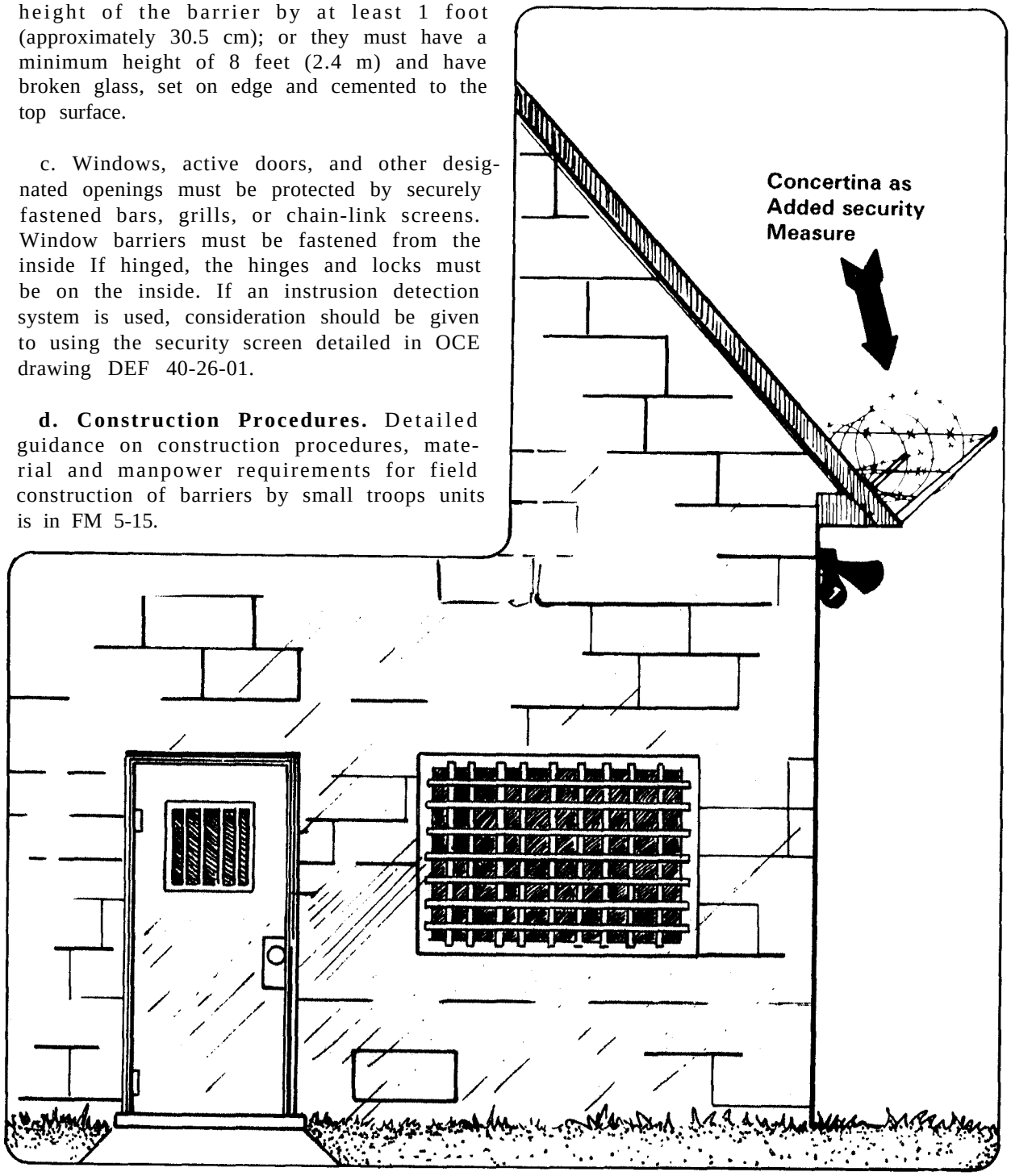


Figure 17 - Sample of top guard on roof.

153-846 O - 94 - 6

5-7 Security Tower Design

Reliance on towers as the only means for observation of a perimeter is usually considered unsatisfactory. However, all towers should be located to provide maximum observation and be constructed for protection from small arms fire.

a. Mobile towers are useful in some temporary situations, such as a large open storage area where there is activity in receiving and storing equipment. All facilities that use towers must have a support force available for emergencies, and tower personnel should be rotated at frequent intervals.

b. Psychologically, the mere elevation of the observer has an unnerving effect on a potential intruder. However, as mentioned above, the isolation of the tower tends to reduce the alertness of its occupants.

c. The **height of a tower** increases the range of observation during daylight hours and at night with artificial illumination. However, during inclement weather and during blackout, towers lose this advantage and must be supplemented by on-the-ground observation.

5-8 Tower Use

In **planning the use of towers,** consideration must be given to the following:

a. A possible necessity for hardening the tower (by use of sandbags, salvage armor-plating, etc.) to protect the occupant. This may require strengthening of the support, which should be performed only under the supervision of an engineer.

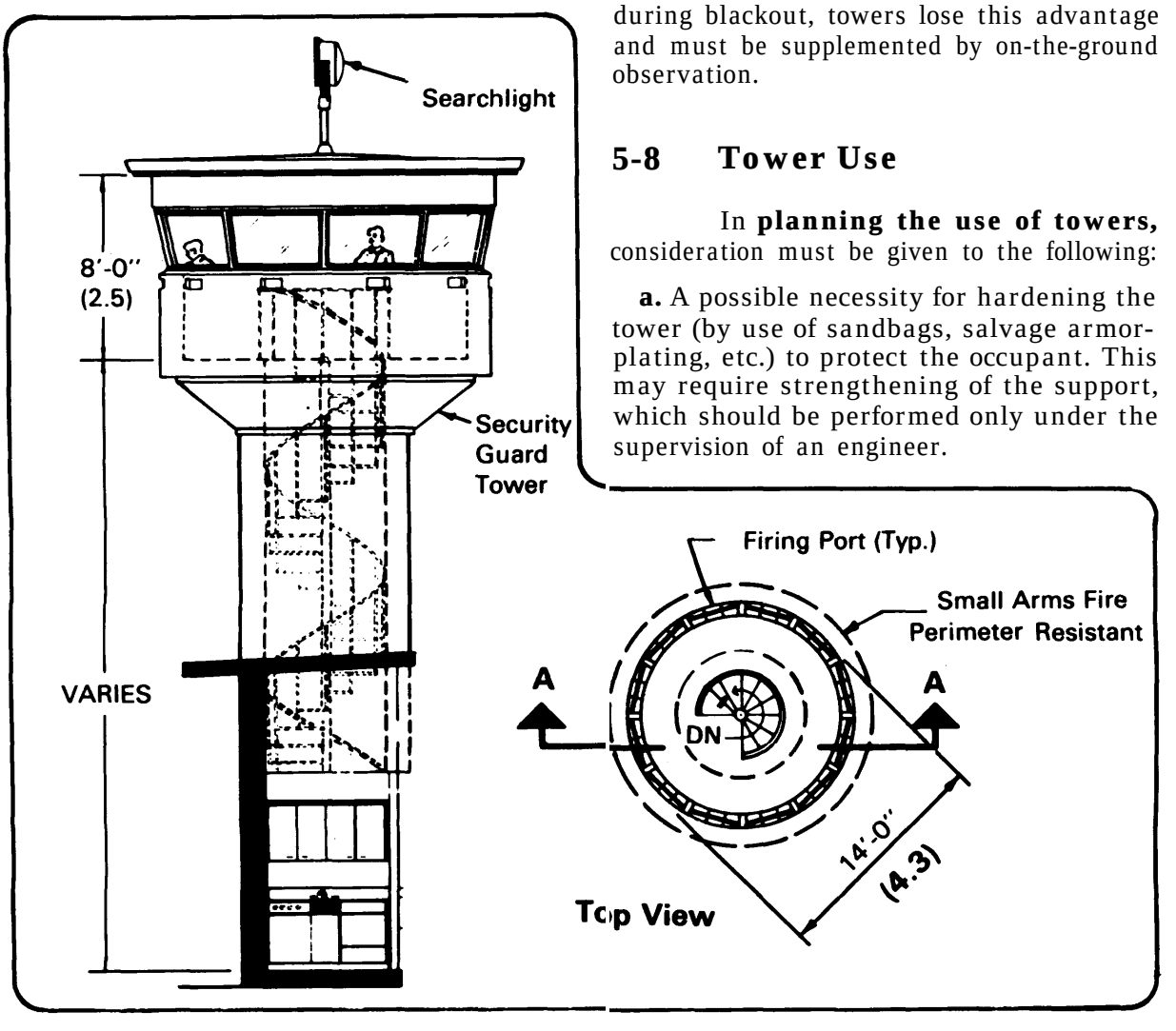


Figure 18—Details of tower design.

b. Communications and alarm systems, both audible and visual (primary and alternate).

c. The possibility of using appropriate STANO equipment with the tower and perimeter barriers being surveilled. Some of the infrared items may be especially valuable.

d. Protective lighting (chapter 6, AR 50-5).

e. Protection of the route to the tower.

f. Height of the tower according to the area of observation.

g. Mutually supporting in terms of small arms fire.

h. Allows for egress and ingress of supporting alert forces, as appropriate.

i. Backed up by a fortified defensive fighting position, as appropriate.

j. Located within the exclusion area. (See figure 18 for tower design details.)

5-9 Installation/Activity Entrances

a. The number of installation/activity gates and perimeter entrances inactive use should be limited to the minimum required for safe and efficient operation of the installation. Protective lighting must be IAW chapter 6 of this manual. When necessary, crash beams should be installed in front of vehicle gates according to the design specifications in figure 19.

b. Entrance plans (primary and alternate) for an installation or activity to control vehicle traffic using guard personnel is outlined in figures 20 and 21 on page 76. The type guard post used to support the entrance plans is detailed in figure 22.

c. Active perimeter entrances should be designated so security forces maintain full control without unnecessary delay in traffic. This is largely a matter of having sufficient entrances to accommodate the peak flow of

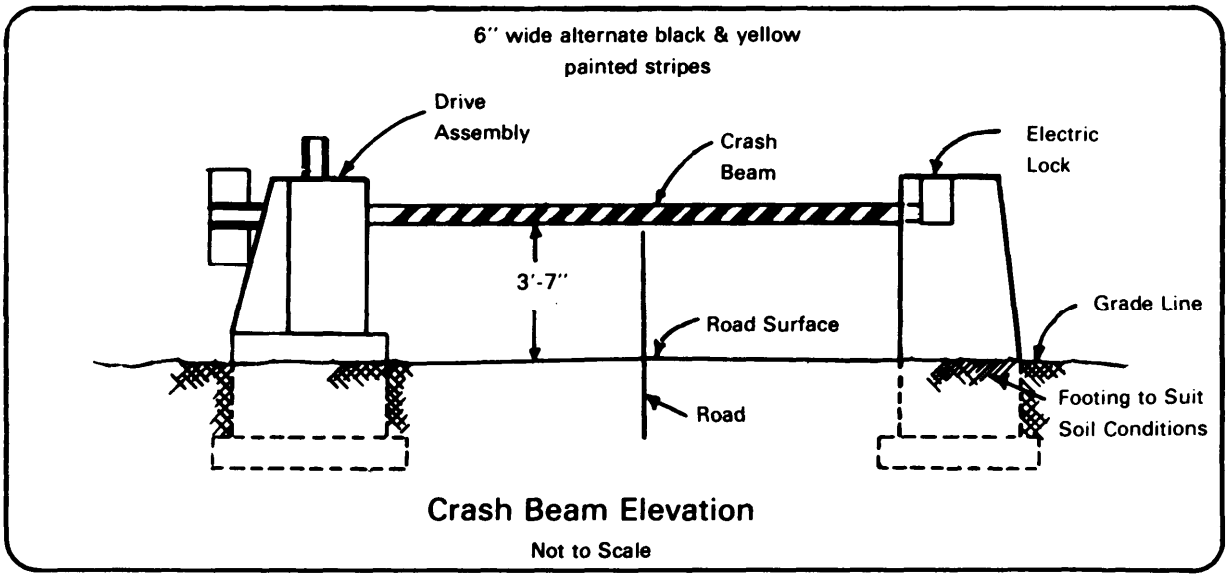


Figure 19—OCE drawing 40-16-10 crash beam details.

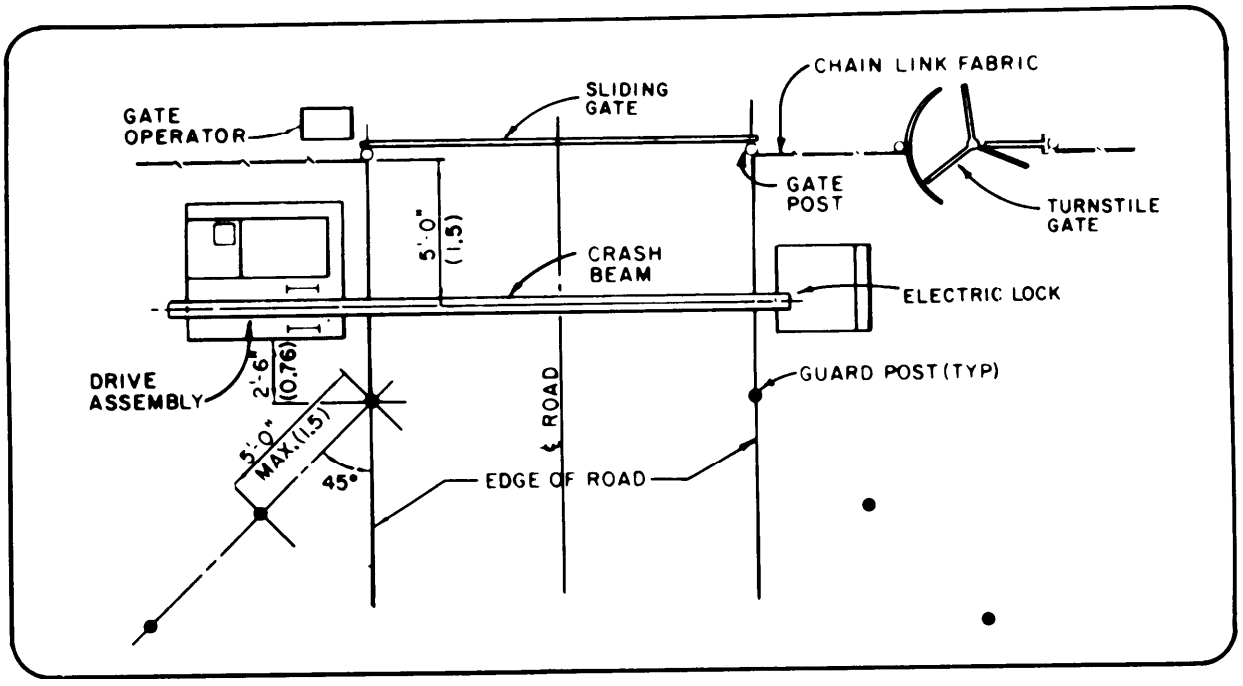


Figure 20—Primary entrance plan.

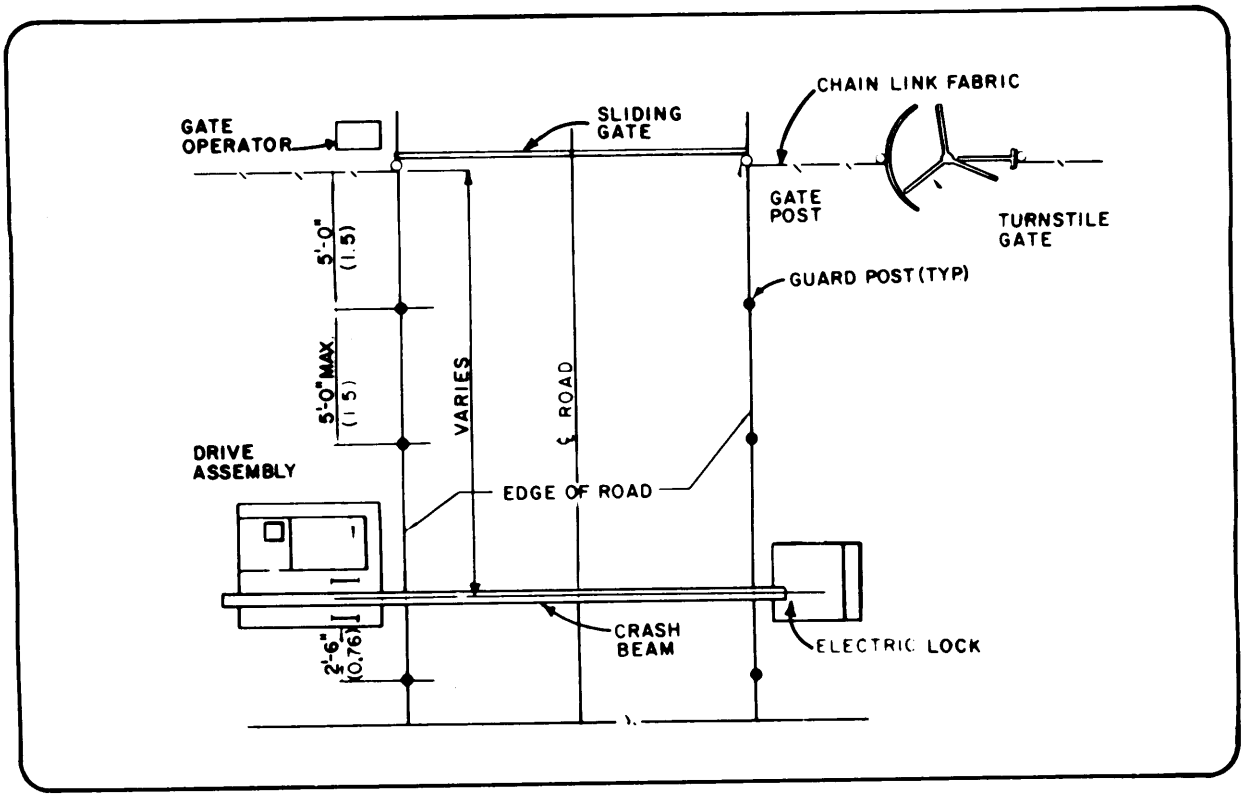


Figure 27—Alternate entrance plan.

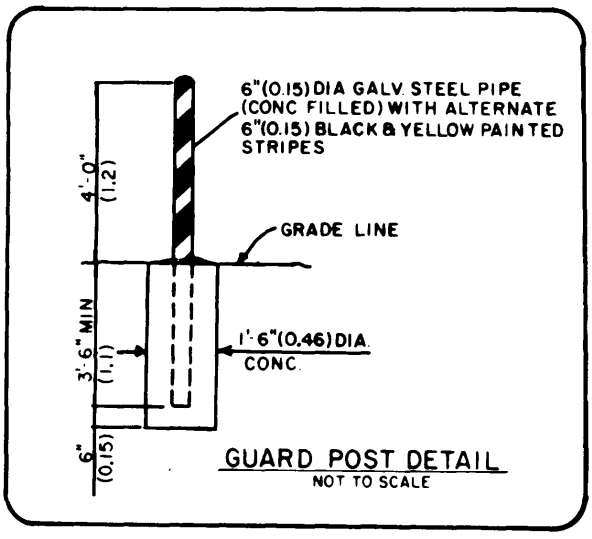


Figure 22—Guard post support plan.

pedestrian and vehicular traffic, and adequate lighting for rapid and efficient inspection. When gates are not manned during nonduty hours, they should be securely locked, illuminated during hours of darkness, and periodically inspected by a roving patrol. This also applies to doors and windows that form a part of the perimeter.

d. Semiactive entrances, such as extra gates for use during peak traffic flow and railroad siding gates, should be locked at all times when not guarded. Keys to such entrances should be in the custody of the provost marshal (security manager) or the chief of the security force, and should be strictly controlled (chapter 8).

e. Inactive entrances (those used only occasionally) should be kept locked and be subject to the same key control and inspection as semiactive entrances.

f. Sidewalk elevators and any other utility openings that provide access to areas within the perimeter barrier should be locked, guarded, or otherwise provided security equivalent to that of the perimeter barrier.

5-10 Entry Control Stations

Entry control stations normally should be provided at main perimeter entrances where such entrances are manned by security personnel on a full-or part-time basis. Considerations for construction and use should be based, in part, on the information outlined in paragraphs 5-8 and 5-9.

a. Entry control stations should be located as near as practicable to the perimeter entrance to permit personnel inside the station to maintain constant surveillance over the entrance and its approaches.

b. Entry control stations that are manned 24 hours each day should have interior and exterior lighting, interior heating (where appropriate) and sufficient glassed area to afford adequate observation for personnel inside. Where appropriate, entry control stations should be designed for optimum personnel identification and movement control (chapter 4).

c. Equipment in a station should include:

(1) Telephone or radio.

(2) Badge racks.

(3) Electronic boards for checking lights.

d. Procedures for hardening against attack.

(1) Reinforced concrete.

(2) Steelplating and bullet-proof glass.

(3) Sandbags two layers in depth.

5-11 Signs and Notices

Signs should be plainly displayed and be legible from any approach to the perimeter from a reasonable distance. The size and coloring of such signs, lettering thereon, and the interval of posting must be appropriate to each situation.

a. Control Signs. Signs should be erected where necessary to assist in control of authorized entry, to deter unauthorized entry, and to preclude accidental entry.

b. Warning Signs.

(1) A system must be provided to warn intruders that the arena is restricted and that trespassing may cause the use of deadly force. The system must include warning signs and a method of challenging intruders.

(2) Warning signs must be installed along the limited area physical barriers and at each entry point so they can be seen readily and understood by anyone approaching the perimeter. In areas where English is but one of two or more languages commonly spoken, warning signs must contain the local language(s), in addition to English; and the wording on the signs will denote warning of a restricted area. Warnning signs must be positioned on or outside the limited area physical barrier and should be at intervals of no more than 100 feet (30.5 m).

(3) Signs must not be mounted on fences equipped with IDA equipment because nuisance alarms could be caused by environmental movement of the signs. Additionally, the restricted area warning signs prescribed in AR 380-20 must be posted at all entrances to limited and exclusion areas.

c. Other Signs.

(1) Signs setting forth the **conditions of entry** to an installation or area should be plainly posted at all principal entrances and should be legible under normal conditions at a distance not less than 50 feet from the point of entry. Such signs should inform the entrant of the provisions of search of the person, vehicle, packages, etc., or prohibitions (such as against cameras, matches, lighters, entry for reasons other than official business, etc.) that may be prescribed by the installation commander (AR 210-10).

(2) Signs or notices legibly setting forth the designation of **restricted areas** and provisions of entry thereto should be plainly posted at all entrances and at other points along the perimeter line as necessary. The wording of such signs or notices is prescribed in AR 380-20, and chapter 4; section III of this manual.

5-12 Installation/Activity Perimeter Roads And Clear Zones

When the perimeter barrier encloses a large area, an interior all-weather perimeter road should be provided for security patrol vehicles. Clear zones should be maintained on both sides of the perimeter barrier to provide an unobstructed view of the barrier and the ground adjacent to it.

a. Roads should meet these requirements:

(1) Be within the clear zone and as close to the perimeter barrier as possible, but not close enough to cause soil erosion.

(2) Constructed to allow for effective road barriers to deter motor movement of unauthorized personnel during mobilization periods.

b. Clear Zones.

(1) Clear zones should be kept clear of weeds, rubbish, or other material capable of offering concealment or assistance to an intruder attempting to breach the barrier.

(2) A clear zone of 20 feet or more should exist between the perimeter barrier and exterior structures, parking areas, and natural or manmade features. When possible, a clear zone of 50 feet or more should exist between the perimeter barrier and structures within the protected area, except when a building wall constitutes part of the perimeter barrier.

(3) When it is impossible to have adequate clear zones because of property lines or natural or manmade features, an increase in the height of the perimeter barrier, increased security patrol coverage, more protective lighting, or an intrusion detection device along that portion of the perimeter barrier may be necessary.

5-13 Protection In Depth

a. On a very large installation such as a proving ground, it is obviously impracticable to construct an expensive perimeter fence and to keep it under constant observation. Such an installation is usually estab lished in a sparsely inhabited area. Its comparative isolation and the depth of the installation itself give reasonable perimeter protection. Under these circumstances the posting of warning signs or notices, reducing access roads to a minimum, and periodic patrols in the area between the outer perimeter and the conventionally protected vital area of the installation may be sufficient.

b. An alternate to erecting new or replacing old chain-link fence involving an entire installation, perimeter is to relocate/isolate the sensitive area or item by:

(1) Relocating the item within a safe perimeter.

(2) Consolidating the item with other items.

(3) Erecting a chain-link fence (regulation permitting).

5-14 Nuclear Weapons Construction Design Criteria

For design and construction criteria, see DOD Directive 5210.41M and AR 50-5.

The interest of security must be kept in mind when walls, ceilings, floors, and roofs are constructed. Facilities that house arms and ammunition should be constructed as security barriers in the interest of deterring penetration. Protection should be equivalent to that provided by chain-link fencing.

Arms Facility Structural Standards Section II

5-15 Wall Construction Standards

a. Walls should consist of 8 inches of concrete reinforced with No. 4 bars on 9-inch centers in each direction and staggered on each face to form a grid approximately 4 ½ inches square. An alternative 8-inch concrete block with No. 4 bars threaded through block cavities at 8-inch centers, with the cavities then filled with mortar or concrete and with horizontal joints reinforced at every course. As a minimum alternative, use 8 inches of brick interlocked between inner and outer courses. These options are stated in order of most to least secure.

b. Selection must depend on local threat and vulnerability.

c. See AR 190-11 for information concerning USAR consolidated arms storage facilities.

5-16 Ceiling Construction Standards

a. The ceiling of the arms storage facility must be reinforced concrete, structurally designed for the spans between supporting walls. The resulting slab should offer security comparable to that provided by the walls.

b. If the ceiling is of concrete pan joist construction, the pans must be reduced in depth over the vault area so the thinnest portion is not less than 6 inches and the clear space between joists does not exceed 20 inches. The reinforcing grid requirement for flat slab construction also applies.

c. Reinforcing bar spacing should form a grid in which the area of any opening does not exceed 96 square inches, using No. 4 bars or larger.

5-17 Floor Construction Standards

Floor slab thickness, if on grade, should be a minimum of 6 inches reinforced with 6x6—W4xW4 mesh or equivalent bars. If the floor forms the ceiling of an underlying room or area, the ceiling standards apply.

5-18 Windows and Entrances

a. Entrances and issue windows should have two doors.

b. Doors should be 1 3/4 inch-thick, solid wood doors with 12-gauge metal plate securely attached to the outside face; or standard 1 3/4-inch-thick, hollow metal, industrial type doors (minimum thickness of skin plate 14-gauge) internally reinforced vertically with continuous steel stiffeners spaced 6 inches maximum on center.

c. The locking device used on the most secure door (usually the inner door) must be a high security padlock and hasp (MILP-43607). The other door must have a secondary padlock (MILP-17802B) or an equivalent mortise cylinder lock approved by the Intelligence Material Development Officer, Ft. Holabird, Maryland.

d. One of the doors in the double-door concept may be a rod and bar grid door; and the other may be either solid wood with metal plate or hollow metal. Grid doors must be constructed of 1 1/4-inch x 3/8-inch flat steel bars horizontal at 8 inches maximum on center, and l/2-inch diameter rods vertical at 4 inches maximum on center welded to, or passing through, the 1 l/4-inch surface of the flat bars, resulting in a grid with openings of 32 square inches or less.

e. The grid door is more suitable for accommodating the high security hasp (MIL P-43607D) and should be used as the inner door. Door hinges must be fixed-pin security type, safety-stud hinges, or must have hinge pins spot-welded to prevent removal. Hinge mounting screws will not be exposed to the outside of the arms room.

f. Frames must be compatible with adjacent doors and walls and must be securely anchored.

g. Class 5 steel vault door (Fed. Spec. AA-D-600B) with a built-in three-position, dial-type, changeable combination lock may be used in lieu of the two doors described above. A vault door day-gate does not provide adequate penetration resistance for an unattended vault, and, if used, should be intended only to prevent inadvertent entry when the vault is open and occupied.

(1) Anchor rings in arms and ammunition vault construction should be placed every 6 feet along the length of each wall.

(2) Review Engineer Technical Letter, 1110-3-229, 11 Apr 75, and definitive drawing, DEF 33-33-18, Consolidated Storage Building.

h. Openings such as windows should be limited to meet the essential minimum, or be eliminated entirely by removal and sealing of the resultant openings with material comparable to that forming the adjacent walls. Any required windows or openings greater than 96 square inches (the smallest dimension is greater than 6 inches) must be protected by a rod-and-bar grid as described in AR 190-11. Grid ends should be imbedded in the structure or welded to a frame that is securely attached to the structure from the inside.

NOTE: It is next to impossible to build a protective barrier that cannot be penetrated by a human or heavy armor. Therefore, as opposed to protecting an installation or facility using only one barrier, a combination of barriers will provide security as discussed in chapter 2.