UNITED STATES
NUCLEAR REGULATORY COMMISSION

LICENSE AMENDMENT
FOR
SPECIAL NUCLEAR MATERIAL SAFEGUARDS

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, and Title 10, Code of Federal Regulations, Chapter 1, Part 70, the following amendment to the special nuclear material license identified below is hereby issued, incorporating specific safeguards requirements for special nuclear material.

Licensee:

Name: GA Technologies, Inc.

Address: P. O. Box 85608
San Diego, California 92138

License No.: SNM-696

Safeguards Amendment: SG-1

Docket No.: 70-734

Date Issued: March 12, 1985

CONDITIONS

1.0 FACILITY ORGANIZATION

Currently there are no license conditions in this section. The necessary information has been incorporated into an approved plan.

2.0 FACILITY OPERATION

2.1 The licensee shall follow Revision A of his Fundamental Nuclear Material Control Plan, dated October 1982; as revised by submittals dated February 3, 1984 (pages 1-8, 4-2, 4-3, 8-2, and 8-3) and January 25, 1985 (pages 7-6 through 7-20, all dated February 1985); and as may be revised in accordance with the provisions of 10 CFR 70.32(c).

2.2 Operations involving special nuclear materials which are not described in the Plan identified in Condition 2.1 shall not be initiated until an appropriate safeguards plan has been approved by the Nuclear Regulatory Commission.

ENCLOSURE A

2.3 Upon reporting an unbiased, adjusted Inventory Difference (ID) value for any regular material balance period that exceeds 1.50 times its applicable regulatory LEID limit (or LEMUF limit) and which also exceeds 300 grams HEU, or U-235 contained in HEU or 9000 grams U-235 contained in LEU, the licensee shall immediately initiate a reinventory of the Plant giving rise to such ID. Unbiased, adjusted IDs shall be obtained by applying any appropriate bias correction to the Inventory Difference value in accordance with Section 4.2.4.1 of the Plan identified in Condition 2.1, and adjusting the resulting ID for any prior period adjustment made to the Beginning Inventory value.

3.0 MEASUREMENTS

3.1 Notwithstanding the requirements of 10 CFR 70.58(e) the licensee need not measure the special nuclear material content of encapsulated SNM sources which are unopened for research and development, calibration activities, or customer service.

3.2 Notwithstanding the requirements of 10 CFR 70.51(e)(2) to inventory all SNM possessed by the licensee, waste materials in Plant III destined for ultimate disposal need not be included in physical inventory listings.

3.3 For those materials measured by non-destructive assay (NDA), the licensee may calculate the element content based on the U-235 NDA measurement and a prior isotopic abundance measurement that can be demonstrated to be representative of the material being measured by NDA.

4.0 MEASUREMENT CONTROL

4.1 All identifiable covariance effects shall be taken into account in the calculation of LEID (or LEMUF).

4.2 LEID (or LEMUF) calculations shall not be required for material balances associated with Plants III, IV and V provided the associated Inventory Difference value does not exceed 300 grams uranium or U-235.

4.3 Notwithstanding the requirements of 10 CFR 70.57(b)(4) to determine systematic sampling errors and perform engineering tests to establish or verify the applicability of existing mixing and sampling procedures, the licensee shall follow Section 4.3 of the Plan identified in License Condition 2.1.

4.4 Notwithstanding the requirements of 10 CFR 70.57(b)(8) to measure standards and replicates for volume systems, to determine separate random errors for sampling and analytical, and to generate random errors for bulk and NDA from replicate measurements of process materials, the licensee shall follow Sections 4.2.2 and 4.4.1 of the Plan identified in License Condition 2.1.

4.5 Notwithstanding the requirements of 10 CFR 70.57(b)(10) to perform bias calculations and corrections and determine limits of systematic errors, the licensee shall follow Section 4.2.4 of the Plan identified in License Condition 2.1.

5.0 INVENTORY

5.1 Notwithstanding the requirement of 10 CFR 70.51(e)(2), to inventory all possessed SNM, the licensee shall follow Section 3.1-2 of the Plan identified in Condition 2.1 with respect to ventilation system holdup.

5.2 In accordance with the provisions of 10 CFR 70.51(e)(6), the licensee shall maintain a system of material control and accounting such that neither the uranium element nor the U-235 LEID (or LEMUF) value for the HTGR Fuel Fabrication Operations (Plant I) shall exceed 1100 grams for any physical inventory taken between November 1, 1984 and October 31, 1985.

5.3 Notwithstanding the requirement of 10 CFR 70.51(f)(2)(ii) to verify the integrity of tamper-safing devices at the time of inventory the licensee may follow Section 5.12-2 of the Plan identified in Condition 2.1 with respect to HTGR fuel blocks.

6.0 RECORDS AND REPORTS

6.1 The licensee shall use his or his designated agent's measured values for SNM accounting, except as provided in Condition 3.1.

7.0 INTERNAL CONTROLS

7.1 Notwithstanding the requirements of 10 CFR 70.51(e)(1)(iv) and 70.58(h) to maintain current knowledge of the identity, quantity, and location of all discrete items and containers of SNM, the licensee shall follow Section 7.3, and all subsections therein, of the Plan identified in Condition 2.1.

8.0 MANAGEMENT

8.1 Notwithstanding the requirements of 10 CFR 70.57(b)(2), (b)(3), and 70.58(c)(2) to conduct management reviews and audits at intervals not to exceed twelve months, the licensee shall follow Sections 1.2.5, 4.1.3, 4.1.4, 8.2.1, 8.2.1.1 of the Plan identified in Condition 2.1. For the purpose of this Condition, the maximum 15-month interval between Review Committee briefings is hereby defined as a period not to exceed 460 calendar days.

9.0 PHYSICAL PROTECTION REQUIREMENTS FOR FORMULA QUANTITIES OF STRATEGIC SPECIAL NUCLEAR MATERIAL

9.1.A The licensee shall follow Revision B of the security plan entitled, "GA Technologies, Inc. Category I Fixed Site Facility Physical Protection Plan," dated November 1982, as revised by letter 696-5039, dated September 29, 1983 and as revised pursuant to the provisions of 10 CFR 70.32(e).

9.1.B The licensee shall follow the "Safeguards Contingency Plan," dated September 1982, as revised pursuant to the provisions of 10 CFR 70.32(g).

9.1.C The licensee shall follow the plan, "GA Technologies, Inc. Security Officer Training and Qualification Plan," dated March 1983, as revised by pages dated March 19, 1983, and as further revised pursuant to the provisions of 10 CFR 70.32(e).

10.0 NOT USED

11.0 NOT USED

12.0 PHYSICAL PROTECTION REQUIREMENTS FOR SPECIAL NUCLEAR MATERIAL OF MODERATE AND LOW STRATEGIC SIGNIFICANCE

12.1 The licensee shall maintain and fully implement all provisions of the Commission approved Physical Security Plan, including changes made pursuant to the authority of 10 CFR 70.32(e). The approved security plan consists of a GA Technologies, Inc. document, withheld from public disclosure pursuant to 10 CFR 73.21, entitled, "Fixed Site and Transportation Plan for the Protection of Special Nuclear Material of Moderate and Low Strategic Significance," dated February 1983, as amended by letter dated Match 17, 1983.

12.2 In the event GA Technologies, Inc. plans to import and assume responsibility for SNM of moderate strategic significance they shall amend their plan and provide NRC with the measures to be used to protect the material in accordance with 10 CFR 73.67(e)(6), 120 days prior to the proposed shipping date.

12.3 In the event GA Technologies, Inc. plans to import and assume responsibility for SNM of low strategic significance they shall amend their plan and provide NRC with the measures to be used to protect the material in accordance with 10 CFR 73.67(g)(5), 120 days prior to the proposed shipping date.

For the Nuclear Regulatory Commission

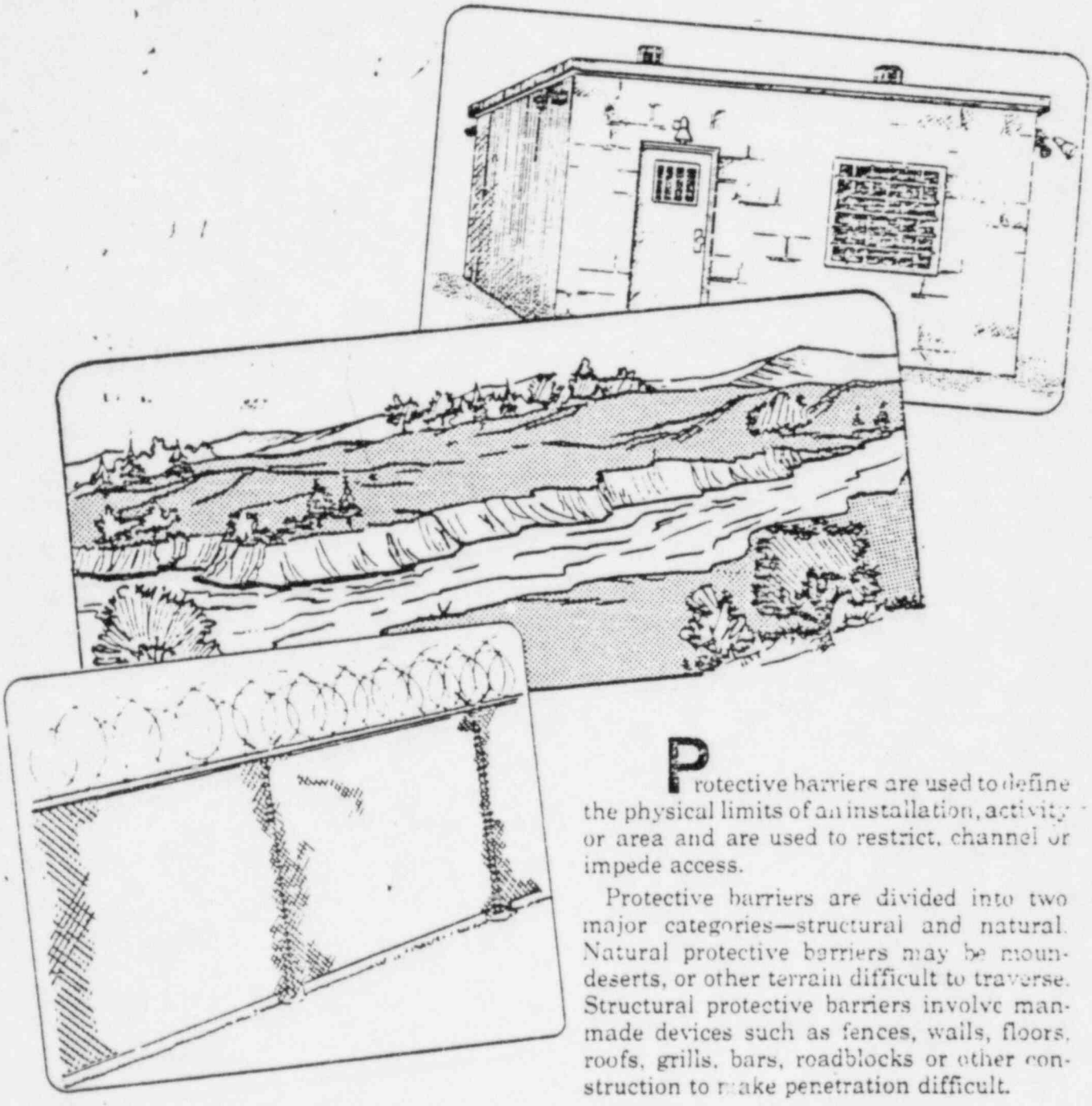
Willard B. Brown

Willard D. Brown, Chief
Fuel Facility SG Licensing Branch
Division of Safeguards, NMSS

Date of Amendment 3/12/85

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.

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.

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).

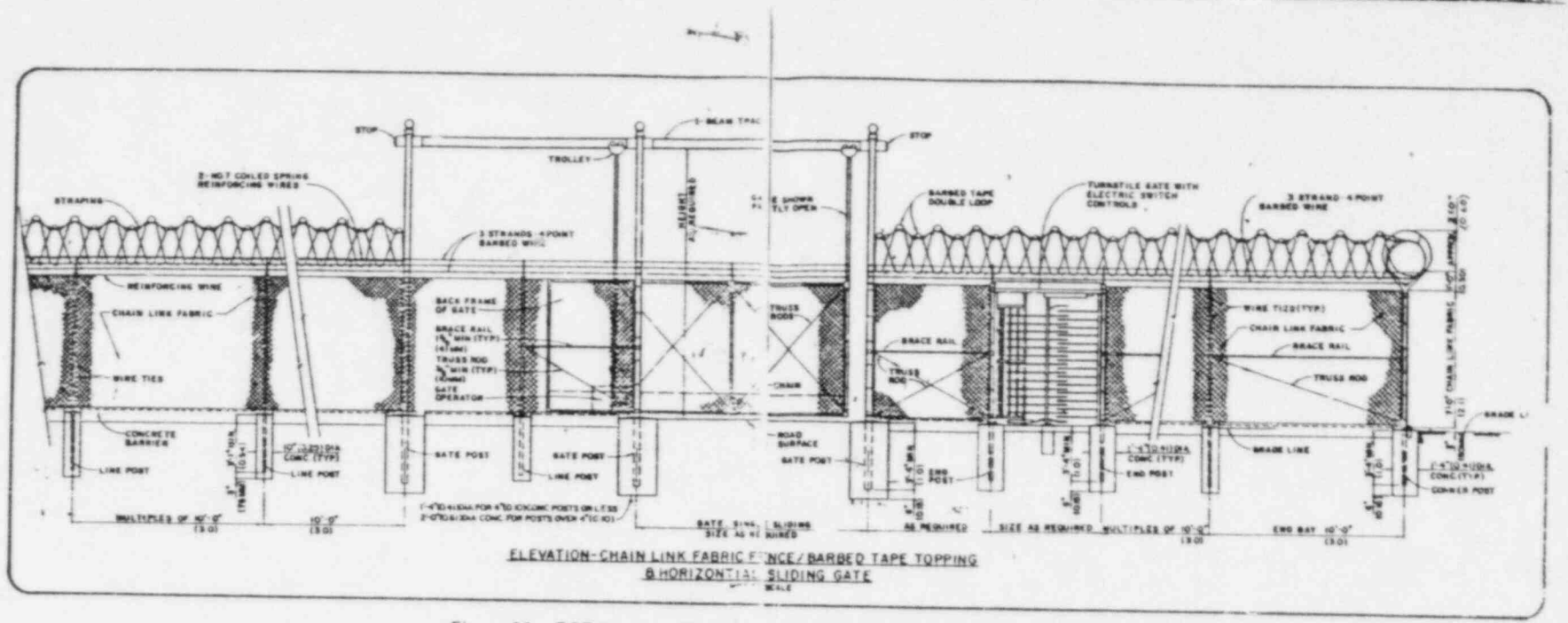
(3) Opaque barriers to preclude visual compromise by unauthorized personnel may be necessary in certain instances.

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-



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

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 may be 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 8 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

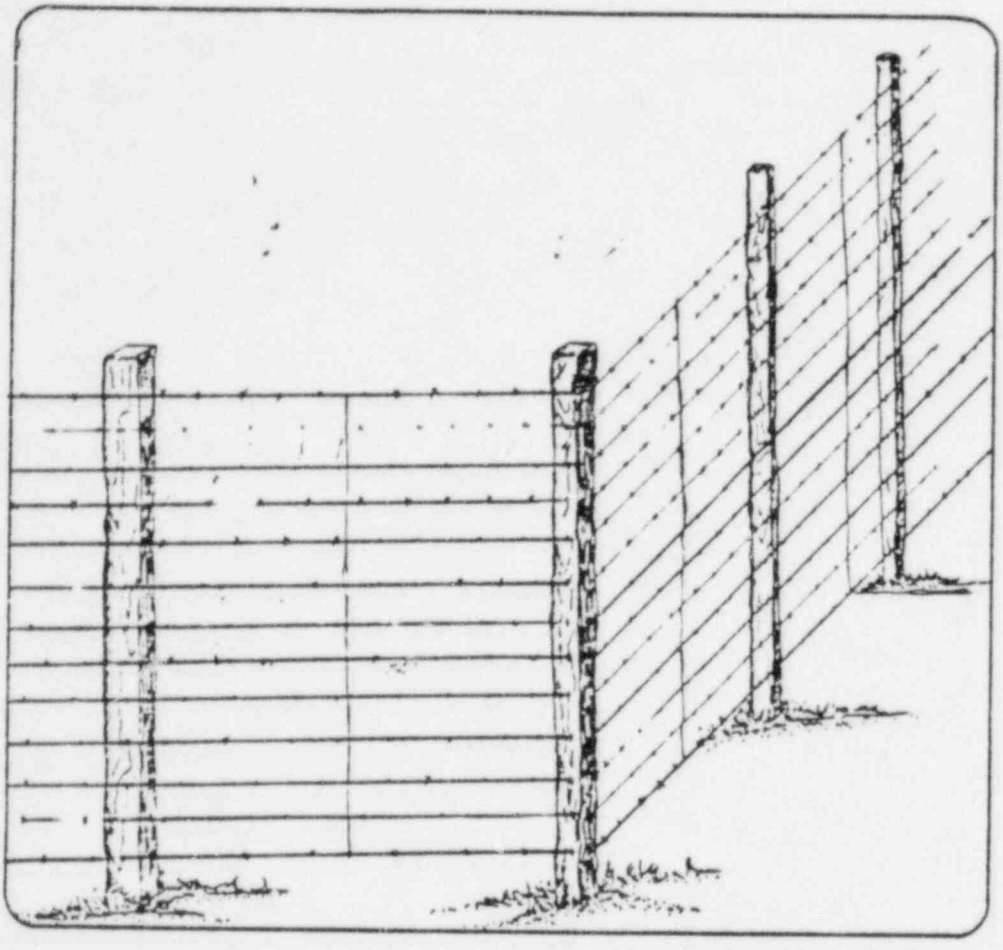


Figure 12—Example of properly constructed barbed wire fence.

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.

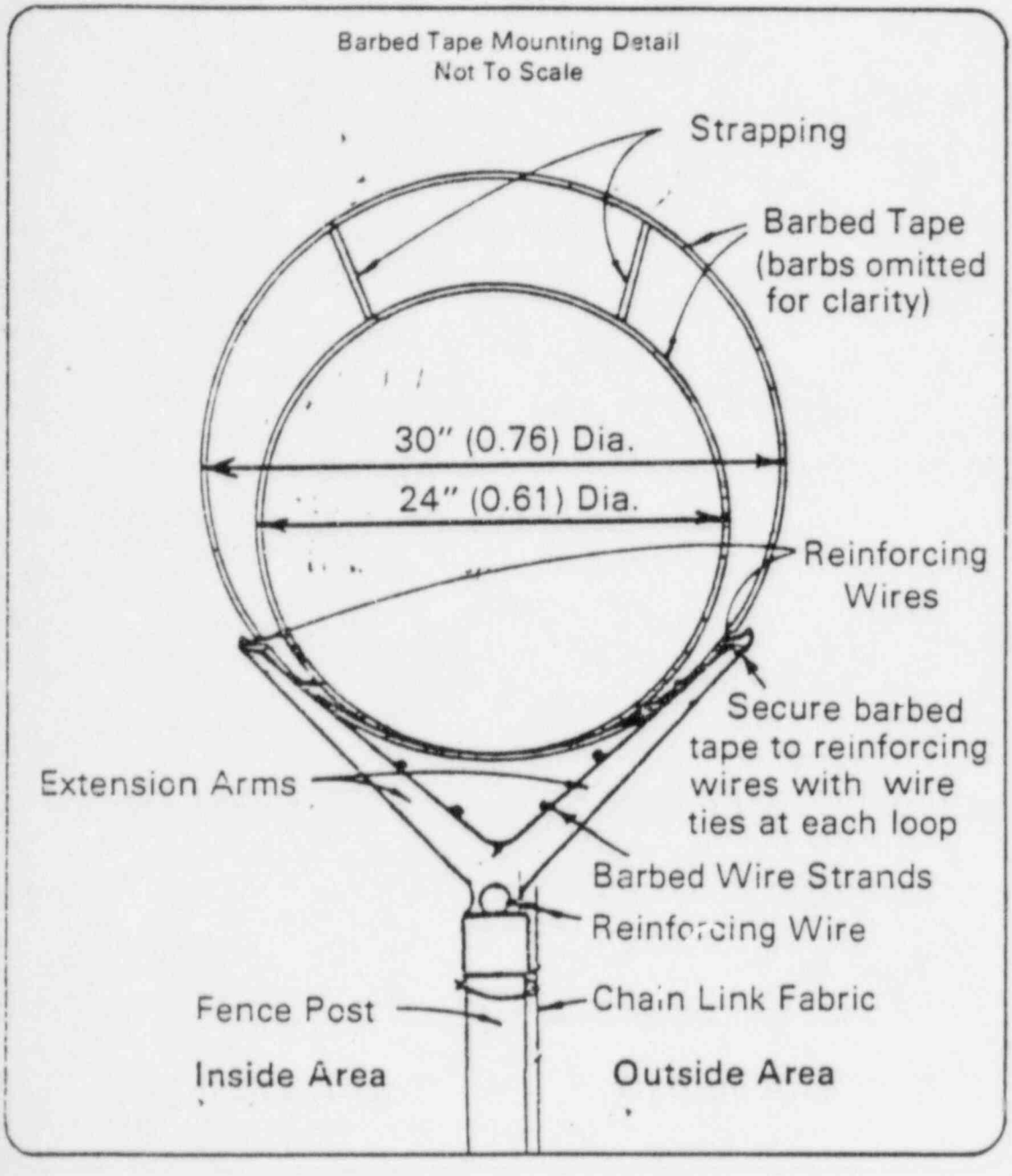


Figure 13—OCE drawing 40-16-10, barbed tape details.

CHAPTER 3

PERIMETER BARRIERS

INTRODUCTION

Perimeter barriers form the outermost protective element of a physical security system and function to exclude unauthorized personnel from an area. Existing barriers, such as fences and gates, may not significantly delay determined adversaries; however, properly designed and positioned barriers could delay personnel and vehicles long enough for other elements of the physical protection system to function, i.e., to detect, assess, respond. This chapter presents results of the evaluation programs to date for various personnel and vehicle barriers. Upgraded designs and advanced concepts for perimeter barriers are included.

The most common type of perimeter barrier is chain-link fencing with gates of comparable materials. Perimeter barriers can be quite extensive and cost per lineal foot should be considered in the initial installation. Most existing industrial-type perimeter barrier systems may be penetrated quite rapidly with simple tools or breached by climbing.

The barrier portion of a physical protection system around a protected area may be developed from the options suggested in this chapter. Consideration should be given to integrating the perimeter barrier and the perimeter detection system. A barrier which provides significant penet-

tration delay may hold the adversary at the point of intrusion long enough to assess the alarm and to allow a response force to intercept the intruder at the point of alarm.

There appear to be many methods of thwarting or significantly delaying vehicle penetrations into a protected area without exorbitant expenditures in equipment and land area. However, providing significant delay for a determined adversary who wants to cross a perimeter barrier on foot is a much more difficult problem and may require significant hardware and land area expenditures if lethal barriers (see p. 3-8) or firepower from guards is not an option.

Improving the penetration resistance of perimeter gates and portals to resist stealthy and forcible penetration, without providing equivalent protection features for the entire perimeter, would not provide balanced perimeter hardness.

STANDARD FENCES

Fences installed around a site can be classified as boundary, temporary, or perimeter installations and are constructed from a variety of materials.

Boundary

A boundary fence is often used to define the outermost limit or border of a facility. Signs are placed on the fence, usually at 50-foot intervals, to show ownership and to warn casual transients of possible dangers within the perimeters. A typical boundary fence is 4 feet high and is constructed of "T" posts to which four strands of barbed wire are installed. This type of fence is often referred to as "cattle fence" and is used only to define a boundary. The boundary fence should not be considered as a physical barrier of any consequence.

Temporary

Temporary fences are installed to deny access to individual areas and are used to enclose construction or storage facilities adjacent to a security area. The construction materials used in this type of fence range from 7-foot-high, 4- by 4-inch wood posts with 6- by 6-inch, 10 gauge mesh to 8-foot-high, 2.375-inch outside diameter steel posts set in concrete with 11-gauge, chain-link mesh, bracing, and 45° extension arms to which three strands of barbed wire are installed. Personnel penetration times for a temporary fence range from 3 to 18 seconds when gloves, boltcutters, or pipe is used as an aid.

Security

Security fences usually consist of galvanized steel posts, galvanized steel-mesh fabric, and 45° extension arms angled outward to which three strands of barbed wire or coiled concertina wire are installed. Security fences are not usually less than 8 feet high and are braced, as necessary, at all corners, gate openings, or structurally inadequate points. The fabric is usually clamped to a bottom rail or cable. Top and bottom rails are used to help support the fabric, as well as to add to the over all bracing of the fence. These rails, together with all other bracing, are located on the inside of the fabric. All vertical posts are set in circular concrete anchor-footings. In addition to line posts, much heavier corner or terminal posts are used in perimeter fence construction.

Although chain-link fences may serve as a deterrent to casual intruders, they would have very little effect on determined adversaries. Intrusion times for typical security fences taken from a variety of government agency tests show that chain-link fences do not delay determined adversaries for more than a few tenths of a minute.[1,2]

ENHANCEMENTS

Security fences topped with barbed wire, barbed tape concertina (BTC), or general purpose barbed tape obstacle (GPBTO) do not prevent intrusion. However, if additional rolls of barbed wire or tape are placed on or near existing perimeter fences, penetration can be made more difficult and more time-consuming.

Barbed Wire

Barbed wire has been used for many years as the standard enhancement for most fences. Although it snags and rips clothing, it seldom punctures or lacerates a properly prepared adversary. In addition to its common installation on boundary fences and out riggers on perimeter fences, barbed wire is also formed into concertina coils, depicted in Figure 3-1. Concertina coils are made of single-strand, spring-steel wire with four-point barbs attached every 2 inches.

When extended, the coils are approximately 36 inches in diameter and 50 feet long. Barbed wire strands are formed in the same manner except that barb spacing is lengthened to 3 to 6 inches.

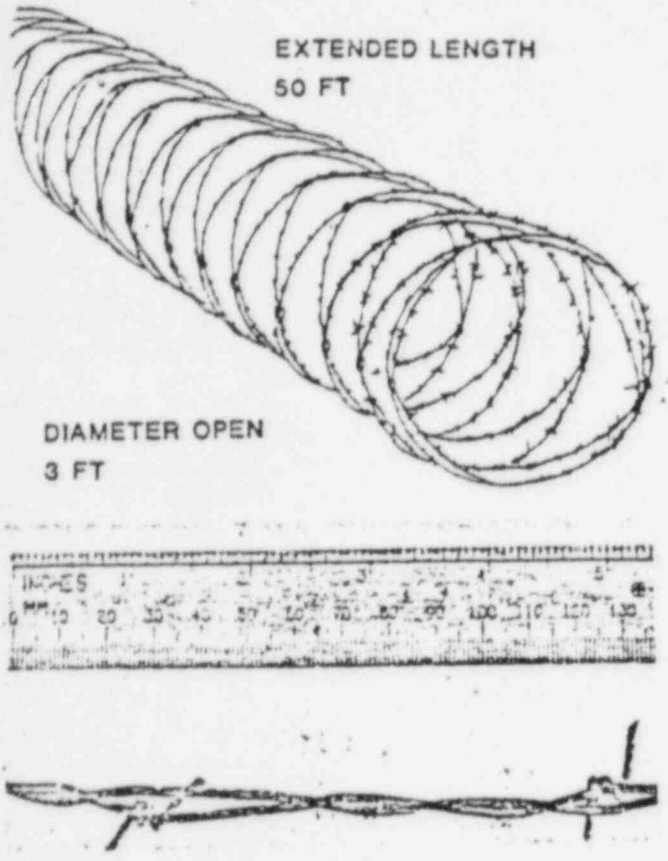


Figure 3-1. Barbed Wire Concertina (BWC). Est. Cost: $0.35/ ft ($1.15/m) [FY 79].

Barbed wire strands are mounted on outriggers and posts by a variety of methods. Some barbed wire is tied to posts and outriggers with soft wire, which is not an effective method. More common methods of attachment consist of diagonal slots in outriggers which contain the wire when pulled taut and standard fabric bands w' ich pinch the wire when tightened. An adjustable tension-tightener is sometimes used at terminal posts to remove sag in the barbed wire strands. Although barbed wire on outriggers presents a psychological deterrent to the casual intruder, it does not prevent determined adversaries from climbing over the fence. Actually, outriggers used for supporting barbed wire and horizontal top rails aid an adversary by supplying him with a handhold to help in climbing over a fence.[3]

Barbed wire concertina (BWC) functions somewhat better than three strands of barbed wire when installed on outriggers because its coiled configuration does not need support. BWC does not need 45° outriggers to support it because it can be attached to chain-link fence fabric with wire ties, "hog rings," or clamps. Although a barbed wire, concertina-topped fence offers an increased psychological deterrent, it can be crossed within 10 seconds with a simple aid such as an S-shaped hook.

Barbed Tape

Barbed tape and barbed tape concertina (BTC) were developed by the West Germans during the early 1950s as an improvement to the more vulnerable, single-strand barbed wire. Barbed tape is manufactured in accordance with Military Specification MIL-B-52488 (MO) and assigned National Stock Number (NSN) 5660-921-5517. BTC is manufactured in accordance with Military Specification MIL-C-52489 (MO) and is assigned NSN 5660-921-5516. Barbed tape can be used for the same applications as barbed wire, i.e., on boundary fences and perimeter fences with outriggers. However, the method of attaching barbed tape to posts and outriggers is completely different from the method used for barbed wire. Barbed tape is wider and flatter than barbed wire. As a result, it must be affixed with wire ties or clamps. The same method is used for barbed tape concertina, which is depicted in Figure 3-2.

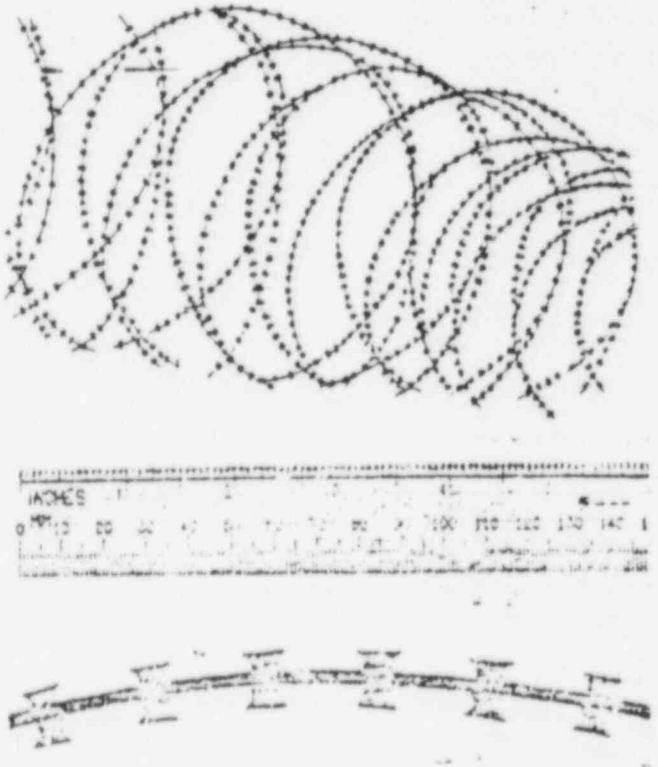


Figure 3-2. Barbed Tape Concertina (BTC). Est. Cost: $0.60/ft ($2.00/m) Single Coil, $1.10/ft ($3.60/m) Double Coil [FY 79].

Barbed tape is fabricated from galvanized steel strips which are 165 feet in length. The strips are wound on plastic reels and can be easily deployed with a barbed tape dispenser. Barbed tape concertina consists of a single strand of spring steel wire and a single strand of barbed tape. The barbed tape is securely affixed around the spring steel wire and coiled into spirals. The spirals are connected by steel clips to form a cylindrical, diamond-shaped coil. BTC is usually 50 feet long and approximately 36 inches in diameter, when it is extended (deployed). In addition to use on the tops of fences, BTC can be attached vertically to the chain-link fabric with wire ties. It can also be installed horizontally on the ground behind a fence or between fences in a double-fence installation as an enhancement. When used on the ground, BTC should be anchored with stakes (metal tent pins) every few feet to prevent movement or lifting.

Barbed tape and BTC have been developed to supercede barbed wire in its application on chain-link fences and perimeter barriers. Their barb spacing and design are definite improvements; however, the life expectancy of galvanized barbed tape and BTC may be drastically reduced when they are subjected to high humidity or salt spray. In addition, the barbs are too small to inflict more than superficial scratches and cuts on an intruder. It is possible to crawl through rows of single-coiled BTC with little difficulty, but a deployed double coil with a 36-inch outside diameter and a 24-inch inside diameter makes crawl-through much more difficult and time-consuming. At least one commercial supplier now manufactures stainless steel BTC, and the cost is slightly more than $2/ft — twice as much as galvanized BTC.

General Purpose Barbed Tape Obstacle (GPBTO)

General purpose barbed tape obstacle (GPBTO) was developed by the U.S. Army Mobility Equipment Research and Development Center (USAMERDC) in Ft. Belvoir, Virginia, to improve most characteristics of antiquated BWC and BTC. Figure 3-3 shows a typical GPBTO section. Emphasis was placed on effectiveness, cost, weight, erection simplicity, and emplacement effort.[4,5] The result was a barbed tape with long vicious barbs, easier deployment, less volume and weight, and easier recovery ability. Initially, the cost was twice that of BWC and BTC. As of FY 1979, the cost of Type II GPBTO (stainless steel) was nearly three times the cost of double-helix BTC (galvanized steel). GPBTO is manufactured in accordance with Military Specification MIL-B-52775A. There are three types of GPBTO available which are suitable for barrier applications.

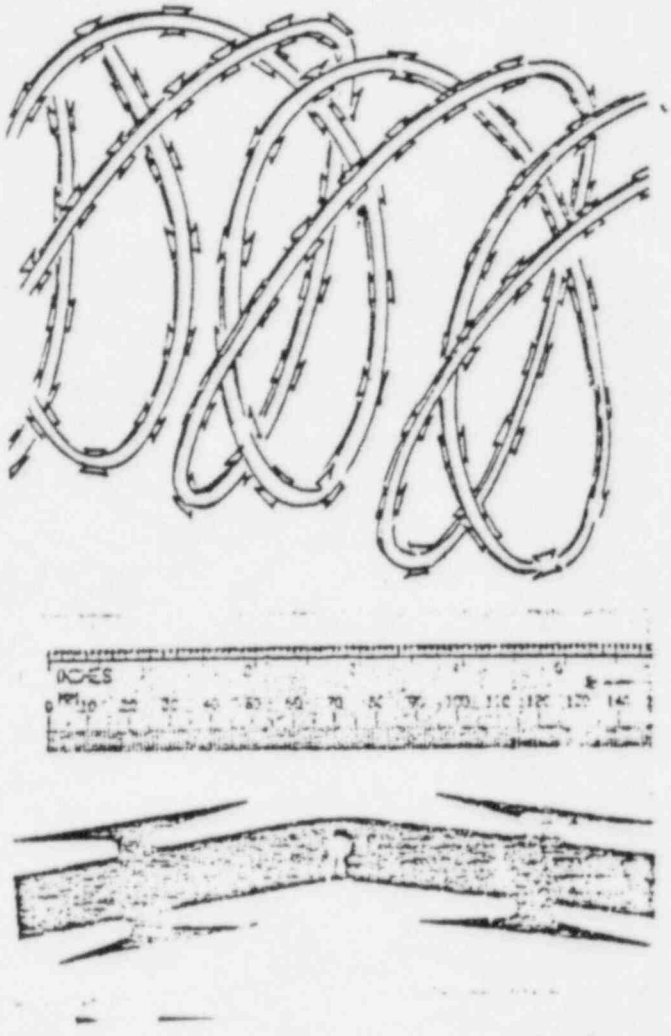


Figure 3-3. General Purpose Barbed Tape Obstacle (GPBTO) Type II. Est. Cost: $3.10/ft ($10.20/m) [FY 79].

Type I GPBTO

Type I GPBTO is a military version used in establishing perimeter barriers in the field. It consists of seven double-coiled assemblies of blackened barbed tape and seven polystyrene barbed tape dispensers. Anchors (metal tent pins) are supplied for attachment to the surface. Because of its neutral finish, Type I GPBTO reflects less light than Types II or III and is ideally suited to military operations. Since Type I is intended for a quick set-up of short duration, as in military movements during wartime, it does not have to be constructed of long-life materials.

Type II GPBTO

Type II GPBTO is a matt-finish stainless steel version of Type I GPBTO, which forms a double spiral, one spiral

inside the other (one with a left-hand lead and the other with a right-hand lead). The coils are free standing due to the use of stainless steel spacer wires. When fully extended, its length is 66 feet and its spiral diameter is approximately 30 inches. Type II GPBTO is supplied with stainless steel wire ties and anchors (metal tent pins). A recovery tool is available to allow the Type II GPBTO to be reused.

Type II can be used on or near fences and walls as an enhancement or for the construction of separate barriers. Since Type II GPBTO is fabricated from stainless steel, it is ideally suited for fixed-site installations where climate or local weather conditions would have little effect on it. Besides being attached as a fence topping, it can also be attached either to the inside or outside (on double fence) surface of chain-link mesh fabric with stainless steel wire ties.

If Type II GPBTO is installed horizontally on the ground, it can be staked every 22 feet with the three anchors supplied with each roll of barbed tape. Additional anchors should be used in windswept areas at a recommended distance of 5 feet. One problem associated with GPBTO (and also with BWC and BTC) is trash accumulation. When paper, weeds, leaves, etc., are caught in the barbed tape, a method should be devised to remove the trash, if for no other than esthetic reasons. In addition, grass and weeds can intertwine themselves in the barbed tape, thereby reducing its delay effectiveness. This condition can be remedied by the use of a soil sterilant or pavement.[6] Costs for sterilants range from $0.10 a square yard for a chemical penetration treatment to $6 a square yard for 2-inch-thick Gunite on level surface. Life expectancies for such treatments range from 2 to 20 years. A defoliant agent, if acceptable, can also be used to kill existing growth and prevent future growth.

Type III GPBTO

Type III GPBTO is a single, 18-inch-diameter coil of stainless steel barbed tape which is used primarily as a fence or wall topping around fixed sites. Each Type III coiled assembly comes with stainless steel wire ties for attachment to chain-link fences or walls. Besides being attached directly to the top of the chain-link fabric, Type III GPBTO can also be supported and tied to a single wire (12-gauge) strung on outriggers facing toward the inside of the fence. This method spaces the barbed tape evenly, prevents movement of the barbed tape, and supports the barbed tape from an inaccessible location. When the outriggers face toward the inside, the solid handhold that can be used by outsiders for climb-overs is eliminated.

Conclusions

GPBTO is a vast improvement over barbed wire. Besides having a vicious array of barbs, it also takes up less volume, takes less time to erect, and is more effective in keeping intruders from climbing or walking through perimeter fences or barriers. The amount of delay that is desired at perimeter fences or barriers must be considered in relation to the complex arrangement and cost of the materials used.

ENHANCED STANDARD FENCES

Placing rolls of barbed tape on or near standard fences can moderately enhance their capability to delay intruders. Arrangements are limited only by land availability and funds for upgrading.

Attaching one roll of barbed tape to the outriggers of an existing perimeter security fence, as illustrated in Figure 3-4, is probably the most cost-effective addition that can be made since an intruder must now bring additional aids or bulky equipment to climb over the fence. GPBTO can be tied to the chain-link fabric and the existing barbed wire by means of stainless steel wire ties. Reversing the outriggers to point from outside to inside when installing BTC or GPBTO as a fence topping eliminates the handgrip used by outsiders in climb-overs. Also, if the top rail on a GPBTO or BTC-topped fence is eliminated, the fence fabric becomes loose and flexible and consequently is much harder to climb. However, if vibration-type sensors are used on a fence, the top rail should be retained since it limits excessive fence fabric movement, a cause of increased false alarms during windy weather.

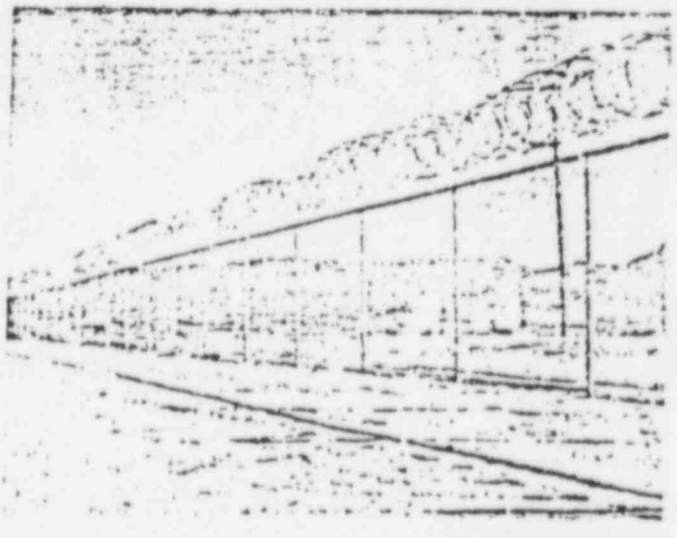


Figure 3-4. Alternate Security Fence with Single Roll 30 24 GPBTO. Upgrade Cost, $5/ft ($16 m) [FY 79].

Other enhancement possibilities are the placement of barbed tape either horizontally on the ground or against the chain-link fabric. Figures 3-5 and 3-6 show these installations. When the rolls are placed vertically, the bottom row should be staked to the ground with anchors (metal tent pins). The barbed tapes can be placed on either side of the chain-link fabric. Usually the barbed tapes are placed on the inside of an outside perimeter fence and on the outside of an inner (double) fence (Figure 3-7). This prevents accidental injury to the casual passerby, both outside and inside a site or facility. When rolls of barbed tape are placed horizontally, they are staked to the ground. Care must be taken to prevent excessive plant growth, and methods should be devised for removal of windblown trash. Even when perimeter fences are enhanced with numerous rolls of BTC or GPBTO, climb-overs, crawl-unders, and cut-throughs are possible with simple breaching aids, as indicated in the section, "Penetration Methods and Tools."

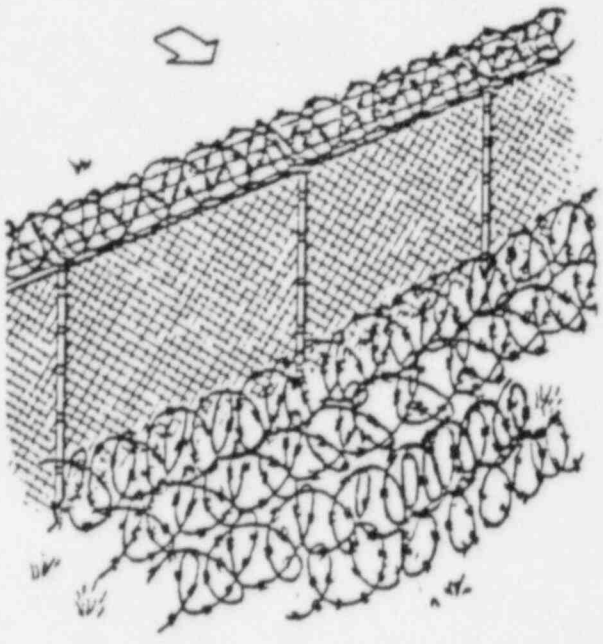


Figure 3-6. Standard Fence with Five Rolls 30/24 GPBTO. Up-grade Cost: $30/ft ($98/m) [FY 79].

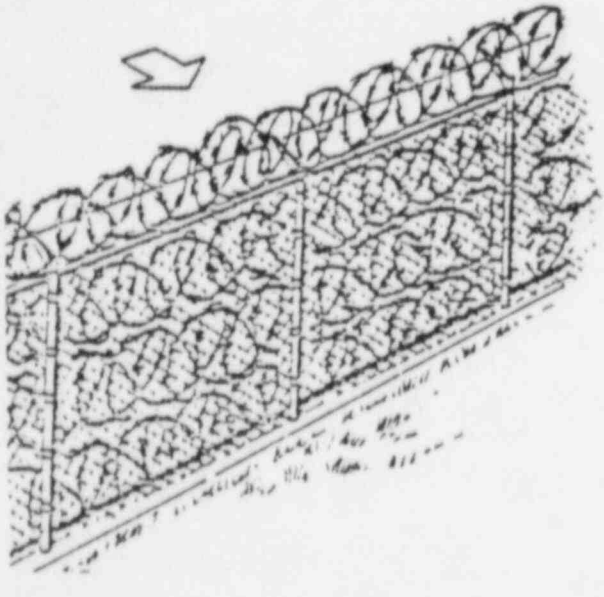


Figure 3-5. Alternate Security Fence with Four Rolls 30/24 GPBTO. Upgrade Cost: $20/ft ($66/m) [FY 79].

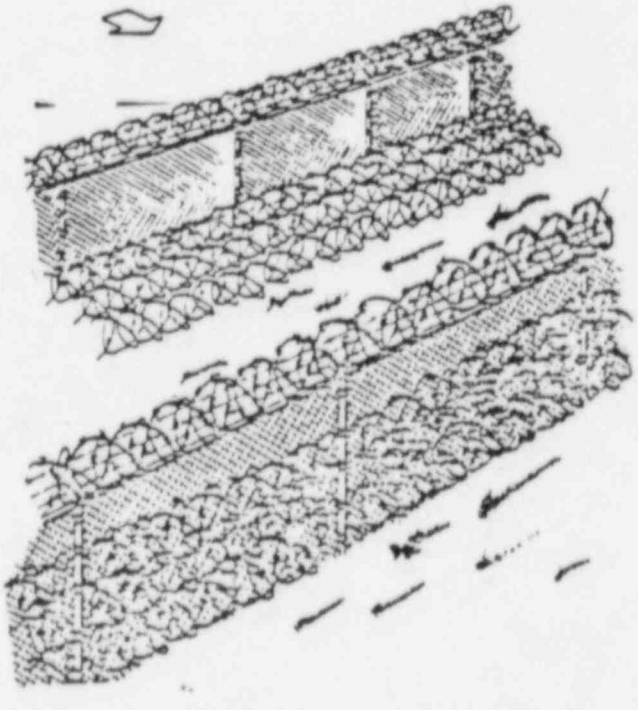


Figure 3-7. Standard Double Fence with Eight Rolls 30/24 GPBTO. Upgrade Cost: $50/ft ($164/m) [FY 79].