

# **UNIFIED FACILITIES CRITERIA (UFC)**

## **DRAFT** **SECURITY ENGINEERING: FENCES GATES, AND GUARD FACILITIES**



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**UNIFIED FACILITIES CRITERIA (UFC)**

**DRAFT FENCES, GATES AND GUARD FACILITIES**

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U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

Record of Changes (changes are indicated by \1\ ... /1/)

<b>Change No.</b>	<b>Date</b>	<b>Location</b>

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**This UFC supersedes, in part, Military Handbook 1013/10, Design Guidelines for Security Fencing, Gates, Barriers and Guard Facilities.**

## **FOREWORD**

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with [USD\(AT&L\) Memorandum](#) dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the more stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Support Agency (AFCESA) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: [Criteria Change Request \(CCR\)](#). The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site <http://dod.wbdg.org/>.

Hard copies of UFC printed from electronic media should be checked against the current electronic version prior to use to ensure that they are current.

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**Unified Facilities Criteria (UFC)**  
**New Document Summary Sheet**

**Subject:** UFC 4-022-03, *Security Engineering: Fences, Gates, and Guard Facilities.*

**Cancels:** Military Handbook 1013/10, *Design Guidelines for Security Fencing, Gates, Barriers, and Guard Facilities.*

**Document Description and Need:**

**Purpose:** This document is to provide a unified approach for the design, selection, and installation of security fences, gates, and guard facilities associated with Department of Defense (DoD) facilities. The examples provided in the UFC are for illustration only and shall be modified and adapted to satisfy installation specific constraints. This document is not intended to address procedural issues such as threat levels or to provide specific design criteria such as impact forces.

This UFC was developed by consolidating and refining criteria from USCE Protective Design Center, Security Engineering Work Group (SEWG); Naval Facilities Engineering Command (NAVFACENGCOM), Engineering Innovation and Criteria Office, and available military, government, and commercial sources that are listed in Appendix A of this document.

**Application and Use:** Commanders, security and antiterrorism personnel, planners, designers, architects, and engineers should use this UFC when evaluating existing and providing new security fencing, gates, and guard facilities. Technical information considered generally known to professional designers, architects, engineers, or readily available in technical references (Unified Facility Criteria, Military Handbooks, Technical Manuals, etc.) has not been included.

**Need:** Fencing is primarily used to define perimeters; however, Department of Defense (DoD) and Service regulations require fencing to be provided for certain restricted areas. DoD and Service policies will be addressed to establish fencing requirements. This UFC will focus on the requirements for security fences, however, the information and notional design details presented within may also be used for general or perimeter fencing. Modifications to existing security fencing are not required to meet the new criteria if the existing fencing provides an equivalent or greater penetration resistance.

**Impact.** The following direct benefits will result:

- Creates a standardized approach for identifying and justifying security and antiterrorism design criteria for DoD facilities.
- Creates standardized nomenclature and criteria for asset, threat, and level of protection definition.
- Creates a standardized procedure for identifying costs for DoD facilities with security and antiterrorism requirements to a planning level of detail.
- Creates a standardized process for evaluating design criteria and protection options based on cost and risk management.
- Provides guidance for incorporating security and antiterrorism principles into installation master planning.
- Does not have any adverse impacts on environmental, sustainability, or constructability policies or practices.

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## **CHAPTER 1 INTRODUCTION**

### **1-1 BACKGROUND.**

Security fences, gates, and guard facilities are installed and used primarily to define the perimeter of a restricted area, and to provide a physical and psychological deterrent to entry while serving notice that entry is not freely permitted. These facilities, in conjunction with personnel and procedures, are instrumental in preventing accidental entry, optimizing security force operations, and enhancing detection and apprehension, while directing and controlling the flow of personnel and vehicles through designated portals.

### **1-2 PURPOSE.**

This document is to provide a unified approach for the design, selection, and installation of security fences, gates, and guard facilities associated with Department of Defense (DoD) facilities. The examples provided in the UFC are for illustration only and shall be modified and adapted to satisfy installation specific constraints. This document is not intended to address procedural issues such as threat levels or to provide specific design criteria such as impact forces.

This UFC was developed by consolidating and refining criteria from United States Army Corps of Engineers (USACE) Protective Design Center, Naval Facilities Engineering Command (NAVFACENGCOM), Engineering Criteria and Programs and Antiterrorism and Force Protection offices, and available military, government, and commercial sources that are listed in Appendix A of this document.

### **1-3 SCOPE AND GUIDANCE.**

Commanders, security personnel, planners, designers, architects, and engineers should use this UFC when evaluating existing and providing new security fencing, gates, and guard facilities. Technical information considered generally known to professional designers, architects, engineers, or readily available in technical references (Unified Facility Criteria, Military Handbooks, Technical Manuals, etc.) has not been included.

These criteria are strongly suggested and should not be overlooked without prior approval from the component office of responsibility:

- U.S. Air Force: Air Force Civil Engineer Support Agency, Technical Support Directorate (HQAFCEA/CES)
- U.S. Navy: Naval Facilities Engineering Command, NAVFAC-Atlantic, Capital Improvements Anti-Terrorism Force Protection (CIATFP)
- U.S. Army: U.S. Army Corps of Engineers, Directorate of Civil Works, Engineering and Construction (HQ USACE/CECW-E)
- U.S. Marine Corps: Commandant of the Marine Corps, Headquarters U.S. Marine Corps, Security Division (PS)

**1-4 CRITERIA DOCUMENTATION.**

Where criteria documentation such as Unified Facility Criteria and military instructions, handbooks, technical manuals, etc., is cited, the latest version shall be used.

**1-5 NATO CRITERIA.**

The criteria authorized or directed by the North Atlantic Treaty Organization (NATO) may be different from the criteria provided in this document. NATO criteria must be obtained to assure that specified NATO security requirements are met when designing security components for facilities in Europe.

**1-6 MANDATE.**

Criteria in this Unified Facilities Criteria (UFC) are mandated for use by the Office of the Secretary of Defense (OSD); the Military Departments (including National Guard and Reserve Components); the Chairman, Joint Chiefs of Staff and Joint Staff; the Combatant Commands; the Office of the Inspector General of the Department of Defense; the Defense Agencies; DoD Field Activities; and all other organizational entities within DoD, hereafter referred to collectively as "DoD Components."

**1-7 APPLICABILITY.**

Criteria in this UFC apply to facilities that require perimeter boundaries and/or restricted area enclosures based on current Service policies, location of facility, and threat level. Security specialists shall provide all risk and threat assessments.

**1-8 IMPLEMENTATION.**

Implementation of an effective security measure in the form of fencing, gates, and guard facilities requires coordinated efforts of engineering, security personnel, and the commanding officer of the facility. Coordination is necessary to produce a design that is practical, cost effective, and meets the requirements for security based on the threat level, local conditions, and applicable directives.

**1-9 SECURITY ENGINEERING UFC SERIES.**

This UFC is one of a series of security engineering Unified Facilities Criteria that covers minimum standards, planning, preliminary design, and detailed design for security and antiterrorism. The manuals in this series are designed to be used sequentially by a diverse audience to facilitate development of projects throughout the design cycle. The manuals in this series include the following:

- **DoD Minimum Antiterrorism Standards for Buildings.** UFC 4-010-01 and UFC 4-010-02 establish standards that provide minimum levels of protection against terrorist attacks for the occupants of all DoD inhabited buildings. Those UFC are for use by security and antiterrorism personnel and design teams to identify the minimum requirements that must be incorporated into the design of all new construction and major renovations

of inhabited DoD buildings. They also include recommendations that should be, but are not required to be incorporated into all such buildings.

- **DoD Security Engineering Facilities Planning Manual.** UFC 4-020-01 presents processes for developing the design criteria necessary to incorporate security and antiterrorism into DoD facilities and for identifying the cost implications of applying those design criteria. Those design criteria may be limited to the requirements of the minimum standards, or they may include protection of assets other than those addressed in the minimum standards (people), aggressor tactics that are not addressed in the minimum standards, or levels of protection beyond those required by the minimum standards. The cost implications for security and antiterrorism are addressed as cost increases over conventional construction for common construction types. The construction components represented by those cost increases are tabulated for reference, but they represent only representative construction that will meet the requirements of the design criteria and should not be construed to limit designers' options for providing required levels of protection. The manual also includes a means to assess the tradeoffs between cost and risk. UFC 4-020-01 is for use by planners as well as security and antiterrorism personnel with support from planning team members.
- **DoD Security Engineering Facilities Design Manual.** UFC 4-020-02 provides interdisciplinary design guidance for developing preliminary systems of countermeasures to implement the design criteria established using UFC 4-020-01. Those countermeasures include building and site elements, equipment, and the supporting manpower and procedures necessary to make them all work as a system. The information in UFC 4-020-02 provides sufficient detail to support concept level project development, and as such can provide a good basis for a more detailed design. The manual also provides a process for assessing the impact of countermeasures on risk. The primary audience for the reference UFC 4-020-02 is the design team, but it will also be useful to security and antiterrorism personnel.
- **Security Engineering Support Manuals.** In addition to the standards, planning, and design UFC mentioned above, there is a series of additional UFC that provide detailed design guidance for developing final designs based on the preliminary designs developed using UFC 4-020-02. These support manuals, of which this UFC is one, provide specialized, discipline specific design guidance. Some address specific tactics such as direct fire weapons, forced entry, or airborne contamination. Others address limited aspects of design such as resistance to progressive collapse or design of portions of buildings such as mailrooms. Still others address details of designs for specific countermeasures such as vehicle barriers or fences. The Security Engineering Support Manuals are intended for use by the design team during the development of design packages.

## **CHAPTER2 FENCING**

### **2-1 FENCING OVERVIEW.**

Fencing is primarily used to define perimeters; however, Department of Defense (DoD) and Service regulations require fencing to be provided for certain restricted areas. DoD and Service policies will be addressed to establish fencing requirements. This UFC will focus on the requirements for security fences, however, the information and notional design details presented within may also be used for general or perimeter fencing. Modifications to existing security fencing are not required to meet the new criteria if the existing fencing provides an equivalent or greater penetration resistance.

The following documents provide Service policies and additional criteria for security fencing:

- OPNAVINST 5530.14D, Navy Physical Security and Law Enforcement Manual
- MCO P5530.14, Marine Corps Physical Security Program Manual
- AR 190-11, Physical Security of Arms, Ammunition and Explosives (AA&E)
- AR 190-16, Physical Security
- UFC 3-260-01, Airfield and Heliport Planning Design
- UFC 3-530-01, Design: Interior, Exterior Lighting and Controls
- UFC 4-021-02NF, Security Engineering: Electronic Security Systems
- UFC 4-022-01, Security Engineering: Entry Control Facilities/Access Control Points
- UFC 4-022-02, Security Engineering: Design and Selection of Vehicular Barriers
- UFC 4-025-01, Design for Waterfront Security
- UFC 4-027-01, Design to Mitigate Terrorist Attacks in Expeditionary Environments
- UFC 4-141-10N, Design: Aviation Operation and Support Facilities
- UFC 4-150-06, Military Harbors and Coastal Facilities

Standard fencing drawings applicable to the following criteria are provided in Appendix B.

#### **2-1.1 Entry Control Facilities/Access Control Points.**

Fencing incorporated with entry control facilities (ECF)/access control points (ACP) should meet the minimum requirements established for the perimeter fencing.

#### **2-1.2 Natural Barriers.**

Natural barriers may be used in place of perimeter or security fencing if they provide equal or greater protection. Barriers, which may be able to provide this protection, include, but are not limited to beaches, waterways, densely wooded areas, cliffs, and mountains. Only the Commanding Officer should make this determination as all sites differ.

#### **2-1.3 Material Selection and Coatings.**

Local environments should be considered during the selection of material for the fencing components as well as coatings to provide additional protection against corrosion. Color polymer and other coatings on fencing fabric, fittings, framework, and gates may be applied to enhance visibility and provide greater corrosion resistance, especially in salt-water environments.

### **2-2 LEVELS OF PROTECTION.**

Levels of protection as identified by Services in various formats are provided herein.

**Air Force:** Minimum requirements for fencing types and protection levels are listed in Table 2-1 and Table 2-2.

**Table 2-1: Chain Link Fencing Types, Materials and Uses**

Type of Fencing	Fence Materials and Installation Details	Typical Uses
Type A	Chain link, 2 inch (50 mm) square mesh, woven 9 gage (without plastic/PVC coating) (3.76 mm or 0.148 inch) steel wire fabric, 7 feet (2.1m) high, surmounted by 3 strands of barbed wire, angled outward at 45 degrees for a total height of 8 feet (2.4 m)	<ul style="list-style-type: none"> <li>• Nuclear weapon storage areas</li> <li>• Aircraft parking areas</li> <li>• Areas with high mission or monetary value</li> <li>• Barrier between flight line activities and cantonment and base or immediately contiguous housing areas</li> </ul>
Type A1	Chain link, 7 feet (2.1m) high, surmounted by 6 strands of barbed wire, 3 on each side of a "Y"-shaped outrigger, for a total height of 8 feet (2.4 m)	<ul style="list-style-type: none"> <li>• Nuclear weapons storage areas</li> <li>• Alert aircraft areas</li> </ul>
Type A2	Chain link, 6 feet (1.8 m) high, surmounted by 3 strands of barbed wire, angled outward for a total height of 7 feet (2.1 m)	<ul style="list-style-type: none"> <li>• Areas with high mission or monetary value</li> <li>• Barriers between flight line activities and the base cantonment or housing areas</li> </ul>
Type B	Barbed wire, 3 or 4 strand, 4 feet (1.2 m) high.	<ul style="list-style-type: none"> <li>• Extension of flight line area barriers</li> <li>• Perimeter boundary for isolated portions of installations</li> <li>• Livestock barrier (4 strands of barbed wire)</li> <li>• Area boundary for on-base bulk material storage areas</li> </ul>
Type C	Concertina Wire, 3 feet (915 mm) in diameter, used in multiple stacked coils	<ul style="list-style-type: none"> <li>• Extra protection/delays</li> </ul>

**Table 2-2: Protection Levels and Criteria**

Protection Level	Threat Level Criteria
PL 1	Loss, theft, destruction, misuse, or compromise would result in great harm to the strategic capability of the United States. This level of security must result in the greatest possible deterrence against hostile acts.
PL 2	Loss, theft, destruction, misuse, or compromise would cause significant harm to the war-fighting capability of the United States. This level of security must result in significant deterrence against hostile acts.
PL 3	Loss, theft, destruction, misuse, or compromise would damage US war-fighting capability. This level of security must result in a reasonable degree of deterrence against hostile acts.

**Air Force:** All restricted areas should use Type A fencing as a minimum. Installations with Protection Level 1 and 2 (PL1 and PL2) resources require Type A2 fencing as a minimum. Boundary barriers for all restricted areas should be located at least 250 feet from the base perimeter or property line. Areas under PL1 and PL2 should be

compelled to install fences around the smallest area needed to contain the resources and meet operational requirements. Entry control should be placed through a single entry point. Areas under PL3 should be urged to place fencing where it best facilitates movement of personnel and equipment while enhancing force protection. Circulation control should be enforced through on-duty user personnel and security forces making periodic checks during normal operations. If a PL3 area is located on a flight line that is located away from the base perimeter and is using Type A fencing at the base perimeter, then it is not necessary to install Type A fencing around the restricted area. If a PL3 area is located on a flight line that is located away from the base perimeter and is not using Type A fencing at the base perimeter, then Type A fencing should be installed between the base perimeter and the restricted area at the most advantageous location around the perimeter of the flight line so it is between the base perimeter and the PL3 area. The boundaries of these restricted areas should also be delineated with elevated barriers or painted lines. PL3 areas located at remote or off-installation sites should consider installing Type A fence around areas to delineate the boundary where circulation controls are applied. Air Force units are directed to refer to AFH 32-1084 and AFI 31-101 for additional guidance concerning Table 2-1 Table 2-2: Protection Levels and Criteria.

**Navy and Marine Corps:** For security applications, fencing requirements, in addition to current policies, should be evaluated on the security levels and corresponding restricted areas provided in Table 2-3.

**Table 2-3: Restricted Area Levels, Descriptions and Examples**

Restricted Area Level	Level Description	Specific Restricted Areas
Level One	The least secure type of restricted area, it contains a security interest that if lost, stolen, compromised, or sabotaged would cause damage to the command mission or national security. It may also serve as a buffer zone for Level Three and Level Two restricted areas, thus providing administrative control, safety, and protection against sabotage, disruption, or potentially threatening acts. Uncontrolled movement may or may not permit access to a security interest or asset.	<ul style="list-style-type: none"> <li>• Motor pools</li> <li>• Fuel issue points</li> <li>• Funds and negotiable instrument storage areas</li> <li>• Provost Marshal Office Desk Sergeant/Dispatcher Area</li> <li>• ESS Monitoring Spaces</li> <li>• Military Working Dog Facilities</li> </ul>
Level Two	The second most secure type of restricted area, it may be inside a Level One area, but is never inside a Level Three area. It contains a security interest that if lost, stolen, compromised, or sabotaged would cause serious damage to the command mission or national security. Uncontrolled or unescorted movement could permit access to the security interest.	<ul style="list-style-type: none"> <li>• Aircraft hangars, ramps, parking aprons, flight lines, and runways</li> <li>• Aircraft rework areas</li> <li>• RDT&amp;E Centers</li> <li>• AA&amp;E storage facilities and processing areas</li> <li>• Fuel depots and bulk storage tanks</li> <li>• Communication, computer, and antenna sites</li> <li>• Power stations, transformers, master</li> </ul>

		valves, and switch spaces
Level Three	The most secure type of restricted area, it may be within less secure types of restricted areas. It contains a security interest that if lost, stolen, compromised or sabotaged would cause grave damage to the command mission or national security. Access to the Level Three restricted area constitutes, or is considered to constitute, actual access to the security interest or asset.	<ul style="list-style-type: none"> <li>• Research, testing, storage and maintenance facilities for the following areas:</li> <li>• Nuclear</li> <li>• Biological</li> <li>• Chemical</li> <li>• Special weapons</li> </ul>

**USMC** Marine Corps units are directed to refer to MCO P5530.14 for additional requirements and guidance concerning Table 2-3: Restricted Area Levels, Descriptions, and Examples.

**Navy** The Level One areas should have the following minimum required security measures:

- Clearly defined and protected perimeter.
- Personal identification and control system for assigned personnel.
- Controlled ingress and egress.
- Controlled admission of individuals who require access for reasons of official business, who render a service, and other visitors as authorized by the Commanding Officer.
- Manual checks for signs of attempted or successful unauthorized entry and other security degrading activities at least once every 12 hours if equipped with an Intrusion Detection System (IDS) or twice every 12 hours otherwise.
- Level Two and Three areas should have the following minimum required security measures:
  - Clearly defined and protected perimeter.
  - Personal identification and control system for assigned personnel.
  - Ingress and egress controlled by guards, receptionist, or other trained personnel.
  - Restricted admission to individuals that have duty requirements or have been authorized in writing by the Commanding Officer.
  - Manual checks for signs of attempted or successful unauthorized entry and other security degrading activities at least once every 12 hours if

equipped Intrusion Detection System (IDS) or twice every 12 hours otherwise.

**USMC** The Level One areas should have the following minimum required security measures:

- A clearly defined perimeter.
- Admission of individuals who require access for reasons of official business, who render a service, and other visitors as authorized by Commanding Officer.
- Secured during non-working hours.
- Manual checks for signs of attempted or successful unauthorized entry and other security degrading activities at least once every 12 hours if not adequately equipped with an operational ESS.

The Level Two areas should have the following minimum required safety measures:

- A clearly defined and protected perimeter. The perimeter will be a fence or the exterior walls of a building or structure. If the defined and protected perimeter is the outside walls of a space within a building or structure, it must be inside a Level One restricted area.
- Admission only to personnel whose duties require access and who have been authorized in writing by the Commanding Officer. Controlled admission of individuals who require access for reasons of official business, who render a service, and other visitors as authorized by the Commanding Officer. Such persons and all other visitors will be escorted by an authorized/cleared activity escort at all times, and the security interest will be protected from compromise.
- A personal identification and access control system (an automated access control system with the capability of recording ingress and egress may be used to accomplish this) is required. All visitors will be logged in and out in an entry/departure log at all times.
- Secured during non-working hours
- When secured, checked once per 12-hour shift if adequately equipped with an operational ESS, or twice per 12-hour shift for those facilities without an operational IDS. Security force personnel will check for signs of attempted or successful unauthorized entry, and for other activities that could degrade the security of the restricted area.

The Level Three areas should have the following minimum required safety measures:

- A clearly defined and protected perimeter. The perimeter will be a fence or the exterior walls of a building or structure. If the defined and protected perimeter is the outside walls of a space within a building or structure, it must be inside a Level One or Two restricted area.
- Ingress and egress controlled by guards or appropriately trained and cleared personnel.
- Admission only to personnel whose duties require access and who have been authorized in writing by the Commanding Officer. Controlled admission of individuals who require access for reasons of official business, who render a service, and other visitors as authorized by the Commanding Officer. Such persons and all other visitors will be escorted by an authorized/cleared activity escort at all times, and the security interest will be protected from compromise.
- A personal identification and access control system (an automated access control system with the capability of recording ingress and egress may be used to accomplish this) is required. An access list and entry/departure will be used for all personnel at all times.
- Secured during non-working hours. When secured, an operational ESS, or security personnel must control access to the area.
- When secured, checked twice per 12-hour shift if adequately equipped with an operational ESS, or twice per 8-hour shift for those facilities without an operational IDS. Security force personnel will check for signs of attempted or successful unauthorized entry, and for other activities that could degrade the security of the restricted area.

**Navy and USMC:** The perimeter may be a fence, exterior walls of a building or structure, or outside walls of a space within a building or structure. Inner and outer security clear zones are to be provided according to service requirements. The personal identification and control system may be electronic with the capability of recording the ingress and egress. If a computer access control or logging system is used, it must be safeguarded against tampering. Ingress and egress entrance areas must be controlled by an electronic security system or security personnel at all secured times. All visitors should be logged in and out in an entry/departure log. The frequency at which visitors are logged in and out rests with the installation commander. Visitors for all three levels must be escorted and the security interest must be protected from compromise. For Levels Two and Three, the escort must be authorized and cleared for the visitor's activity.

Fencing should be kept at a minimum distance of 14 feet (4.3 m) from all tree limbs and adjacent site elements to prevent an aid to climbing. Any fencing using an Intrusion Detection System (IDS) should be designed to have minimal possibilities of vibrations by maintaining fabric tension. Additional fortification measures of perimeter security are requested to be implemented when soil conditions permit ease of tunneling under the fence line. Soft or shifting soil, such as sand, when located along a fence line is

compelled to have a soils engineering analysis conducted on it, and be able to provide at least 15 seconds of tunneling resistance.

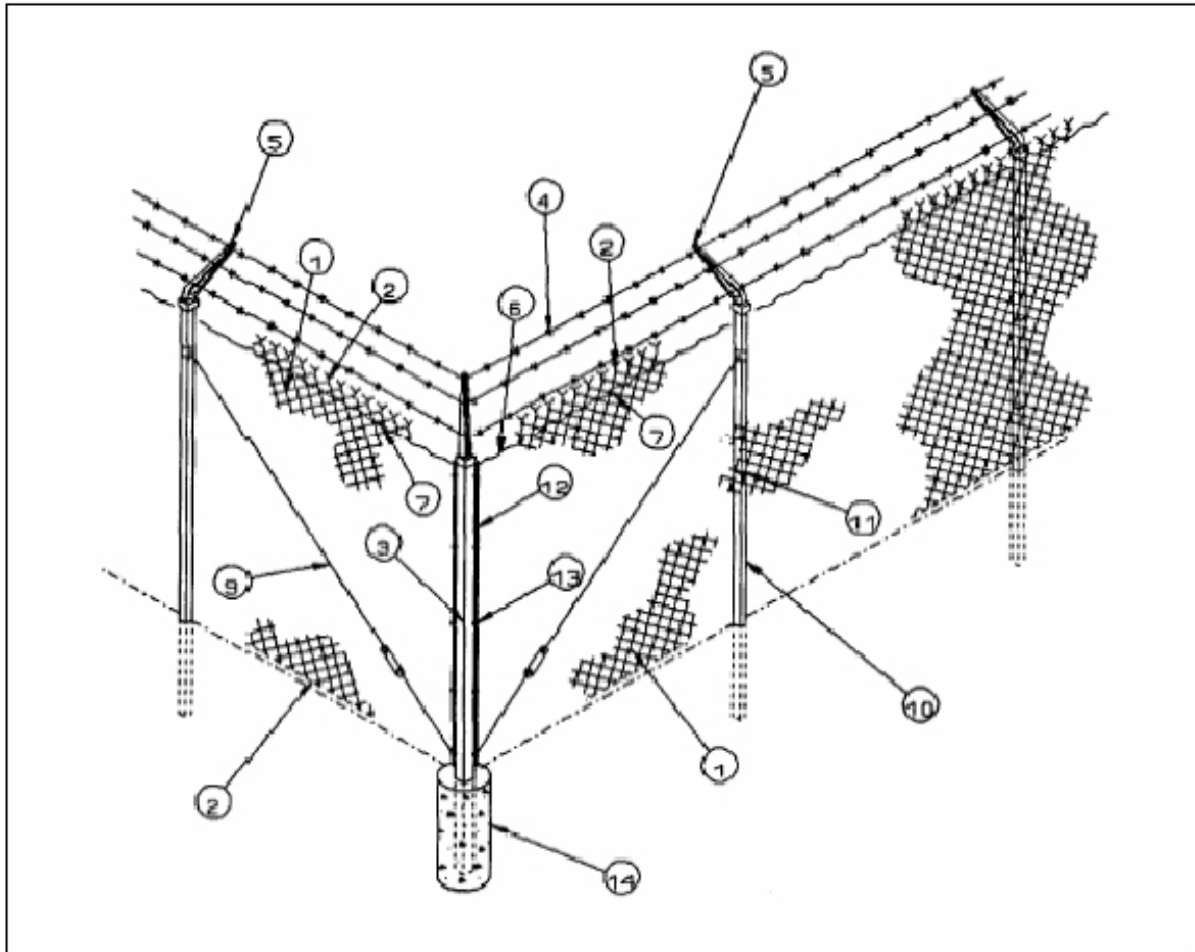
Area with water boundaries should be protected by barriers with proper signs, as indicated in the Signage section. High threat areas, activities, or installations may consider using patrol craft for additional protection. When weather does not permit patrol craft, an increase in all other security measures (waterfront patrols, watch towers, military working dog teams, and other security systems) may be considered as an alternative.

Dual fencing may be used for added protection and to increase security breach time. They may be considered at the more critical portions of the fence if resources allow. This may also be considered as an effective means for use with an electronic detection system. By detecting the intruder on the first fence, enforcement could be aware before the second fence is breached. Dual fencing can be created by two parallel fences separated by a space large enough to detect an intruder. The separation can also provide access for vehicles and/or military working dogs for security patrols. The space between fences should remain free of obstructions to prevent concealment by an intruder. This space should be maintained and monitored in the same manner as clear zones.

## **2-3 CHAIN LINK FENCING.**

See Figure 2-1 for a standard chain link fence section identifying all of the components. The components include (1) fabric, (2) selvage, (3) corner post, (4) barbed wire, (5) outrigger (barb wire arm), (6) tension wire, (7) hog ring, (9) truss rod, (10) line post, (11) tie wire, (12) tension bar, (13) tension clip, and (14) concrete footing.

Figure 0-1: General Chain-Link Fence Components



### 2-3.1 Chain Link Fencing Fabric.

Fencing fabric wire gage and mesh openings are dependent on the type of fence, protection needed, and location of the fence. Fence fabric material should be galvanized steel, PVC coated steel fabric (use PVC coated if located in corrosive environment or where aesthetics are of prime importance), or aluminum coated steel fabric (use aluminum coated if located in corrosive environment). Painting of fence fabric or any fencing components is prohibited; however, in the case of fabric and components that are PVC coated, they should be manufacturers' standard color. Fencing fabric should be mounted on steel posts that are set in concrete with additional bracing at corners and gate openings, as necessary. If steel posts are not available, reinforced concrete posts may be used. Posts, bracing, and all other structural members are directed to be placed on the secure-side of the fencing fabric. Provide twisted and barbed selvages at the top and bottom of the fence fabric. Fencing fabric can be securely fastened to tension wires on the top and bottom with 9 gage (3.76 mm) galvanized tie wires incorporating at least three full twists, 9 gage round wire galvanized hog rings, or in a manner that provides a tensile strength equal to or greater than the

strength of the fencing fabric. Coating on any fasteners or ties must be electrolytically compatible with fencing fabric to inhibit corrosion. The fencing fabric should be extended to within 1 inches (51 mm) of firm ground and anchored, if required by service requirements, using horizontal bottom rails, tension wires, concrete curbs, sills, sheet piling, piping or other inexpensive materials. Burying the fabric 12 inches (305 mm) may also be considered; however, corrosion of the buried fabric should be monitored. This anchoring should prevent the fencing fabric from being able to be lifted more than 5 inches (125 mm) in height. Chain-link fabric tautness requirements can be found in UFGS (32 31 00.00 10 / 32 31 13.00 20 / 32 31 13.00 40). Mesh openings in chain link fencing are intended to not be covered, blocked, or laced with material which would prevent a clear view of personnel, vehicles, or material in outer clear zones unless an approved waiver or exception is obtained. For facilities located in Europe, the fencing may be a NATO standard design of 2.5 – 3 mm diameter wire with a 3 inch (76 mm) grid opening. ASTM standards A 116, A 392, A 491, A 817, F 668, A 90, A 428, and F 567 should be followed for all materials, installations, and repairs of standard fencing fabric. Fences to be sensor equipped should be constructed to service and sensor manufacturer standards for the system used. Fence requirements for application of fence sensors are covered in UFGS (32 31 00.00 10 / 32 31 13.00 20 / 32 31 13.00 40).

**Army** Fence fabric should be twisted and barbed on the top selvage and knuckled on the bottom selvage.

**Air Force** Use non-reflective coating for fences to reduce glare that could affect remote camera and visual assessment.

**Navy** The use of reinforced concrete posts will not be allowed.

**Navy and USMC** Security fences will be fabricated with 9-gage (3.76 mm) steel wire mesh material with mesh openings not larger than 2 inches per side.

See Appendix B for notional design details of chain link fencing.

### **2-3.2 Fencing Components, Fittings and Accessories.**

Provide chain link fencing components and accessories in accordance with ASTM standards F1043, F626, A817, A824, F1083 and F1664. Locate all posts, rails, bracing and tension wires on the secure-side, i.e. inner side, of the fencing fabric. Posts should be vertical within plus or minus 2 degrees in each direction. Determine the embedment depth of the fence posts and associated footings considering wind load, local soil conditions, and the potential for wind and water erosion. Posts for security fencing must be embedded and encased in concrete according to the notional design details in Appendix B while general fencing shall be in accordance with ASTM F 567.

Steel truss rods used for bracing must have a minimum nominal diameter of 5/16 inch (8 mm) and provided with turnbuckles for tensioning. Provide bracing for each gate, terminal and end post. Install truss rods diagonally from near ground level of the gate, terminal or end post to within 6 inches (152 mm) from the top of the fabric at the adjacent line post.

All fence fittings must be electrolytically compatible with all fence components. Consider securing all fastening and hinge hardware by peening or welding to prevent disassembly of fencing and gate components where warranted by the required level of protection.

**Navy and USMC** The use of top rails is prohibited.

See Appendix B for notional design details of chain link fencing posts, rails, braces, and tension wires.

### 2-3.3 **Conventional Arms and Ammunition Storage Areas.**

Fencing fabric should be constructed of a minimum of 9-gage (3.76 mm) wire with mesh openings not larger than 2 inches (51 mm) per side. Provide twisted and barbed selvages at the top and bottom of the fence fabric. Material should be galvanized steel, PVC coated steel fabric (use PVC coated if located in corrosive environment or where aesthetics are of prime importance), or aluminum coated steel fabric (use aluminum coated if located in corrosive environment). Paving beneath fencing will aid in weed control.

**Army** Fence fabric should be twisted and barbed on the top selvage and knuckled on the bottom selvage. Refer to AR190-11 for physical security criteria for conventional arms, ammunition, and explosives (AA&E).

**Air Force** Use non-reflective coating for fences to reduce glare that could affect remote camera and visual assessment. Refer to DoD 5100.76-M for physical security criteria for conventional arms, ammunition, and explosives (AA&E).

**Navy** The use of reinforced concrete posts will not be allowed. Refer to OPNAVINST 5530.13 for physical security criteria for conventional arms, ammunition, and explosives (AA&E).

**USMC** Refer to OPNAVINST 5530.13 for physical security criteria for conventional arms, ammunition, and explosives (AA&E).

### 2-3.4 **Nuclear Requirements.**

For nuclear storage facilities, fencing fabric should be encased in a 6 inch (152 mm) wide concrete curb extending approximately 12 inches (305 mm) into the soil around the entire perimeter. In areas where freezing is experienced, the curb should extend below the local frost level depth.

### 2-3.5 **Airport Requirements.**

For Air National Guard (ANG) and Air Force Reserve Command (AFRC) units that are co-located with civilian airports, the airfield side of the restricted areas does not require fencing installation as it is prohibited by the Federal Aviation Agency (FAA) safety requirements. Fencing requirements for airports and heliports are provided in UFC 4-141-10N and UFC 3-260-01.

## **2-4 ORNAMENTAL FENCE.**

Ornamental (also known as tubular) fencing provides a greater resistance to climbing as well as providing aesthetic qualities in comparison to chain link fencing. Anti-ram reinforcement as well as anti-ram gates should be considered when using ornamental fencing. Ornamental fencing systems are constructed of either steel or aluminum components. Ornamental fencing as a security fence is to be constructed of all steel components. Structural steel tubes and gate frame members should be in accordance with ASTM A513 and have a minimum yield stress of 60,000 psi (414 MPa), while steel fence components should be in accordance with ASTM A525. Install ornamental fence pickets plumb and provide a minimum of 2 inches (51 mm) or maximum of 6 inches (152 mm) between the fence and the ground.

See Appendix B for notional design details of ornamental fence.

## **2-5 WELDED WIRE MESH FABRIC FENCING.**

Welded wire mesh fabric fencing in comparison to chain link fencing has a greater deterrence to intrusion by climbing and cutting. Welded wire mesh fabric fence openings are relatively small to prevent toe or finger hold. Although the mesh sizes are small, visibility through the fence may be higher than chain link fencing even at sight angles near parallel to the fence line.

Fence fabric is fabricated from low carbon steel wire, ASTM A 853, Grade AISI 1008 and 1010, with a minimum tensile strength of 73,000 psi (485 MPa), minimum gage size of 10 (2.59 mm), and maximum mesh size of 2" x 2" (51 mm x 51 mm).

Welded wire mesh fabric fencing construction costs in non-urban environments may be approximately one half of ornamental security grade fencing.

See Appendix B for notional design details of welded wire mesh fabric fencing.

### **2-5.1 Fence Components, Fittings and Accessories.**

Provide welded wire mesh posts in accordance with ASTM F 1083, F1043, or A 500. Posts and rails should be designed to resist specified loading and be spaced per manufacturer's guidance. Connect fencing fabric with a minimum of 9 gage (3.76 mm) tie wires or other connection per manufacturer providing equal or greater capacity and resistance to tampering. If using welded wire mesh fence panels, attach to line and terminal posts and gate frames with post brackets.

## **2-6 EXPANDED METAL FENCING.**

Similar to welded wire mesh fabric fencing, expanded metal fencing is ideal for medium and high security applications. The diamond shaped mesh's small openings and wide strands deter climbing, cutting, and tunneling. Panels are constructed of steel sheets, simultaneously slit and stretched into a rigid, open mesh design making continuous sheets that prohibit unraveling at the strands.

Expanded metal fencing fabric is constructed of carbon steel or stainless steel and should be in accordance with ASTM A 1011 and ASTM F 1267. The minimum gage size should be 13 (1.83 mm) and the maximum mesh size should be 1 ½ inches (38 mm). Fabric coatings available are hot dip galvanized, vinyl, and powder coated. At the time of this publication, an ASTM standard entitled “Specification for Fences Using Expanded Metal for Security Applications” is under development. It is recommended that this specification be used for this type of fencing when it becomes available. Available fence patterns can provide the architectural aesthetics of ornamental fencing.

In lieu of installing a fence topping, an expanded metal fabric cap sheet can be installed at a 45-degree angle extending outside of the secured perimeter and terminating with a turned up vertical section. If additional protection measures are required, barbed tape can be applied to the back of the vertical portion of the cap sheet.

See Appendix B for notional design details of expanded metal fencing.

#### **2-6.1      Retrofitting Existing Fencing.**

Expanded metal fencing can be applied as a retrofit to existing chain link fencing and gates to provide additional protection, strength, and durability. Expanded metal fencing should be installed directly to the existing fence utilizing the installed chain link fence fabric and framework.

#### **2-6.2      Fence Components, Fittings and Accessories.**

Line and terminal posts should be hot-dip galvanized **SS40** and in accordance with ASTM F 1043 and ASTM F 1083. The manufacturer’s recommendation should be considered when spacing line posts. Top, middle, and bottom rails should be hot-dip galvanized. Rails can be fastened to posts using clamps. Standard weight piping should be used for the posts and rails of expanded metal fencing. Fittings such as line rail clamps, post caps, tension bands, and panel clamps should be galvanized, heavy pressed steel or malleable iron.

#### **2-7            FARM-STYLE FENCE.**

**Army and Air Force**      Farm style fences, barb wire, and woven wire should comply with specification requirements in UFGS (32 31 00.00 10 / 32 31 13.00 20 / 32 31 13.00 40) and the standard construction drawings indicated in Appendix B- Gate and Fence Notional Drawings. They may be used at facilities with low or negligible threat with approval from the installation’s Commanding Officer. Farm style fences are constructed of wood and/or metal posts and wire. All wood posts should be pressure treated and metal post shall be zinc coated and conform to ASTM A 702. Steel post conforming to ASTM F 1043 may be used in conjunction with T-section or U-section line post. The gates are constructed of 1 5/8” (41.3 mm) minimum diameter tubular steel, and secured with a chain and padlock.

See Appendix B for notional design details of farm-style fence.

#### **2-8            EXPEDITIONARY PERIMETER FENCING.**

Refer to UFC 4-027-01, Design to Mitigate Terrorist Attacks in Deployed Operational Bases (DOBs) for perimeter security requirements.

## **2-9 FENCE FABRIC HEIGHT.**

All security and perimeter fencing should have a minimum fence fabric height of 6 feet (1.8m), excluding the top guard.

**Air Force** All security fencing should have a minimum fence fabric height of 7 feet (2.14 m), excluding the top guard.

**Navy** All security fencing should have a minimum fence fabric height of 7 feet (2.14 m), excluding the top guard.

**USMC** All security fencing should have a total height of 8 feet (2.44 m). This includes a fabric height of seven feet, plus a top guard. An additional four to five feet of fencing height will be added at building connections to a point at least 10 feet (3.05 m) away from the building. Fences or walls at free-standing facilities with high threat levels should be a minimum of 9 feet (2.74 m) tall and extend at least 3 feet (915 mm) below grade.

The bottom of perimeter fence fabric should not be capable of being lifted more than 5 inches (125 mm). One method of providing additional resistance is to bury the fabric 12 inches (305 mm) to anchor it. Fencing design may consider increasing the fence height above the minimum required at all building connection points for additional security. Perimeter fencing surrounding nuclear weapon storage facilities should be a minimum of 7 feet (2.14 m) high fabric plus outriggers. Modifications to existing fences are not required to meet the new criteria if the existing fencing provides an equivalent or greater penetration resistance.

## **2-10 TOP GUARDS.**

Top guards should be constructed of the same material as the other fencing components.

### **2-10.1 Outriggers.**

Install outriggers (support arms) at 45-degree angles in a single arm or "Y" configuration, constructed of a single or double outrigger consisting of 18-inch (457 mm) arm(s), each having three strands of barbed wire at regular intervals along the top of the fence in accordance with RR-F-191. Nuclear weapon storage facilities should be directed to use the "Y" configuration. All steel outriggers overhang should face outward, away from the protected site. The outriggers should provide a minimum of an additional 12 inches (305 mm) to the fence height. The top guard fencing adjoining gates may range from a vertical height of 18 inches (457 mm) to the normal 45 degree outward protection, but for a limited distance along the fence line to adequately open the gates. Outriggers should be permanently affixed to the fence posts with screws or by spot welding. Screws used to affix outriggers to posts must be made tamper-proof either by design, peening, or welding.

## **2-10.2 Barbed Wire and Barbed Tape Concertina.**

Fencing requiring barbed wire should use a minimum of 3 strands of barbed wire equally spaced 16 inches (406 mm). Additional strands may be added as required. Barbed wire shall consist of two 12-1/2-gage 0.099-inch (+0.005-inch) twisted line wires with 1~-gage 0.080-inch (+0.005-inch) round barbs. Barbed wire shall be zinc-coated steel, aluminum coated steel, aluminum alloy, or PVC over zinc-coated steel as specified. All barbs shall consist of four points and spacing of barbs shall be at 5-inch (+1-inch) centers.

Conventional arms and ammunition security fencing should use twisted, double strand, 12.5 gage (2.51 mm) wire with four-point barbs spaced an equal distance apart. Any barbs used with farm fencing ought to be a minimum of 15.5 gage wire. Barbed clusters should have a minimum width of 1.21 inches (30.7 mm). The distance between these strands is intended not to exceed 6 inches (152 mm) and at least one wire should be interlaced vertically and midway between posts. The ends of the barbed wire strands may be staggered or fastened together, and the base wire may be picketed to the ground.

3 or 4-strand barbed wire fencing, 4 feet (1.2 m) high, should be used for extensions of flight-line area barriers, perimeter boundary for isolated portions of installations, livestock barrier, and area boundary for on-base bulk material storage areas. Barbed wire fastened on wooden posts may use a minimum of 1.5 inch (38 mm) staples made from the same metal as the wire for fastening.

Barbed-tape concertina is a commercially manufactured wire coil constructed of high-strength-steel barbed wire that is clipped together at intervals to form a single coil or double coil. The single coil should be a minimum of 2 feet (610 mm) in diameter and extend at least 50 feet (15.2 m) without permanent distortion. Double coil should be 24/30 inch (610 mm/762 mm) and extend at least 50 feet (15.2 m) without permanent distortion. Barbed tape concertina as an expedient measure for short-term use, pending the erection of permanent fencing, can be non-reinforced. Reinforce all barbed tape concertina used for permanent security applications.

When used for temporary purposes, concertina wire should be used in multiple stacked coils. Stacked concertina wire on perimeter barriers may be laid between poles with one roll on top of another or in a pyramid arrangement (minimum of 3 rolls). Concertina blades should have a minimum length of 1.2 inches (30.5 mm). Barbed tape concertina may be added to the top and, in some cases, to the bottom to increase the level of protection. Barbed tape concertina should be secured at a minimum interval of 18 inches (457 mm) along the fence fabric to the top barbed wire strand and a maximum gap of 2 inches (51 mm) should be maintained between the bottom barbed wire and the top of the chain-link fabric. After use, barbed tape concertina may be recoiled and reused without distortion. For additional protection, barbed tape concertina may be installed between the "Y" of the outriggers.

Barbed tape concertina should be in accordance to ASTM F 1911 and F 1910. Except where specifically required by service criteria, the use of barbed wire and barbed tape concertina should be approved by the Commanding Officer.

See Appendix B for notional design details of barbed tape.

## 2-11 **GROUNDING.**

Grounding and bonding of the perimeter systems should be in accordance with the National Electric Safety Code (NESC).

Metal fences that are electrically continuous with metal posts extending at least 24 inches (610 mm) into the ground require no additional grounding. Metal posts in concrete footings will require grounding regardless of depth of footing. Other metal fences should be made electrically continuous and grounded on each side of every gate at gateposts, at corner posts, and at end posts. The gate should be bonded to the adjacent fence post utilizing flexible copper grounding braid with sufficient slack to permit 180 degree (3.14 rad) opening of gate. Provide ground rods or ground plates every 1000 feet to 1500 feet (305 m to 457 m) when fences are located in isolated areas; and every 500 feet to 750 feet (152 m to 228 m) when located within 100 feet (30 m) of public roads, highways, and buildings. Ground all metal fences at or near points crossed by overhead power lines in excess of 600 volts and also at distances of 150 feet (46 m) on each side of the line crossing. The overhead power line is considered directly overhead if it is run within 50 feet or the height of the pole, whichever is greater. The ground should be made with a bolted connection at a fence post by the use of No. 2/0 AWG copper cable. Where plastic coated fabric is used, remove plastic coat and braze or bolt conductor to post. Fences around electric supply stations and communication facilities may be required to have a bonding cable run underground between gate posts, see National Electric Safety Code (NESC) for these requirements.

If the fence consists of wooden posts and horizontal metal strands only, provide down conductors for the full height of the fence and securely bond each wire to be electrically continuous.

Ground fences at places where personnel may routinely touch the fence and areas where structures and gate must be bonded to the fence or gate.

Where chain link fence is plastic coated on metal posts, connect each post at the top by means of a rigid support bar or wire positively bonded (metal to metal) in order to ensure grounding. Where the fence is connected to the gate post, cut the plastic as to make electrical contact with the post. Ground post via ground rod. Do not use plastic coated fence where overhead power lines run parallel to the fence.

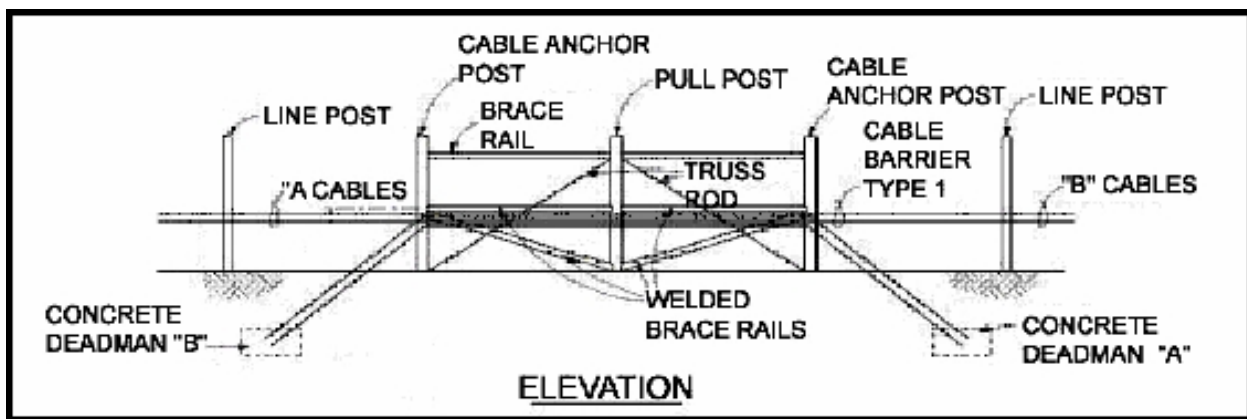
Where there are three or more parallel fences, bond and ground outside fences as indicated above. Bond and ground all gates and posts, regardless of location as indicated above. Bond and ground interior fences, excluding the innermost fence (that is, the fence closest to the facility) only at the gates. To prevent personnel shock, suspend all maintenance, inspection, and testing during thunderstorm activity.

## 2-12 REINFORCEMENT FOR FENCING.

Refer to UFC 4-022-02 for additional guidance and requirements (number and size of cables) on fence reinforcement for identified moving vehicle threat. Reinforcement for fencing is typically done by installing a minimum 6X19 class wire rope across the fencing material on the secure-side. See Figure 2-2 for a notional layout of cable reinforcing. The wire rope should be regular lay, extra improved plow steel (EIPS), independent wire rope core (IWRC), class A galvanized and in accordance with ASTM A 603. Cables may be installed either between the fence fabric and post or on the outside of the fabric. Installing the cables between the fence fabric and post may be more costly due to the labor of removing and replacing the fabric or "sewing" the cable through the fabric. Cables should be overlapped, where possible, before terminating at the deadman to ensure that there are no voids of reinforcement along the perimeter. Where overlapping is not possible, other means (such as using bollards) can be used to continue the protective barrier. Due to limitations in the penetration resistance provided by single strand cable systems, a minimum of two cables should be provided. The cables should be fastened with wire rope clamps, Type 1, Class 1, galvanized and in accordance with Federal Specification, FS FF-C-450, at a height of approximately 30 inches (762 mm) from the ground. The second, or any other additional cables, should be placed 5 inches (125 mm) above or below the first cable and attached to the fencing and anchored to the same deadman in the same manner as the first cable. Each cable end may be terminated with four wire rope clamps or a wire rope hydraulically swaged press fitting conforming to Military Specification, MS20668. The cable end should be attached to one end of a 1 ¼ inch (6.35 mm) X 12 inch (305 mm), Type 1, Grade 1, zinc coated round turnbuckle with one jaw end and in accordance with ASTM F1145. Eye ends should be attached to the deadman eyebolt by a ¾ inch (19 mm) anchor shackle, National Aerospace Standard, NASM 45908. If located in a corrosive environment, coated or sheathed cable may be used; however, the sheathing shall be removed at the connections.

See Appendix B for notional design details of fence reinforcement.

**Figure 2-2: Steel Cable-Reinforced Chain Link Fence**



### 2-12.1 Deadman Anchor.

Reinforcing cables should be terminated to concrete deadman anchors. Anchors are to be placed at intervals of 200 feet (61 m) on the secure-side of the perimeter fencing with the front edge of the deadman parallel to the fence fabric. Offset deadman anchors from fence at the minimum distance required to avoid interference with post and to allow maintenance access to the turnbuckles, clamps, and other accessories.

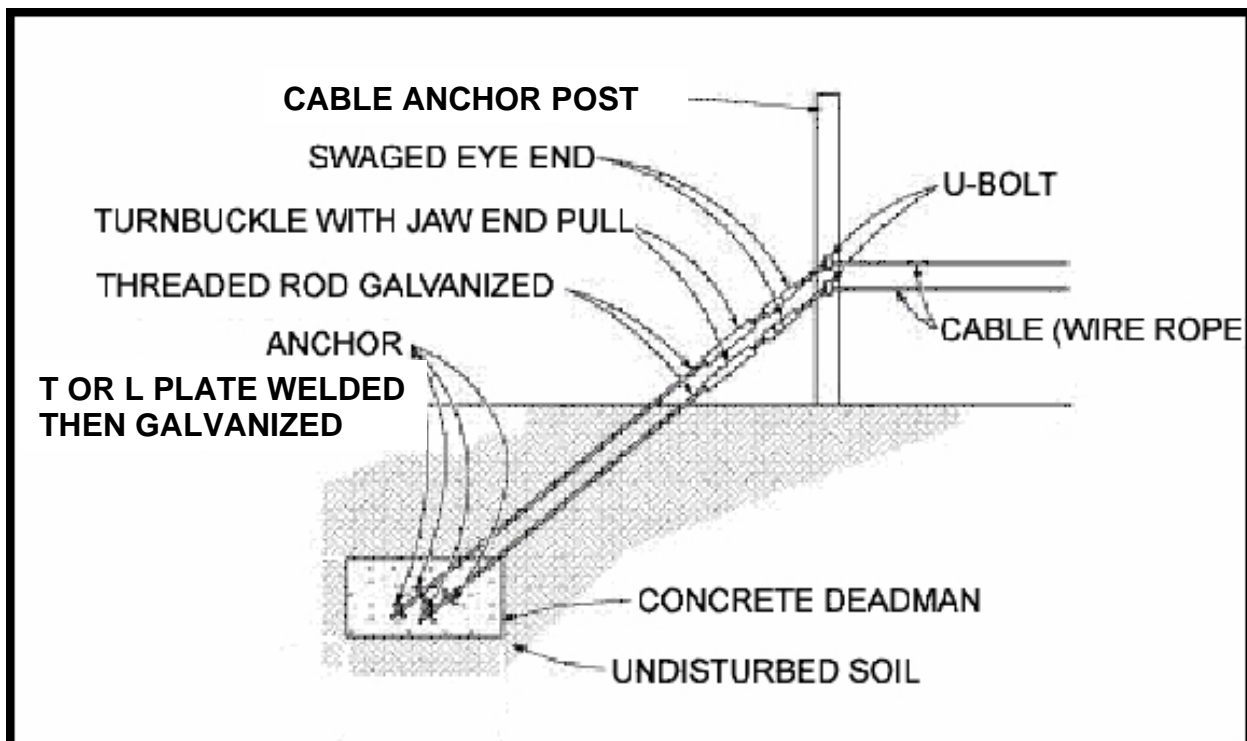
Eyebolts embedded in the concrete deadman anchors may have either a welded “T” or “L” end. The eyebolt can either be in-line with the attached cable or flush against the deadman surface. When used, eyebolts should be welded and galvanized to the anchor rods. The top side of the deadman can either be placed flush with or below the ground surface with the eye of the eyebolt above ground. Threaded rods may also be used as an alternative to the eye bolt when securing the cables to the deadman anchor. When using threaded rods, the threaded rod and wire rope connection should be visible above ground like the eyebolt previously described.

Figure 2-3 shows the deadman positioned using a cable clamp and turnbuckle to secure the cable rather than a swaged on clamp. This turnbuckle adds the advantage of being able to adjust the tension of the wire rope.

The anchoring system: deadman dimensions or other anchoring systems and burial depth, eyebolt embedment depth, etc. should be designed for local soil conditions and the anticipated impact force established by the threat parameters defined in UFC 4-020-02.

See Appendix B for notional design details of deadman anchors.

**Figure 2-3: Deadman Anchor Detail**



## 2-13 CLEAR ZONES.

Vegetation within any clear zone should not exceed 6 inches (152 mm) in height. If clear zone requirements are not feasible, consideration may be given to increasing perimeter barrier height, increasing security-patrol coverage, additional security lighting, or installing an intrusion detection system.

Locate fence as to not impede emergency vehicle or emergency personnel access to fire hydrants. See UFC 3-600-01, *Fire Protection Engineering for Facilities* for additional information on fire hydrants.

**Army** Conventional arms, ammunition, and explosive areas (AA&E) should have a 12 foot (3.6 m) minimum clear zone between the perimeter barrier and exterior structures, parking areas, and any topographical features and a 30 foot (9.2m) minimum clear zone between the perimeter barrier and structures within the protected area. Corrections Systems Facilities should provide clear zones for guard towers to have a clear view of at least 80 feet (24.4 m) in all directions along the perimeter fence.

**Air Force** A clear zone should be created at least 30 feet (9.2 m) on both sides of a single boundary barrier. For areas with 2 fences, a clear zone of at least 30 feet (9.2 m) inside the inner fence and 30 feet (9.2 m) outside the outer fence should be maintained. Areas with animal control fences are not considered to have a dual fence. Consider moving all possible dips, ridges, ditches, and objects that could conceal an intruder or obstruct vision. Poles (lighting, power, camera, etc.), overhead wires, and other features should be positioned so they cannot be used to circumvent the sensor system or fence.

**Navy** Perimeter fencing should maintain a combined 50 foot (15.2 m) minimum clear zone on both sides between the perimeter barrier and exterior structures, parking areas, and protected area. Areas with minimum security levels should maintain a 20 foot (6.1 m) minimum clear zone between the perimeter barrier and exterior structures, parking areas, and any features, and a 30 foot (9.2 m) minimum clear zone between the perimeter barrier and structures within the protected area.

**USMC** Interior/exterior clear zones will be a minimum of 33 feet (10.1 m), with the interior clear zone being no less than 20 feet (6.1 m), and the exterior clear zone being no less than 10 feet (3.05 m). Clear zones for arms, ammunition, and explosive (AA&E) facilities will remain at a 30 feet (9.2 m) interior clear zone and a 20 feet (6.1 m) exterior clear zone. Where possible, a larger clear zone should be provided to preclude or minimize damage from thrown objects such as incendiaries or bombs.

Objects that present no aid to circumvent the perimeter barrier or do not provide concealment to an intruder (such as patrol roads, perimeter light poles, fire hydrants, steam pipes, etc.) may be permitted to stay within the clear zone, based on an evaluation of the installation mission, congestion adjacent to the security fence line, resources being protected, and flightline security requirements.

If an adequate clear zone is not provided, a combined fire break of 50 feet (15.2 m) in width should be provided along both sides of the security fence line of barriers surrounding restricted and non-restricted areas. However, if the clear zone requirements stated in the service exceptions above are met, a fire break is not required. Fences should be placed a minimum of 20 feet (6.1 m) inside the facility's property line. Fences not along the property lines are directed to establish a clear zone of at least 20 feet (6.1 m) or greater outside of the fence line.

All nuclear weapons sites should maintain a clear zone of at least 30 feet (9.2 m) inside the inner fence, the area between fences, and 30 feet (9.2 m) outside the outer fence.

## **2-14 ELECTRONIC SECURITY SYSTEMS.**

Electronic Security Systems (ESS) may be used to increase the probability of detection and the assessment of intruders attempting to enter restricted areas. ESS includes Intrusion Detection Systems (IDS), Access Control Systems (ACS), and Closed Circuit Television (CCTV) for assessment of alarm conditions. The design of fences, gates and guard facilities should support the site specific design of the ESS. The following sections outline general guidelines to be used in planning for these systems as a reference for the design engineer, but are not intended to replace the requirements for a given site. Further information on Electronic Security Systems can be found in UFC 4-021-02NF and UFC 4-020-04FA.

### **2-14.1 General Conduit Locations.**

To support an ACS or IDS, a gate would require two to three, 1-inch (25.4 mm) conduits. These conduits would typically serve a card reader, buried loop sensor, and control wiring to the gate motor control. For a CCTV system, conduits will be required to run the power and video cabling from the Site Security Center to the camera locations. Power is typically required at exterior camera locations for heaters and pan/tilt/zoom capabilities. Typically a 1-inch (25 mm) conduit for the video cabling and a ¾-inch (19 mm) conduit for the power wiring would be adequate to serve several camera locations in a particular zone. The required number of conduits will depend on the quantity and layout of cameras required to cover each zone.

Taut wire sensor systems employ signal processors mounted on the fence line. Each fence mounted signal processor requires a conduit run back to the installation/base security operations center (Regional Operations Center (ROC), Emergency Operations Center (EOC)). The actual conduit size may vary depending upon the quantity of signal processing units served. At a minimum, one 1-inch (25 mm) conduit should be provided for each signal processing unit. Microwave and infrared sensors employ a transmitter and receiver for each zone. Each transmitter will require a conduit back to the installation/base security operations center. The actual conduit size may vary depending upon the quantity of transmitters served. At a minimum, one 1-inch (25 mm) conduit should be provided for each transmitter. Ported coaxial sensors or buried line type sensors employ a transmitter and receiver for each of two buried coaxial cables for each zone. Each transmitter/receiver will require a conduit back to the installation/base security operations center. The actual conduit size may vary depending upon the

quantity of transmitter/receivers served. At a minimum, one 1-inch (25 mm) conduit should be provided for each transmitter/receiver.

#### **2-14.2 Taut-Wire.**

A taut-wire intrusion detection system includes an array of horizontal wires connected to a detector post assembly and securely anchored at each end. Mechanical action, including climbing, cutting, and spreading, against one or several of the wires generates an alarm. Taut-wire systems can be used as an overlay on an existing fence, an outrigger at the top of a fence or wall, or as a “stand alone” system which provides both a physical barrier and detection.

Taut-wire systems maintain low false alarm and nuisance rates, can be use in all terrains and harsh environmental conditions, and provide a high probability of detection. However, high cost and high maintenance requirements are to be considered before installation. Maintenance requirements include maintaining appropriate individual wire tension and separation between wires.

The type of taut-wire sensor system used will vary based on the manufacturer; however, before designing taut-wire sensed fences, the NAVFAC Antiterrorism and Force Protection Ashore Program should be contacted for the latest installation requirements.

### **2-15 SPECIAL SECURITY FEATURES.**

#### **2-15.1 Double Fence Lines.**

A double row of fencing can be used around the perimeter or internal restricted areas to increase the level of security. If double rows of fencing are used, sensors and detectors, or a perimeter patrol road between the fences should be considered. The first line of fencing provides the boundary for initial detection, so that either sensors on the first fence or sensors monitoring the area between the fences, performs the initial detection. The second fence then acts as a delay element giving the response forces a tactical advantage.

#### **2-15.2 Patrol Roads.**

Patrolled perimeter fencing enclosing an area generally greater than 1 square mile (2.6 sq Km) should provide an interior, all-weather perimeter road in all areas not affected by impassable terrain features for security-patrol vehicles. Drainage ditches parallel to patrol roads are designed to utilize shallow or low angle side slopes to prevent obscuring the observation from a 4-foot (1.2 m) high line of sight above the road surface. Where patrol roads pass through clear zones, precautions should be taken in roadway design to preclude concealment for intruders.

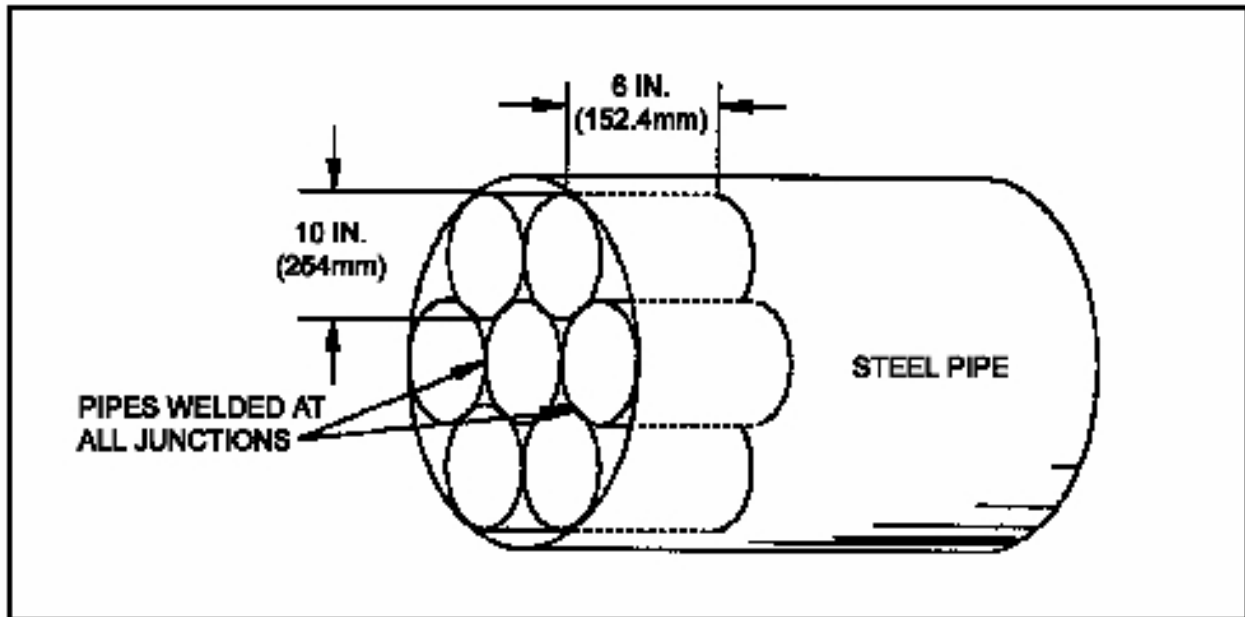
**Army** Corrections Systems Facilities should provide patrol roads around the perimeter of the facility to accommodate vehicular and foot patrols.

#### **2-15.3 Drainage Culverts and Utility Openings.**

Secure drainage openings (drainage ditches, culverts, vents, ducts, and other openings) having a cross-sectional area greater than 96 square inches (620sq cm) that pass through any security fence with welded bar grill or locked manhole covers.

If drainage conditions require large diameter pipes, or if it is a more economical approach to provide security protection, drainage openings may be constructed of multiple pipes having individual diameters of 10 inches (250 mm) or less. Welded bar grills should still be used for individual pipe diameters greater than 6 inches (152 mm). Extend multiple pipes through the entire conduit, secured to each other and to the large opening. As an economical alternative, reduce the pipe lengths to short segments approximately 6-inches (152 mm) long. Place the short segments at the attack side of the opening and secure them to the welded bar grill. See Figure 2-4.

**Figure 0-4: Large Culvert with Short Pipes**



Drainage structures and water passages passing under fences should be barred to provide penetration resistance equivalent to the fence above.

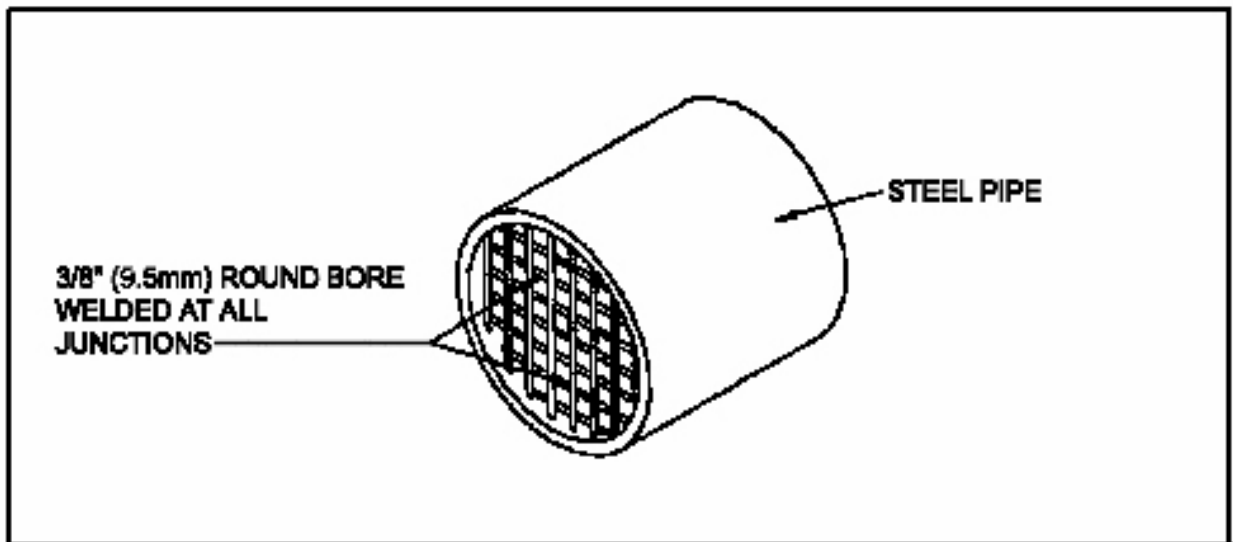
Grills should be placed on the attack side in all cases. Care should be taken during design to assure that bars and grills across culverts are not susceptible to clogging. All utility openings are intended to be designed with a debris catcher to permit either rapid clearing or removal of grating for cleaning when required.

Steel pipes that pass under fences should have grills welded to the pipe as shown in Figure 2-5. For concrete pipes that pass under fences, the grill ends should be welded to a steel rim that fits snugly over the concrete pipe. The rim and grillwork may be fastened over the concrete pipe and bolted or pinned to the rim of the concrete pipe as shown in Figure 2-6. Grill ends may be embedded in a concrete headwall that encapsulates the concrete pipe.

Culverts that are located under security fences should have a concrete headwall at the upstream end with cross-hatched  $\frac{3}{8}$  inch (9.5 mm) diameter steel bars embedded 6 inch (152 mm) deep in concrete. Bars should be spaced 9 inches (228.6 mm) on center and welded at their intersections.

Inlets for utility openings that are outside of the fence line should have a debris catcher with grating. As shown in Figure 2-7, outlets for utility openings that are outside of fence line should have a debris catcher on the inlet side, inside the fence line, with the grating on the outlet side. Caution should be taken when using debris catchers to ensure that plugging and flooding of the area surrounding the headwall do not occur.

**Figure 0-5: Steel Culvert Grill**



**Figure 0-6: Concrete Culvert Grill**

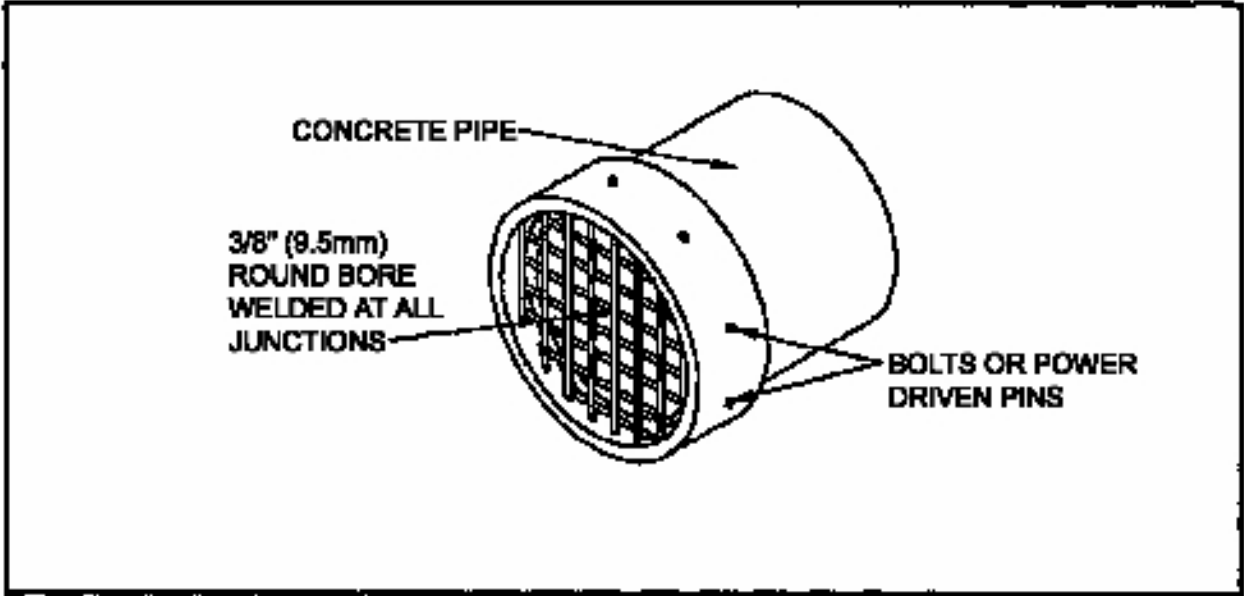
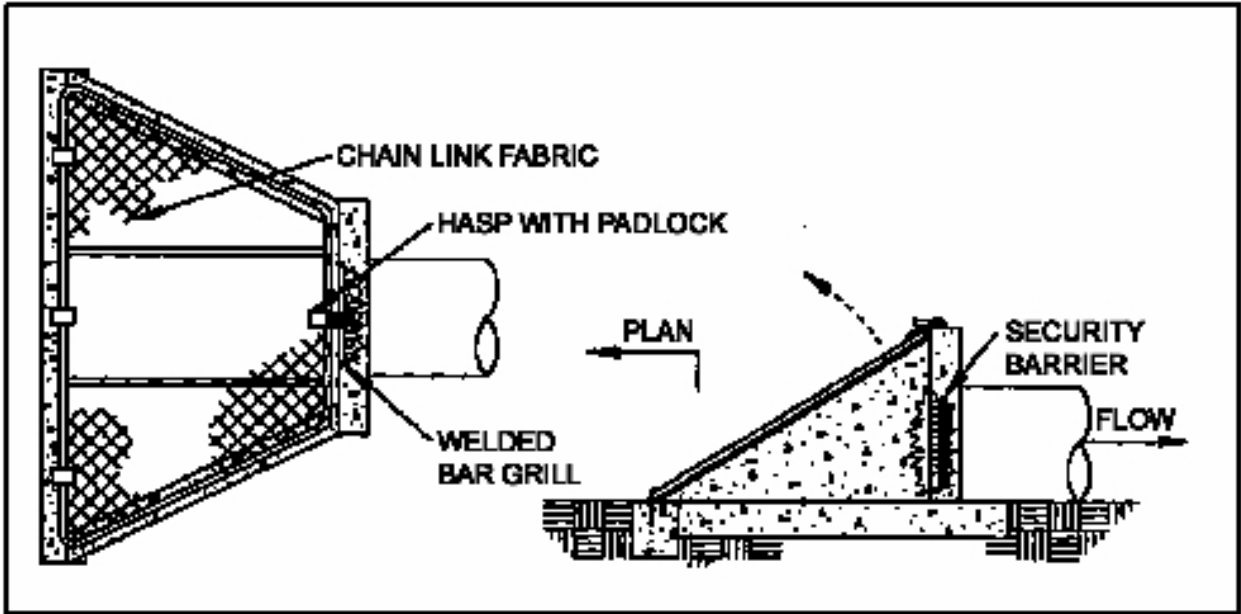


Figure 0-7: Debris Catcher Details



In lieu of installing grid in utility pipe itself provide manhole covers, 10 inches (254 mm) or more in diameter, covering a utility which passes through security perimeter fencing of a restricted access area should be secured with locks and hasps by welding them

shut, by bolting them to their frame, or by using keyed bolts. Hasps, locks, and bolts should all be made of materials that resist corrosion.

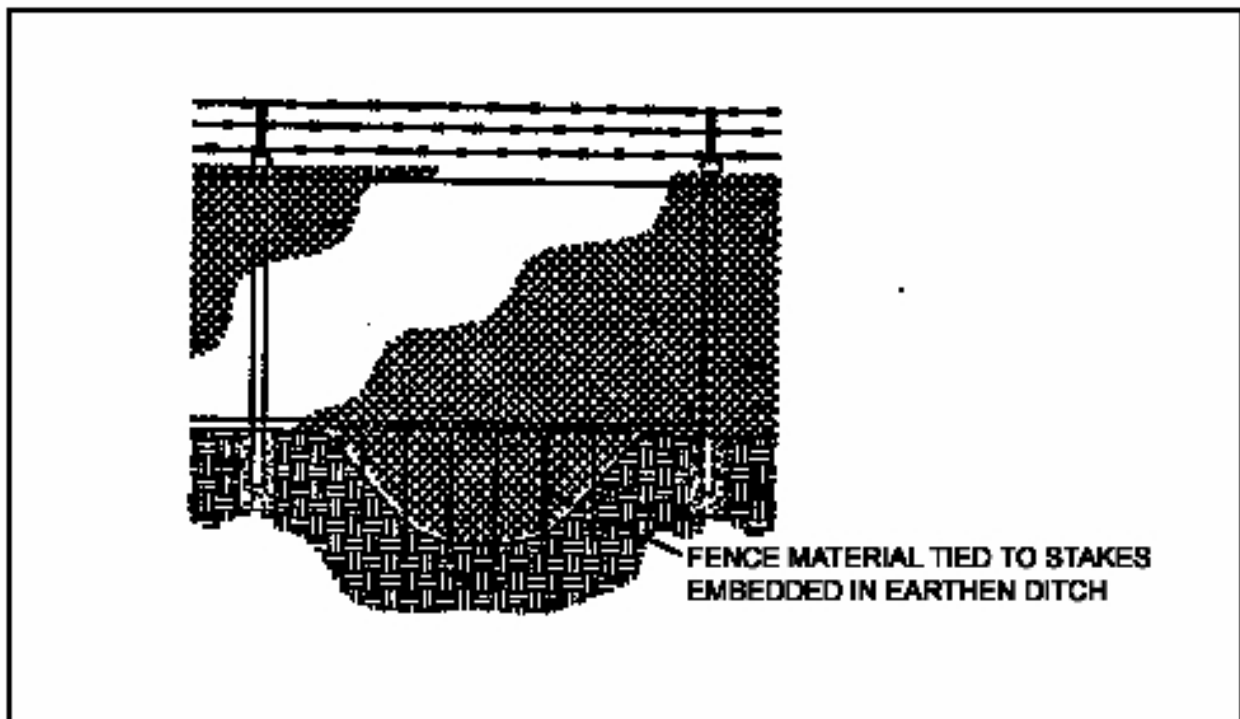
See Appendix B for notional design details of drainage culverts with utility openings.

#### 2-15.4 **Drainage Crossings.**

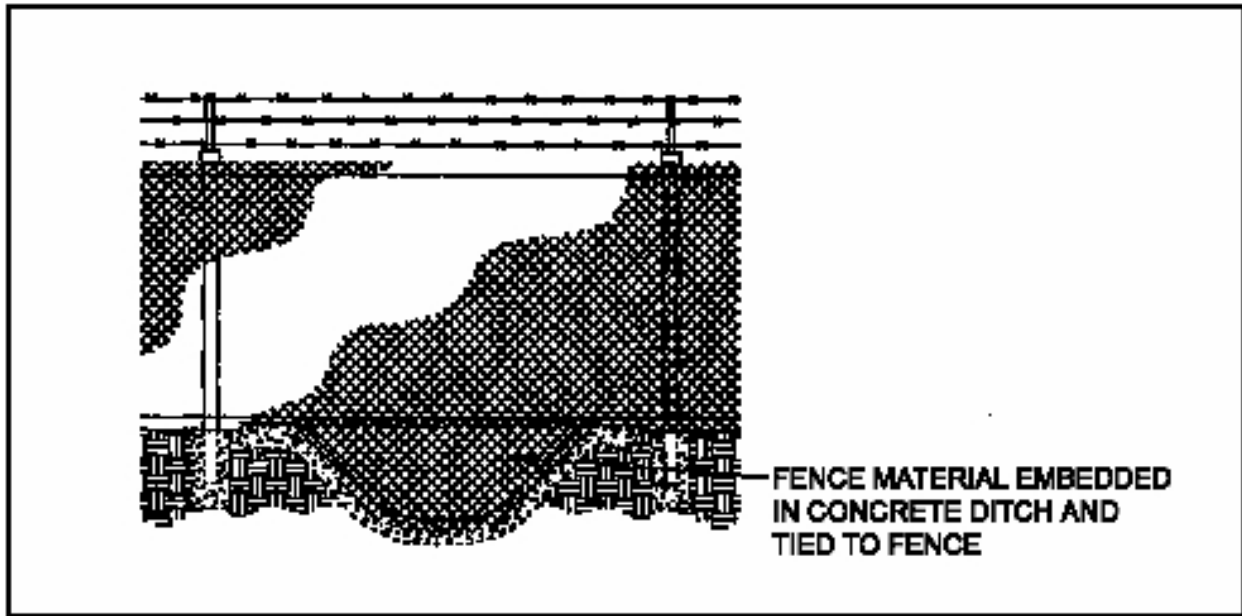
Security fencing passing over ditches or swales is intended to provide protection to prevent unauthorized entry. Ditches and swales that do not receive frequent water flow should provide additional fencing below, suspending from the lower rail of the main fence to the auxiliary frame and around the sides of the ditch. The added fence should be attached every 2 inches (51 mm) along the intersection of the two fence sections and either attached to a series of ground stakes secured to the sides and bottom of the ditch, or embedded in a concrete sill in the ditch or swale as shown in Figure 2-8 and Figure 2-9. Concrete curbing may be used to fill areas between fencing and ground surface.

Provide a screen arrangement below fencing using vertical and/or horizontal steel bars or pipes for ditches and swales receiving frequent water flow. Provide a maximum spacing of 9 inches (229 mm) between either vertical or horizontal bars. Possible debris should be considered when designing the spacing between bars. Crossing bars should be welded at each intersection, with bars embedded 6 inches (152 mm) into concrete and fastened to the bottom rail of the crossing fence. See Figure 2-10.

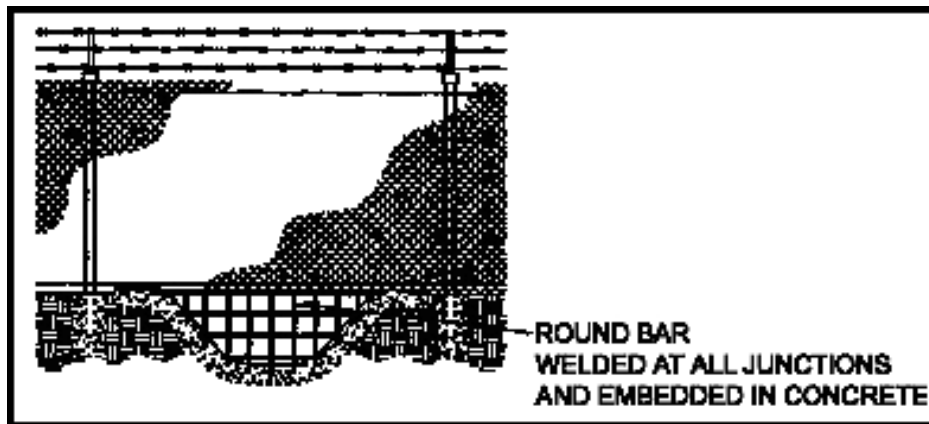
**Figure 0-8: Swale Crossing with Ground Stakes**



**Figure 0-9: Swale Crossing Embedded in Concrete**



**Figure 0-10: Bar Grill Embedded in Concrete**



Analyze the hydraulic capacity of ditches, swales, and culverts to verify the bar grill will not decrease the channel flow capacity below the maximum expected design flow.

See Appendix B for notional design details of a swale crossing.

2-15.5 **Tunneling Prevention.**

Tunneling prevention should be used in areas containing “soft” soils. UFC 3-220-10N describes “very soft” and “soft” soils as those that can be extruded between fingers when squeezed and/or molded by light finger pressure. Classification of soils shall be in accordance with ASTM D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), and ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Areas with a soil analysis indicating that “soft” soils are present should embed fencing in a continuous concrete curb. The recommended depth of the curb will be determined from the soil analysis and the frost depth at the facility. The frost depth for the subject areas should be considered to assure that heaving of posts and curb cannot occur during the winter. If the soil analysis does not indicate tunneling may occur quickly, continuous concrete curbing may still be considered as an added protective measure. Nuclear sites with very sandy terrain are directed to have a soils engineering analysis to determine the recommended depth of the concrete curb. Restricted access facilities with a risk of tunneling may provide infrared IDS for tunneling protection. These systems may be passive or active sensors and may be used in conjunction with seismic sensors. Welded wire mesh fence systems may incorporate additional fence panels for burial on the secure-side of the perimeter and tie-wired to the vertical panels to deter tunneling.

#### **2-16            FORCE PROTECTION.**

Security measures to deter vehicular aided intruders include installing passive barriers such as berms, ditches, bollards, reinforced fences or concrete planters to strengthen perimeter boundaries. Active vehicle barriers such as cable beam barriers, retractable bollards, steel wedges or plates, or crash gates, may be used against the moving vehicle tactic. Refer to UFC 4-022-02, Selection and Application of Vehicle Barriers for information and guidance on the selection and application of vehicle barriers.

#### **2-17            SIGNAGE.**

Signs should be posted at intervals no greater than 200 feet (61m) along the entire perimeter of the installation. Signs may also be placed where boundaries make abrupt changes in direction. Perimeter signs are directed to read “U.S. GOVERNMENT PROPERTY – NO TRESPASSING.” If the perimeter barrier is the exterior wall of a building or structure, signs should be posted at all points of ingress. Posting of signs is not required in camouflaged tactical areas. Restricted area warning signs are requested to be placed at intervals of no more than 100 feet (30.5 m) and where boundaries make abrupt changes in direction. Reflective surfaces for signs may be considered.

Warning signs located in areas with widespread illiteracy may use accepted danger or warning symbols. Signs should use white for the sign’s background color and words “WARNING” and “USE OF DEADLY FORCE AUTHORIZED” in red with the remaining words in blue or black. Signs should be placed so as not to aid intruders in climbing fences and breaching boundaries. In foreign countries, or in areas where languages other than English are predominate, each sign should show messages in English and the host-nation language.

All restricted area fencing containing IDS should mount warning signs on posts, in the ground, outside the fence so they do not interfere with the IDS.

**Air Force** Restricted areas containing Protection Level 1 resources should construct signs directing the removal of ignition keys from parked vehicles and place these signs next to and inside restricted areas. Areas with security systems that are supported by military work dogs may post Air Force Visual Aid (AFVA) 31-206, Military Working Dog Notice, directly below AFVA 31-211 and AFVA 31-230 or AFVA 31-101 signs. These signs should use a white background and blue or black for the lettering. Restricted warning signs may use the AFVAs 31-101 Restricted Area Sign, 15 X 18 and 31-102 Restricted Area Sign-National Defense, 8 X 17 designs. Warning signs installed at vehicle entry points are intended to follow the Air Force Visual Aid (AFVA) 31-230 Installation Warning Sign 36X30 design. Warning signs installed at each pedestrian entry point and strategic locations such as runway approaches, closed gates, fence corners, and roads that dead-end on a perimeter fence, etc. should follow the AFVA 31-211 Installation Warning Sign 18X15 design.

**Navy** Consult OPNAVINST 5530.14D for guidance on how signs for restricted and perimeter areas and Navy installations should read.

#### 2-18           **EXTERIOR SECURITY LIGHTING.**

Refer to UFC 03-530-01, *Interior and Exterior Lighting and Controls* for appropriate security lighting criteria.

#### 2-19           **FLIGHT LINE REQUIREMENT.**

Refer to UFC 03-260-01, *Airfield and Heliport Planning and Design* for flight line requirements and Air Force Engineering Technical Letter (ETL) 01-20 for airfield frangibility requirements.

## **CHAPTER 3 GATES**

### **3-1 GATES OVERVIEW.**

Gates, as part of perimeter fences, must be as effective as their associated fence to provide an equivalent deterrent. Gates will normally require additional hardening features due to their location across entrance roads and the inherent vulnerability of their hinges and latches. Gates are known to be the weakest point in the perimeter security fence and as such, attention must be paid to their requirements when designing security fencing. Materials used in fabricating and erecting chain-link gates must be the same as the materials used for the associated chain-link fence. As for security fences, aluminum pipe, poles, fabric, or accessories will not be used or specified for security gate components. A primary concern for gate design associated with security fences is to assure that the bottom of the gate fabric extends within 2 inches (51mm) of the roadbed or firm soil when closed. Where possible, pedestrian and vehicular gates should be clearly separated and defined.

See Appendix B for notional design details of standard gates.

### **3-2 PERSONNEL GATES.**

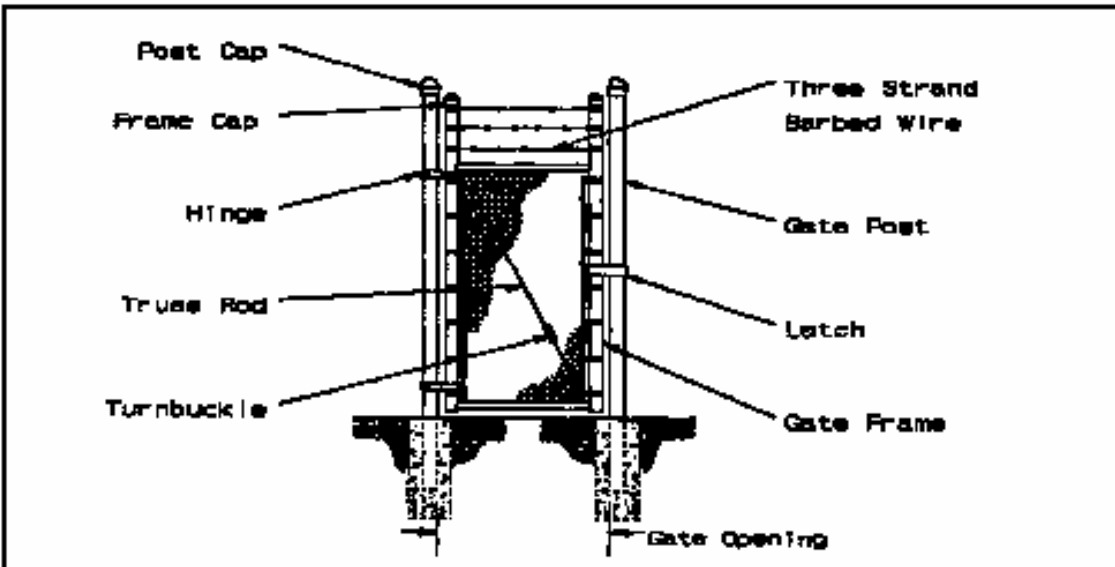
Personnel gates are intended to be designed to permit only one person to approach the guard at any time. Turnstile gates may be considered to control personnel entry. Personnel entry gates at nuclear storage areas should include access and exit routes in accordance with DoD 5210.41.

#### **3-2.1 Single Swing Gates.**

Single swing gates should be designed with a minimum 4 ft (1.2m) wide opening, by a minimum of 6 ft (1.9 m) high, with an additional 1 ft (305 mm) of three strand barbed wire added to the height if barb wire is part of the fence structure. The gate opening should not exceed a width of 14 ft (4.3 m). Gate frames should be constructed from 2 in (51 mm) (outer diameter) rails or 2 in (51 mm) square members welded in all corners. Gate posts are intended to meet the requirements of ASTM F 900.

For pedestrian use, single swing gates may be considered as the second alternative to turnstile gates. Operational and guard personnel requirements may be considered to determine the most economical long-term cost for the facility. See Figure 3-1 for a fixed and welded single swing gate example.

Figure 0-1: Single Swing Gate



### 3-2.2 Turnstile (Rotational) Gates.

Turnstile gates are manufactured as single or tandem and are available for ADA access. Tandem turnstile gates should be considered where high volumes of pedestrian traffic are exchanged from both sides of the perimeter such as shift work. Only full height turnstile gates are permitted for access through security fencing. Automated access control systems such as card readers, push button, and wireless remote can be incorporated to access turnstile gates. Metal detectors and counters are also available as accessories. Movement of travel can be set for clockwise, counterclockwise, or bi-directional. Arms and barrier tubing are 1-3/4 in (44.5) diameter, 14 gage. Overall exterior height is 91 in (2.31 m) with a pedestrian walk through height of 84 in (2.13 m). See Figure 3-2 for a turnstile gate example.

**Navy** NAVFAC DM-13.02 should be reviewed for specific information concerning these access control systems. Setting gates to revolve in only a specific direction (exiting) may be considered to reduce the need for an exit guard.

See Appendix B for notional design details of turnstile (rotational) gates.

**Figure 0-2: Turnstile Gate**



### **3-3 VEHICULAR GATES.**

Vehicular gates should limit opening sizes when possible to decrease open/close cycle time. There is no maximum height for vehicular gates. Coordinate gate height with surrounding/adjacent security fencing, and the width will be at least as wide as the road entering the gate. The operational requirements for the gate should be evaluated to determine which gate type is most suitable. Analysis for all vehicular gates should consider daily peak of vehicular traffic and the operational access control requirements for the secured area to determine opening size, gate type, and whether an automatic operator is needed. Gates used for vehicular traffic that are to be automated shall conform to ASTM F 2200. Cantilevered, sliding or wheel supported gates are considered the best selection for vehicle security gates followed by overhead sliding gates, swing gates, and overhead “guillotine” gates. Areas where snow and ice are prevalent may consider using cantilever or swing gates instead of tracked sliding gates. However, if sliding gates are used, consideration should be given to adding internal heating for gate mechanisms.

#### **3-3.1 Sliding Gates.**

Sliding gates should have all entry-exit points secured with a heavy duty sliding steel, iron, or heavily braced chain link gate equipped with a heavy locking device. The cross-slope of the road surface should be sloped at a constant grade for the full length of the gate path to permit proper drainage while maintaining smooth operation of the gate opening and closing. Where a sliding gate is installed at an existing paved entrance, the pavement may be filled or leveled where the gate will be installed. Sliding gates shall conform to ASTM F 1184.

##### **3-3.1.1 Single Wheel-Supported (V-groove) Sliding Gate.**

A guide rail or trough across the roadbed is utilized by this type of gate. The trough provides a smoother surface for vehicular traffic, but is not recommended due to debris buildup. Single wheel supported sliding gates do not have an opening distance

restriction, but are limited by the power requirements of the gate operator. Wheel supported gates require 1/3 less straight level storage space along adjacent fence than cantilevered.

### **3-3.2 Cantilevered Gates.**

#### **3-3.2.1 Single Cantilevered Gate.**

All single cantilevered gates should use full support and suspension of gate frame by four rollers secured to two posts inside the restricted area. Single cantilevered gates are not recommended for openings exceeding 24 ft (7.3 m). When an opened gate rests parallel to existing fence, a straight and level fence line 1.5 times the size of the opening should be made to accommodate when the gate is fully open. See Figure 3-3 for examples of single cantilevered gates.

#### **3-3.2.2 Double Cantilevered Gate.**

Double cantilevered gates are not recommended for openings greater than 48 feet (14.6 m) and should be constructed in a similar manner as described for single cantilevered gates as shown in Figure 3-4.

### **3-3.3 Double Swing Gates.**

All double swing vehicular gates should be designed to swing inward, toward secured area. A 2 inch (51 mm) maximum clearance should be maintained between the bottom of fence and the road surface when gate is in closed position. The road surface may be leveled or sloped downward in the direction the gate opens. Recommend gate openings for double swing gates are not greater than 28 feet (8.5 m). Table 5 provides recommended concrete foundation diameters for swing gate posts. A minimum of 3 feet (915 mm) deep concrete foundation should be used for swing gate posts. Foundations for general fencing shall be in accordance with ASTM F 567. Gate swings greater than 90 degrees should be designed with a large arc space for proper operation. See Figure 3-5 for double swing gates.

**Table 3-1: Gate Post Foundations**

Steel Post Diameter	Foundation Hole Diameter	Gate Leaf Length
2.875 in (73 mm)	18 in (450 mm)	0 - 6 ft (0 - 1.8 m)
4.000 in (101.6 mm)	24 in (609.6 mm)	6 - 12 ft (1.8 - 3.7 m)
6.625 in (168.3 mm)	36 in (914.4 mm)	12 - 18 ft (3.7 - 5.5 m)
8.625 in (219 mm)	40 in (1016 mm)	18 - 24 ft (5.5 - 7.3 m)

Figure 0-3: Single Cantilevered Gate

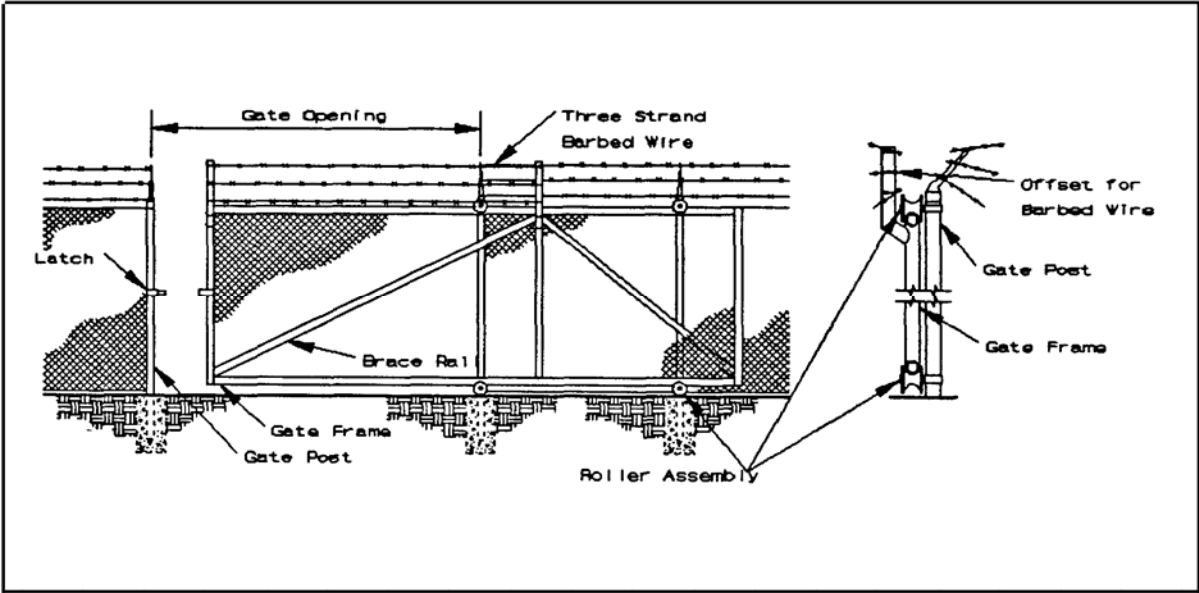


Figure 0-4: Double Cantilevered Gate

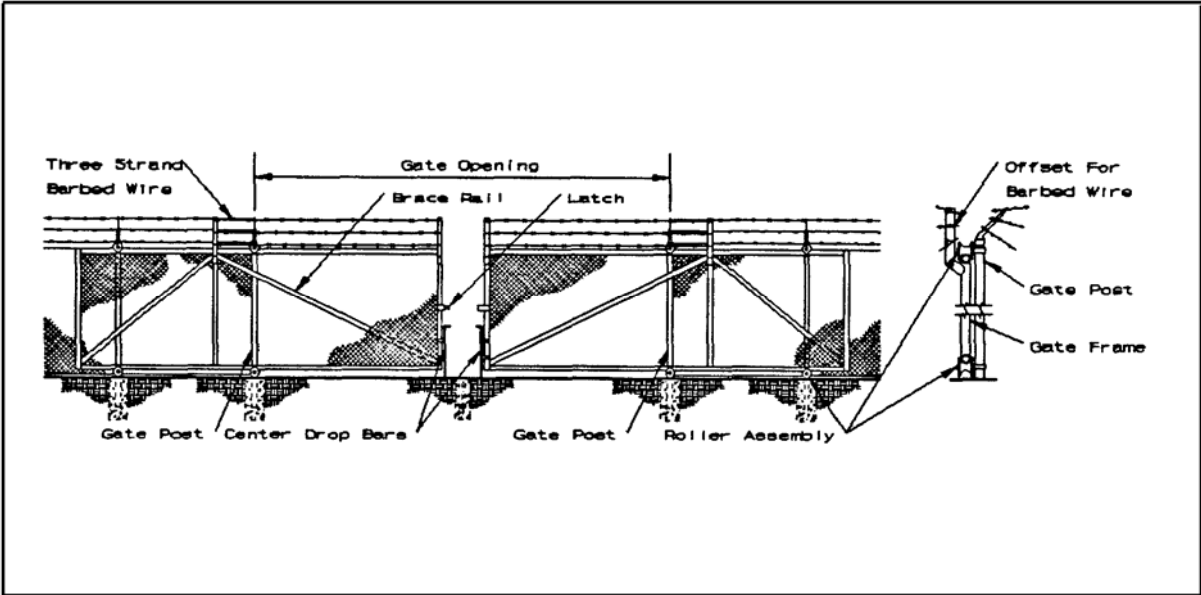
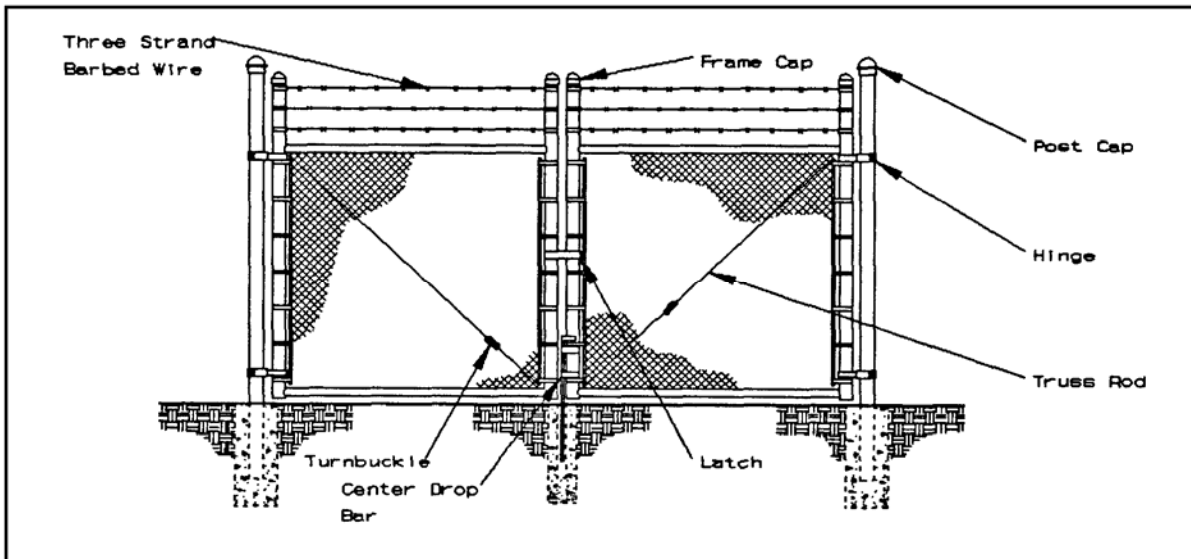


Figure 0-5: Double Swing Gate



### 3-3.4 Overhead Gates.

An overhead gate is supported by an I-beam or enclosed track that is suspended above the opening. The support must extend at least the full opening width on one side of the opening to support storing the gate parallel to the adjacent fence line when the gate is opened. The gate storage area should be in line with the gate opening and either be level or have a decreasing grade to accommodate the gate when it is fully opened. Gates may be suspended from the I-beam or enclosed track by rollers attached to posts extending upward from the leading and trailing edge of the gate. The overhead beam or track height is intended to allow room for the largest possible vehicle going through the gate. Gates should be suspended above ground from the overhead beam or track and supported laterally near the ground by vertical rollers. The I-beam may be applied to strengthen the gate for peak hour traffic, large opening sizes, and heavy gate construction. More posts extending upward from the center of the gate to the tracks may be added to carry heavier loads. Overhead gates shall conform to ASTM F 1184.

#### 3-3.4.1 Single Overhead Supported Gate.

See Appendix B for notional design details of single overhead supported gates.

#### 3-3.4.2 Double Overhead Supported Gate (Biparting) Gate.

See Appendix B for notional design details of double overhead supported gates.

### 3-3.5 Vertical Lift Gate.

Vertical lift gates should have a counterweight with a continuous drive chain on each side. The vertical lift gate, or “guillotine” gate, should be used where the topography does not provide enough room to store the gate adjacent to the fence line.

### 3-4 GATE REINFORCEMENT.

The gates discussed in Section 3.3 are non-reinforced gates and not considered to resist impact by vehicles. Standard non-reinforced gates can be retrofitted with cables, chains, and deadman anchors to increase their resistance to penetration by vehicles. In addition, there are proprietary, rated active vehicle barrier gate systems that are designed to resist penetration by vehicles. See UFC 4-022-02 for more information on active vehicle barriers. Cables used should be a minimum 3/4 inch (19 mm) wire rope and be in accordance with Federal Specification, FS FF-C-450. Welded alloy steel chains should be 1/2 inch (13 mm) diameter. Padlocks used with this system should be medium security padlocks. Application of deadman anchors should be in accordance with previous sections 2.12 and 2.12.1.

For swing gates, the cable should be looped around the gatepost, the gate frame upright, and through the fence cable loop. It should be strung across the inside of the gate leaf and fastened around the vertical gate frame upright and fabric tension bar midway above the road surface. The cable should be terminated with a swaged loop or wire rope clamp around the gatepost to interconnect with the gate cable barrier system. All cable ends may be looped and terminated with either four wire rope clamps or hydraulically swaged wire rope fittings. Remove sheathing on covered cables at connections so that the connections can be properly made and rated. These wire ropes should then be chained together and fastened with padlocks to create a continuous barrier. The wire ropes should be positioned as to not interfere with gate operations when the chain is removed. Figures 3-6 and 3-7 provide illustrations for reinforced gates.

**Figure 0-6: Cable Reinforcement for a Vertical Lift Gate**

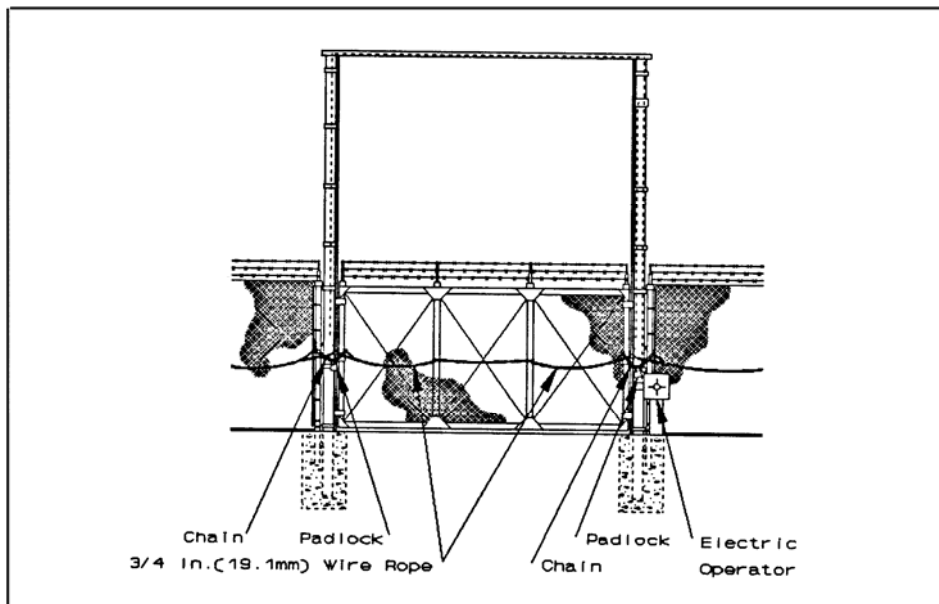
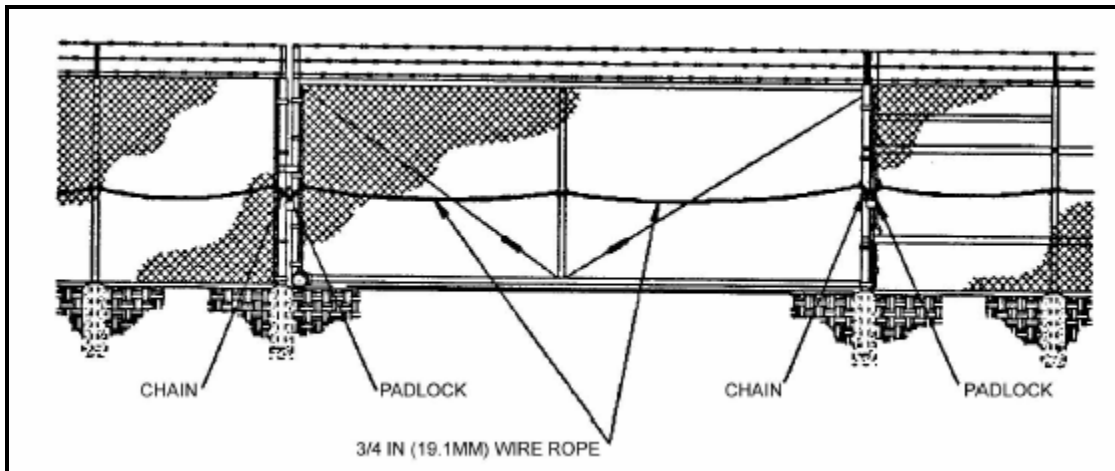


Figure 3-7: Cable Reinforcement for a Sliding Gate



For sliding and vertical lift gates, the same materials should be used for reinforcement; however, the cable placement may vary. These gates should have the cable running along the length of the gate in the inside and looped around the frame in an appropriate place. The cable should be terminated and fastened as described previously in this section.

There are times when a gate reinforcement cable barrier system is desired but a cable reinforcement system for the adjoining fence is not necessary since terrain, natural barriers, structures, or other passive barrier features provide vehicle crash protection adjacent to the gate. In such cases, the gate cable system can be terminated directly on each side of the gate with the deadman anchors.

### 3-5 LATCHES, HINGES, STOPS ETC.

Hinge selection should consider size of the gate and frequency of use. Weld hinges to the gate post and gate frame if increased resistance against tampering is desirable. In addition, hinges may incorporate welded security top plates, reverse the direction of hinge pins, or have the hinge pins spot welded to provide increased tamper resistance and displacement during an incident.

### 3-6 LOCKING SYSTEM.

As a minimum any locking system should provide penetration resistance equal to an approved general field service padlock. Where sally-port gates include automatic latches and the gate provides access for emergency vehicles or other special situations, the gatehouse should have an emergency override. The padlocked bolt or plunger arrangement must not be easily accessible from outside the barrier.

Gates at nuclear weapons storage sites should have sally-ports that consist of an enclosed area between two gates so when the inner gate is open the outer gate is closed and when outer gate opens inner gate closes. Nuclear facilities should also have automatic latching devices for vehicular and personnel gates. When locking hardware is not practicable, ½ inch (12.7 mm) chains, Type 1, Grade C, Class 1, in accordance with U.S. Federal Specification RR-C-271, will be used with an approved medium security padlock.

See Appendix B for a notional design detail of a chain and wire rope locking system.

### **3-7 GATE POWER-OPERATORS.**

Locate all gate operators to prevent tampering from outside the fence. Coordinate design of gate operating systems with the Command Safety Officer to ensure consideration of site particular operating accessories, warning devices, and safety systems. Provide powered gate operators for vertical lift gates unless use is infrequent and manual operation is reasonable. Powered gate operators with automatic latching systems should be provided at nuclear storage facilities.

#### **3-7.1 Sliding Gate Power-Operators.**

Automated sliding gates at restricted areas should use hydraulic compression rail gate power-operators.

#### **3-7.2 Swing Gate Power-Operators.**

Swing gate power operators may be either hydraulic piston or electromechanical swing. Areas with frequent snowfall should use hydraulic piston type operators for increased reliability.

#### **3-7.3 Gate Power-Operator Peripherals.**

Access Control is a primary design consideration for gate systems. The design of gates should consider and address the following items to ensure proper specification of power-operator accessories and controls.

- Pedestrian traffic
- Reversing devices to keep gates from closing on vehicles
- Traffic flow
- Number of open and close cycles
- Type of vehicles
- Operational site security plan

## **CHAPTER 4 GUARD FACILITIES**

### **4-1 SENTRY/GUARD BOOTHS AND GATEHOUSES.**

**Army** For standard drawings of guard booths and gatehouses see Army Access Control Points, Standards Definitive Design; December 2004, prepared by United States Army Corps of Engineers (USACE), Protective Design Center, Omaha District. (<https://pdc.usace.army.mil/library/drawings/acp>)

#### **4-1.1 General.**

When selecting an Entry Control Facility (ECF)/Access Control Point (ACP) site, consider the existing terrain. Flat land without thick vegetation and a gentle slope up to the gatehouse is advantageous for a clear view of the arriving vehicles. Where possible, it is encouraged to utilize natural barriers such as bodies of water and densely wooded areas to secure the perimeter. A traffic investigation should be completed to determine the anticipated demand for access to the facility, the traffic origin and destination, and the ability of the existing road network to incorporate the ECF and additional traffic. Coordinate with the local Department of Transportation during the planning and the design phases, as traffic changes at ECF/ACP typically impact civilian traffic patterns. Vehicle inspections or searches are intended to be possible without causing undue traffic backups.

The guard facilities at the ECF should provide a comfortable, safe working environment for security personnel. Generally, a single gatehouse centered in the entry control facility may be utilized, or alternatively the gatehouse or sentry booth may be located to the side of the roadway. The gatehouse could also be located after the last rejection point (turn-around) to give security personnel in the gatehouse an overall view of the Access Control Zone operations and vehicles directed to the rejection point or vehicle inspection area. If the gatehouse is located to the side of the roadway or after the last rejection point, consider providing a sentry booth in the central island of the access control zone or in between entry lanes to provide easily accessible shelter and protection for the guards operating the ECF.

**Army** The Army recommends the gatehouse be located after the ID check point between inbound/outbound lanes, or on the right shoulder, to observe all activities in and around the ID check point.

Since guard facilities are located in the immediate vicinity of the explosive threats they are trying to prevent from entering the installation, it is impractical and impossible to provide protection from the possible effects of an explosive device. In addition, the occupancy of the facilities is typically below the threshold for the requirements of UFC 4-010-01. Therefore, no protective design elements are required for guard facilities to mitigate the effects of an explosive device. Paragraph 4.1.5.3, discusses protection from other potential threats and tactics.

For areas with special weapons storage, arrange the entry gate to permit only one person to enter at a time to ensure they remain fully under the control of the security force. In order to facilitate the establishment of a cordon and evacuation procedure; if

practical, do not construct non-ECF/ACP related structures within a 2,500 feet (762 m) radius from any point within the containment area.

When properly documented in accordance with Service requirements that only able-bodied security personnel utilize guard facilities, the facilities are not required to meet *Americans with Disabilities Act Accessibility Guidelines (ADAAG)* requirements.

Where guard facilities are located near the roadway, provide a minimum platform width of 3 feet (914 mm) behind the curb. This width is the minimum necessary for security personnel to stand post adjacent to the facility, therefore additional platform width is recommended to provide additional safety through increased lateral clearance and space for security personnel carrying weapons or equipment.

In addition to the guard facilities, a shelter should be provided near any inspection lane for occupant of a vehicle that is to be searched. The shelter should be similar to a bus stop shelter, with see-thru walls to allow security personnel to observe the vehicle occupants at all times.

**Navy and USMC** Plan guard facilities in accordance with NAVFAC P-80.

#### 4-2.1 **Gatehouse.**

The gatehouse serves as the central control center for the ECF and provides shelter for security personnel. Every ECF should have a gatehouse, designed to support a minimum of three security personnel. As the control center, the gatehouse controls the vehicle barricades, traffic control devices, access controls, and lighting. Do not locate controls for other aspects of an installation security system in the gatehouse or other facilities associated with an ECF. Locate the installation security center or emergency control center within the controlled perimeter of the installation. The gatehouse should serve only as the control center for equipment associated with the ECF.

Base the design of the gatehouse on consideration of the following equipment and functions:

- Communications equipment;
- Electronic control panels for all current or anticipated future automated gates, barriers, or alarms;
- Monitor stations for closed circuit television or computer monitors associated with automation controls;
- An electrical room for the main electronic panelboards;
- Storage for traffic control devices, weapons, and personnel equipment including vehicle inspection kits and the storage of personal protective equipment for CBR exposure;
- Computer servers for future automated identification systems;

- Counter or work space; and
- A unisex restroom.

#### **4-1.3 Sentry/Guard Booth.**

The sentry/guard booth is located in a median strip or channelization island between traffic lanes. The booth provides one or two guards with protection against the weather and potential threats (*Securing U.S. Army Site Access Points*). It should have space allotted for electronic control panels for gate automation equipment, workspace incorporating space for computer monitors, and an electrical panelboard. It should be possible to enter or exit the booth from either side of the structure.

#### **4-1.4 Overwatch Position.**

Many installations desire additional position(s) for security personnel to facilitate a response to a threat. These positions are normally placed in the response zone to facilitate surveillance and armed response. This position may be fixed or temporary/portable. Manning of the overwatch position will be in accordance with the installation physical security plans. Design the facility to permit security personnel to respond to any attackers from a protected position (*Securing U.S. Army Site Access Points*). A permanent facility will normally be site-built. The position should be provided with emergency fast operation (EFO) controls to activate the active vehicle barrier system. Provide an enunciator in the overwatch position to alert security personnel of the duress alarm being triggered at the other guard facilities. Maximize visibility from the facility, with a minimum of 180-degree visibility. The overwatch position should have a direct line of sight to the access control zone of the ECF including identification and inspection areas.

The location of the overwatch position should also be designed to afford personnel the ability to assess the threat, initiate alarms, activate the barrier system (if other personnel are incapacitated), and respond to the attack with force if necessary and authorized. Therefore the overwatch position should be located to provide a minimum of four (4) seconds of reaction time from the time a threat is detected or alarm is initiated. The threat scenarios and guidelines for assessing the required response time and the distance required in order to provide sufficient response time are discussed in UFC 4-022-01.

In most cases the overwatch position will be located at or near the end of the response zone in order to provide sufficient distance for this response. Coordinate the facility location with security personnel to ensure proper line of fire and safety considerations. If required, elevate the facility to aid the observation of incoming traffic and reduce incidental/collateral damage by creating a plunging fire scenario.

If the overwatch position is established as a temporary facility; an asphalt or otherwise paved pad should be provided at the overwatch location, to accommodate a security forces vehicle or temporary facility during increased FPCONs. A utilities communications stub should be provided for this facility.

#### **4-1.5 Site-Built Structures.**

Ensure a thorough site analysis and review of the operational requirements is completed before beginning the design of the sentry/guard booth and gatehouse.

**4-1.5.1 Structure Size.**

The gatehouse should be designed to support a minimum of 3 security personnel, electronic and electrical equipment (e.g. communications equipment and gate controls), the mechanical support equipment (HVAC), storage space, and space provided for any required counter or work area.

**4-1.5.2 Construction.**

Design the facilities as required in UFC 1-200-01, *General Building Requirements*, and UFC 3-310-01, *Structural Loads*. Consideration of the corrosion resistance and maintenance requirements of the guard facilities, especially pre-manufactured facilities, is important due to varying geographic areas, such as shore side exposure, and the high visibility of these structures.

**4-1.5.3 Physical Security and Protective Design.**

Determine the required physical security design features in accordance with installation requirements and UFC 4-020-01. Threats that may commonly be considered include forced entry and ballistic attack. Provide ballistic protection equivalent to UL 752 Level III (formerly SPSA) for all guard facilities as a minimum. Provide this protection in the design and construction of the exterior envelope including windows, doors, walls and other equipment. It is not required for openings or penetrations for weapons in guard facilities, such as the overwatch position. Another consideration in establishing the minimum level of ballistic protection is ensuring protection from the weapons carried by security personnel at the ECF. Table 5 provides examples of the wall thickness required for commonly encountered materials to provide an adequate ballistic resistance against UL 752 Level III. Additional information and guidance can be found in UFC 4-023-07.

**Air Force** Construction of guard facilities should meet the minimum ballistic requirements of UL 752 Level V. See Table 4-2.

**Table 4-1: Thickness of Common Materials for Resistance Against UL 752 Level III**

Wall Material	Wall Thickness
Concrete Masonry (Grouted)	4 in (102 mm)*
Brick	4 in (102 mm)*
Reinforced Concrete (3000 psi)	2.5 in (63.5 mm)
Steel Plate (mild)	5/16 in (8 mm)
Steel Plate (armor)	1/4 in (6 mm)

**Air Force**

**Table 4-2: Thickness of Common Materials for Resistance Against UL 752 Level V**

Wall Material	Wall Thickness
Concrete Masonry (Grouted)	6 in (152 mm)*
Brick	6 in (152 mm)*
Reinforced Concrete (3000 psi)	4 in (102 mm)
Steel Plate (mild)	9/16 in (14.3 mm)
Steel Plate (armor)	7/16 in (11.1 mm)

Some mechanical equipment installed in the exterior envelope of a guard facility may not be capable of providing sufficient ballistic resistance. Therefore, locate the equipment to minimize potential exposure to projectile penetration or provide ballistic hardened equipment and/or louvers. As an example, it may be prudent to install the HVAC equipment on the roof of the gatehouse or sentry booth to reduce penetrations in the walls. Provide roof ballistic protection only where there are sightlines to the roof.

**4-1.5.4 Windows.**

Provide limited view window glazing. Glazing should limit viewing into the facility to the extent possible without restricting views out of the facility during day and night operations. The intent is to reduce the visible signature of security personnel, as seen from the outside of the gatehouse, without reducing the ability of security personnel to see out. The IESNA HB-9 suggests specular-reflecting, low transmission glazing at a tilted angle can be used in the windows to limit view into the guard facilities from the exterior.

See paragraph 4.1.5.3 for ballistic resistance requirements. Any windows provided in the overwatch positions should not interfere with the capability to respond to an attack. Therefore, any windows should be capable of being fully opened/removed quickly or have a substantial gun port to enable unobstructed line of fire from the position. Without these capabilities the overwatch positions should have no windows in the exterior wall openings. If ballistic resistant glazing is maintained for some portion or all of an opening, consider the visibility through the glazing after it has been impacted during an

attack. Some ballistic resistant glazing materials provide better visibility characteristics after impact than others.

#### **4-1.5.5 Floors.**

Construct floors with reinforced concrete with a finish floor elevation of six inches (152 mm) above grade or the adjacent walkways unless located on a raised island, in which case the elevation will be that of the raised island. Provide a 3 foot (915 mm) apron around the outside wall. Design floors and walkways to have an anti-skid surface. Also provide anti-fatigue mats to relieve fatigue and discomfort from standing for long periods.

#### **4-1.5.6 Environmental Control.**

Provide heating and cooling appropriate for personnel, the electronic and electrical systems or fixtures, and the security support equipment. The HVAC requirements should be based on existing service design guidance and installation requirements. Consider protection from chemical or biological agents used during an attack based on the anticipated threats. However, due to the small size of the facility, comprehensive protection is often not feasible. In order to limit airborne contamination and maximize the time for security personnel to shelter in place in order to initiate a response, utilize protective gear, and respond to an attack, the design of the HVAC system should include minimum measures such as those outlined in UFC 4-010-01. Design features include elevated air intakes, emergency air distribution shutoff switch (or easily accessible controls), and the use of gasketed doors and windows to minimize air leakage.

### **4-2 PREFABRICATED STRUCTURES.**

State-of-the-art prefabricated sentry/guard booths and gatehouses offer an alternative to site-built structures. Prefabricated structures range from simple weather protection to ballistics resistance. Prefabricated structures can be procured to meet electrical requirements desired and with standard HVAC features. Additional options include gun ports, card pass trays, intercoms, and toilet facilities. Each manufacturer offers a number of standard sizes or will custom build to specifications. It is recommended a cost analysis be performed to compare new construction of the same structure to determine which is the most cost-effective.

### **4-3 LIGHTING.**

The interior lighting should be diffused lighting and should be provided with dimmer controls to aid with night vision and reduce the ability of those outside the guard facility to see inside. The interior lighting should be connected to the backup power source. As discussed in the IESNA HB-9, the illuminance inside the guard facility should be limited to the minimum required for comfortable completion of the expected tasks and functions. As indicated in Figure 29-17 of the IESNA HB-9, the recommended average illuminance for the gatehouse is 30 footcandles (300 lx) on the work plane in the gatehouse. Additional recommendations from the HB-9, include providing well-shielded task luminaires to avoid reflections on monitors and windows. Also providing specular-

reflecting, low transmission glass at a tilted angle and painting the inside of the gatehouse dark colors limit the view into the guard facility. Consider providing magenta filters for interior lighting to lessen the impact of interior lighting on the night vision of security personnel. Exterior lighting for sentry/guard booths and gatehouses should be in accordance with UFC 4-022-01.

#### **4-4 GROUNDING.**

Provide grounding protection in accordance with UFC 3-520-01.

#### **4-5 UTILITIES.**

Provide water and waste system service for general use and for the unisex restroom in the gatehouse. If it is technically impossible or economically infeasible to provide these utilities to an ECF due to site constraints, the installation may waive the requirement to provide the water and waste utilities.

Additional utilities, including power, should be in accordance with UFC 4-022-01.

**Army** A standby generator and UPS are required.

**Air Force** Install a toilet, sink, and outside water faucet with a hose bib.

#### **4-6 COMMUNICATION REQUIREMENTS.**

Provide capability for communication equipment, including local area network (LAN), phone, and computer with Internet access. See UFC 4-022-01 for additional guidance.

#### **4-7 GUARD TOWERS.**

##### **4-7.1 Location and Height.**

Towers will be located inside the inner clear zone of the security fencing system. The height to the cabin floor should be between 25 and 50 feet (7.6 and 15.2 m); it varies based on visibility and land terrain. Towers located on the waterfront (shoreline or end of piers) should be elevated to have the line of sight above nearby ships. The door of the tower should face another tower to allow for visual monitoring. Towers should be spaced at a maximum of 300 feet (91.4 m) apart and have an uninterrupted view of a minimum of 240 feet (73.1 m) in any direction along the perimeter fence. Towers must be able to observe the entire inner and outer clear zones and fence line.

##### **4-7.2 Site Built Structures.**

Conduct a thorough site analysis and review of operational requirements for the restricted area involved prior to initiating design of guard towers. While there is no specific size or floor spacing criteria for tower cabins, the designer should use analogous criteria contained in NAVFAC P-80. See UFC 4-020-01 for determining a ballistic threat level and UFC 4-023-07 for the material requirements to mitigate the threat.

#### **4-7.2.1 Structure Size.**

The first consideration is the number of personnel that will be assigned during normal or alert operations. Make a careful review of electronic and electrical equipment (e.g., communications equipment and, plumbing and mechanical support equipment (HVAC), and storage space (e.g., AA&E storage). Provide adequate space for the equipment, in addition to security personnel space allocations. Ensure that the surface area of any required counter or work space is added to the overall floor space requirements for the tower cabin.

#### **4-7.2.2 Construction.**

Design the facilities as required in UFC 1-200-01 and UFC 3-310-01. Also, a new concept in guard tower design was developed by Sandia National Laboratories in Albuquerque, New Mexico. Their design consists of using pre-cast concrete double tee beams, with a 28-day compressive strength of 5,000 psi (34.5 MPa), placed vertically to form the walls, and a pre-cast concrete cap placed atop the structure to house guard quarters and surveillance equipment. The tower should be supported on a spread footing with a maximum allowable bearing of 2,300 psf (110 kPa); some areas may require special foundations, i.e. piles or caissons. All walls should be a minimum of 4 in (101 mm) thick.

#### **4-7.2.3 Windows.**

Windows must be no less than 3 feet (915 mm) high in size and placed a minimum of 3 feet above the floor surface. Having windows continuous around the cabin may be considered as it increases visibility. Windows must meet the same ballistic threat level as the cabin construction itself.

#### **4-7.2.4 Stairs and Ladders.**

The stairs up to the tower should have periodic landings for climbing ease and to facilitate maintenance of the inside of the tower. A rectangular configuration is recommended to a circular one. Provide ballistic-resistant enclosure for the stairwell if required based on the determined threat level and required level of protection. See UFC 4-023-07 for additional guidance on ballistic protection.

Stairs should be installed with a max angle to the horizontal of 50 degrees per 29 CFR part 1901.24 whenever possible.

Where conventional stairs cannot be installed, "ship stairs" shall be installed at a slope of between 50 and 70 degrees from the horizontal. (OSHA standard interpretation dtd 2/10/2006)

Consider installing equipment such as HVAC at lower level to provide safer access for maintenance personnel and their tools/equipment.

Rational: To ensure access meets OSHA standards and NFPA 101 code requirements and to highlight the need to consider providing easier access for maintenance personnel.

#### **4-8 ENVIRONMENTAL CONTROL.**

Conduct an analysis of the ambient temperatures to determine the HVAC requirements. Consider heating due to electronic and electrical systems or fixtures, and security support equipment inside the structure. Determine HVAC requirements based on criteria for the local area. Provide water and waste lines if toilet facilities are required.

#### **4-9 PREFABRICATED STRUCTURES.**

Ensure the system consists of a cabin with a roof, floor and sidewalls, access hatches, vision windows, and gun ports with an optimal hardened tower "tunnel." Optional hardened "tunnel" with circular or standard riser stairway, hardened personnel access door, shrouded HVAC ports, and a security lighting package may be ordered from manufacturers; all other parts are standard. Cover steel surfaces with rust inhibiting primer and finish paint.

#### **4-10 LIGHTING.**

The tower cabin should be equipped with dimmer controlled lights to aid with night vision and additional security to the occupants. Provide a night light with red lens and remote emergency lighting. The roof of the cabin should have a movable searchlight controllable from the interior of the cabin. All lighting should be connected to a standby power source for restricted areas.

**Air Force** Provide alternate power source and battery sustained emergency egress lighting. Install so it provides shadow free light and clearly illuminates physical appearance of individuals, hand carried objects, and clothing.

**Army** Provide adequate outside security lighting and have wire mesh or safety glass covering it for protection from breakage. Use perimeter and interior lighting to ensure observation of all possibilities for escape. The emergency generator will be adequately secured and controlled, inspected weekly, and tested monthly under load conditions.

#### **4-11 GROUNDING.**

Provide grounding protection in accordance with UFC 3-520-01.

#### **4-12 FORTIFICATION.**

Gun points located around the cabin should be designed to ensure that the security fence and entire clear zone can be brought under fire. Consideration should also be given to the compatibility of gun ports to the types of weapons and attachments to be used, such as night vision scopes.

#### **4-13 COMMUNICATION REQUIREMENTS.**

Provide intercommunication systems independent of any telephone system for communication between guard towers, gates, and a central communication station. For prison facilities, communication networks should also include prisoner living and segregation areas, prisoner processing areas, and dining facilities. Intercommunication

systems should include voice, data, and control. If possible, any unmanned towers should have the data and camera feeds monitored and controlled by a manned tower. Telecommunication systems should also be independent of the intercommunication systems. All guard facilities should be networked together through a system that is not completely dependent on any one tower. Ring, multiple ring, and mesh networks may be considered for this purpose as each creates redundancy in the event that any one system fails.

## **GLOSSARY**

<b>Term</b>	<b>Definition</b>
Active Sensors	A sensor that can receive signals from either itself or other devices.
Active Vehicles	Vehicles which may attack while moving.
Anchor Plates	A square metal plate created to be placed on top of a deadman. The plate has a hole through the center for the cables and turnbuckles to protrude.
Anti-ram Reinforcement	Cable reinforcement on the secure-side of gates or fences to protect area from active vehicles.
Attack Side	The outer side of the perimeter fence for a restricted area. The side from which to expect attacks or forced entry.
Auxiliary Power Supply	An alternate power supply to be used in the event that the primary source is unavailable.
Barbed Cluster	A collection of 4 barbs welded together.
Barbed Tape Concertina	A steel strip, reinforced or non-reinforced, fabricated in a single or double coil configuration. The fabricated tape has sharp barbs, or cluster of barbs, intended for use as an anti-personnel barrier.
Barbed Wire	Protective wire available with the 4-point barbs spaced either 3 inches or 5 inches (75 or 127 mm) apart.
Blast Wall	A wall built to withstand an explosion to protect the occupants both from the blast and the debris from the blast.
Bollards	Reinforced concrete shapes or sleeves, or steel pipe filled with concrete, used to slow down vehicles and/or deny vehicle access.
Brazed	To solder (two pieces of metal) together using a hard solder with a high melting point.
Clear Zone	Area free of obstacles, topographical features and vegetation which reduce the effectiveness of the physical barrier, impede observation or provide cover and concealment of an intruder.
Color Polymer Coating	A coating on chain link fences to further protect and add color.
Concrete Sill or Curb	A concrete section to create a non-passable connection between a fence and the existing ground.
Corrosive or Salt Laden Atmosphere	Atmosphere which contains enough salt or corrosive elements to corrode a fence enough to decrease the intended strength. These areas are typically bordering oceans or other water bodies.

<b>Term</b>	<b>Definition</b>
Deadman Anchor	An anchor for fence or gate reinforcement cables which transfer the force from the fencing or gate fabric/surface to the ground. Deadman anchors are typically concrete blocks buried in the ground.
Egress	An exit from the restricted area.
Electromechanical Chain Driven	An electric motor driving a series of reduction and worm gears, chains, and sprockets which in turn drive a chain to the gate for operation.
Electromechanical Rack and Pinion	An electric motor operating, through gear reduction, a rack and pinion gear arrangement attached to the gate for operation.
Electromechanical Swing	An electric motor, through gear reduction, operating a primary arm that travels in an arc parallel to the ground. A second arm is attached between the gate leaf and the primary arm for operation.
Electronic Security System (ESS)	The integrated electronic system that encompasses interior and exterior Intrusion Detection Systems (IDS), Closed Circuit Television (CCTV) systems for assessment of alarm conditions, Automated Access Control Systems (ACS), Data Transmission Media (DTM) and alarm reporting systems for monitoring, control and display.
Entry Control Facility/Access Control Point (ECF/ACP)	Entry control facilities/access control points ensure the proper level of access for all DOD personnel, visitors, and commercial traffic to an installation. ECF/ACP encompasses the overall layout, organization, infrastructure, and facilities to secure the installation from unauthorized access.
Eye Ends	Center space created when looping a wire for termination or reinforcement.
Fabric Diamonds	The opening formed by the woven wires in chain link fence fabric.
Fabric Fasteners	Small metal wires, clamps and bolts used to securely fasten the fencing fabric to the tension wires or posts.
Fabric Tension Bar	A bar that the fencing fabric is attached to and it serves to hold the fabric tight to decrease ability to deform.
Fencing Accessories	Any fasteners, ties, wires or other objects used to attaching the fencing fabric, posts or top guards.
Fire Break	A safety zone containing no flammable vegetation that surrounds an area or facility.
Gate House	A manned structure located at the entrance gate to control entrance.
Gate Leaf	A panel of a gate (There is one gate leaf for single fences and two for double fences).
Gates	Openings in the barrier system to allow authorized entry and exit.
Guard Tower	An elevated structure to oversee a restricted entrance or exit of an area.
Hasps	A metal fastener with a hinged slotted part that fits over a staple and is secured by a pin, bolt, or padlock.

<b>Term</b>	<b>Definition</b>
Ingress	An entrance to the restricted area.
Inner side/zone	The inside of the fence that is being protected through various security measures.
Intrusion Detection System (IDS)	A system consisting of interior and exterior sensors, surveillance devices, and associated communication subsystems that collectively detect an intrusion of a specified site, facility or perimeter and annunciate an alarm.
K-Clamps	A fastening clamp that holds the piece on both sides with plates that is bolted together.
Line Posts	Intermediate posts spaced a maximum of 10 feet (3 m) apart and considered the backbone of the fence line.
Mesh Openings	The opening formed by the woven wires.
Moving Vehicle Bomb Tactic	A forced entry tactic to place an explosive or other damaging terrorist device in a moving vehicle to create a mobile vehicular weapon.
Natural Boundaries	Natural formations such as bodies of water, rough terrain, or densely wooded areas that may act as a barrier to define and protect the restricted area's perimeter.
Outriggers	Metal top guards which are placed on the top of the barrier and may consist of at least one vertical arm, angled arm facing inside, angles arm facing outside or two angles arms facing both inside and outside. In addition, there may be more than one arm on each side if desired. The number and direction of arms depends on the nature of the barrier.
Passive Barriers	A passive barrier has no moving parts. Passive barrier effectiveness relies on its ability to absorb energy and transmit the energy to its foundation. Highway medians (Jersey), bollards or posts, tires, guardrails, ditches and reinforced fences are examples of passive barriers.
Passive Sensors	A sensor that receives signals through light or radio waves.
Patrol Craft	Water or aircraft that patrol to watch for possible intruders or intrusion attempts for which ground patrol is inaccessible or inappropriate.
Peak Hour Traffic	Peak times when the gate is being operated. This most often occurs during shift changes or times of generally high traffic.
Pipe Struts	Device used to attach fence posts to ground surface.
Protected Side	The inside of the fence that is being protected through various security measures.
Razor Ribbon	Same as concertina wire with a different shaped blade
Sally Ports	Heavy chain link gates that roll upward to open. Personnel sally ports are used to control entry into highly protected and restricted military areas, whereas, vehicular sally ports are similar but have a large middle space to control the incoming/outgoing vehicle and personnel within the vehicle.
Service	Branches of the Military under the Department of Defense. Services include The Army, Air Force, Navy and Marine Corps.

<b>Term</b>	<b>Definition</b>
Secure Side	The inside of the fence that is being protected through various security measures.
Special Nuclear Material (SNM)	Nuclear material that requires extensive protection.
Standoff Zone	A controlled area surrounding a facility into which only service and delivery vehicles, and vehicles operated by handicapped people, are allowed. The perimeter of this area is defined by perimeter barriers and is set at a distance sufficient to reduce the blast effects of a vehicle bomb detonation on the protected facility.
Swaged Loop	A loop created by looping a wire and fastening the loop with a swaged on clamp.
Swing Gates	Gates for entrance or exit that swing open either manually or automatically when controlled either electronically or manually.
Tamper-Indicating	Devices or accessories that indicated any unauthorized alteration or tampering.
Taut Wire	Wire that is continuously under tension through a series of spring connections.
Tension Bar	The bar that is threaded through the last vertical link of fabric. It attaches the fabric to the terminal post.
Top Guard	Additional protection of fences or other barriers that are placed on top of the barrier to prevent climbing or jumping. Possible top guards include, but are not limited to, outriggers with barbed wire, concertina wire, or barbed tape.
Truss Rods	A rod used in brace assemblies to draw and hold the line post firmly to the brace rail. The truss rod uses an adjustable turnbuckle to maintain proper tension. Truss rod details can be seen in the "Non Reinforced Chain-Link Fence" drawings in Appendix B.
Turnbuckles	A metal coupling device consisting of an oblong piece internally threaded at both ends into which the corresponding sections of two threaded rods are screwed in order to form a unit that can be adjusted for tension or length.
Turnstile Gates	Pedestrian gates which rotate around a central pole to allow only one entrance at a time.
U-Clamps	Clamps for fastening that are shaped as a "U".
Uninterruptible Power Supply (UPS)	A power supply that will not be affected or interrupted during generator starting and load transfers.
Welded Bar Grill	A series of vertical and horizontal bars that are placed over an opening and welded at all bar crossing points.

**APPENDIX A – REFERENCES**

<b>Short Title</b>	<b>Long Title</b>	<b>Publisher</b>
MCO P5530.14	Marine Corps Physical Security Program Manual	US Marine Corps
OPNAVINST 5530.13C	Physical Security Instruction for Conventional Arms, Ammunition, and Explosives (AA&E)	Navy
OPNAVINST 5530.14D	Navy Physical Security and Law Enforcement Manual	Navy
SECNAVINST 3300.3A	Perimeter Fencing Standardization	Navy
AFH 32-1084	Facility Requirements	Air Force
AFI 31-101	The Air Force Installation Security Program	Air Force
AFI 31-101 supplement	The Air Force Installation Security Program	Air Force
AFPAM 10-219 Vol 2	Pre-attack and Pre-disaster Preparations	Air Force
AR 190-11	Physical Security of Arms, Ammunition, and Explosives	Army
AR 190-16	Physical Security	Army
AR 190-47	The Army Corrections System	Army
AR 190-51	Security of Unclassified Army Property (Classified and Unclassified)	Army
AR190-54	Security of Nuclear Reactors and Special Nuclear Materials	Army
ASTM Standards	Fence Material Products	American Society for Testing Materials
DoD 5100.76-M	Physical Security of Sensitive Conventional Arms, Ammunition, and Explosives	Department of Defense
DoE AE Standards - Appendix P	Standard Security Design Elements	Department of Energy
DoJ	Correctional Technology - A User's Guide	American Correction Association
DoS P-10213	Security Guidelines for American Enterprises Abroad	Overseas Security Advising Council
FPB VBMG	Force Protection Battlelab Vehicle Bomb Mitigation Guide	Air Force
IESNA HB-9	Lighting Handbook 9 <sup>th</sup> Edition	Illuminating Engineering Society of North America

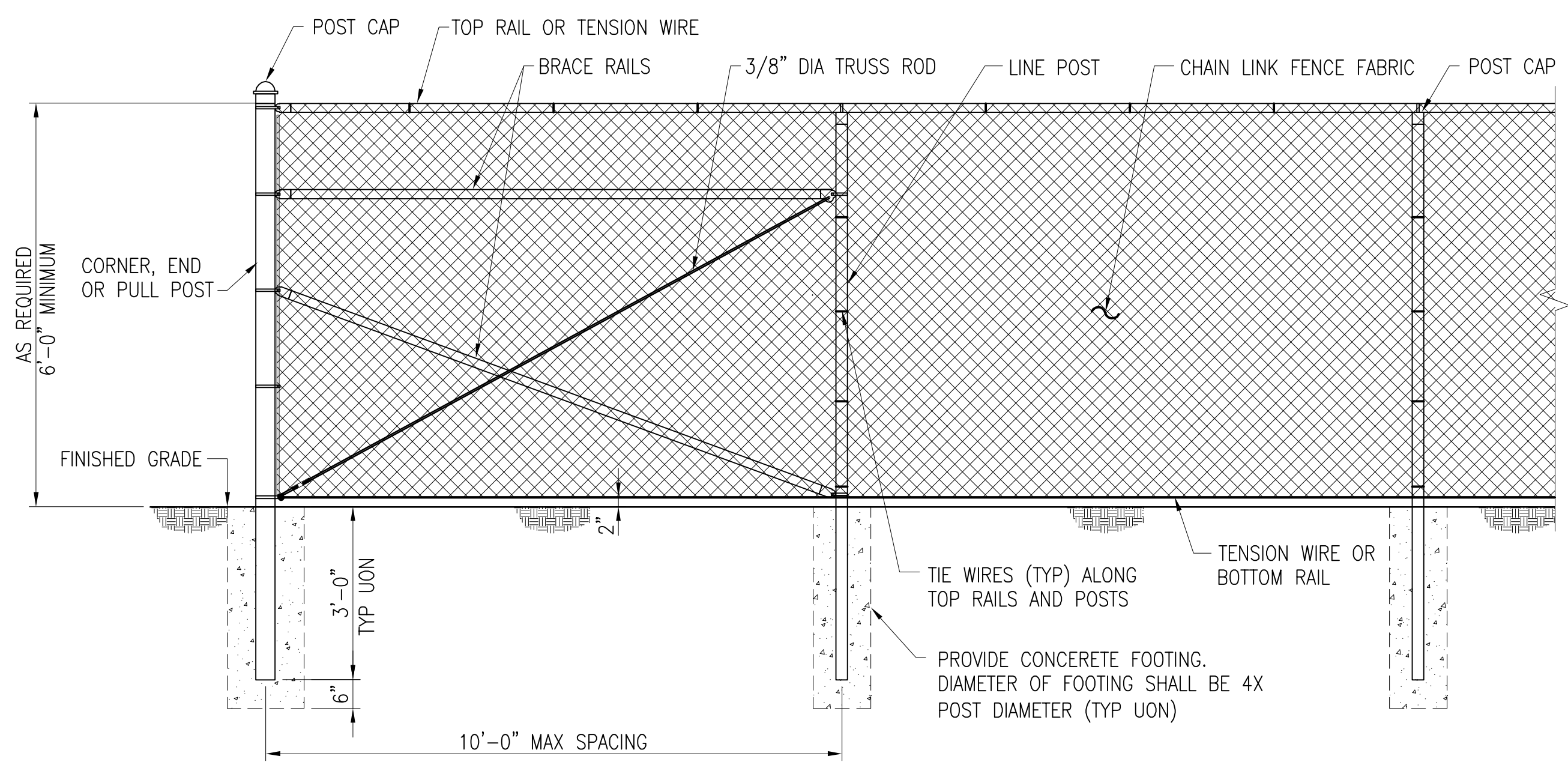
<b>Short Title</b>	<b>Long Title</b>	<b>Publisher</b>
MIL-STD-3007B	Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications	Department of Defense
NAVFAC P-80	Facility Planning Criteria for Navy and Marine Corps Shore Installations	Navy
UFC 1-200-01	General Building Requirements	Department of Defense
UFC 1-300-01	Criteria Format Standard	Department of Defense
UFC 1-300-02	Unified Facilities Guide Specifications (UFGS) Format Standard	Department of Defense

UFC 3-220-10N	Soil Mechanics	Department of Defense
UFC 3-260-01	Airfield and Heliport Planning and Design	Department of Defense
UFC 3-310-01	Structural Load Data	Department of Defense
UFC 3-520-01	Interior Electrical Systems	Department of Defense
UFC 3-530-01	Design: Interior and Exterior Lighting and Controls	Department of Defense
UFC 3-600-01	Fire Protection Engineering for Facilities	Department of Defense
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings	Department of Defense
UFC 4-020-01FA	Security Engineering: Project Development (FOUO)	Department of Defense
UFC 4-020-02FA	Security Engineering: Concept Design (FOUO)	Department of Defense
UFC 4-020-03FA	Security Engineering: Final Design (FOUO)	Department of Defense
UFC 4-020-04FA	Electronic Security Systems: Security Engineering	Department of Defense
UFC 4-021-02NF	Security Engineering: Electronic Security Systems with Change 1	Department of Defense
UFC 4-022-01	Security Engineering: Entry Control Facilities/Access Control Points	Department of Defense
UFC 4-022-02	Security Engineering: Design and Selection of Vehicle Barriers	Department of Defense
UFC 4-023-04	Security Engineering: Design of Windows to Resist Explosive Effects	Department of Defense
UFC 4-023-07	Security Engineering: Design to Resist Direct Fire Weapons	Department of Defense
UFC 4-141-10N	Design: Aviation Operation and Support Facilities	Department of Defense
UG-2031-SHR	Users Guide on Protection Against Terrorists Vehicle Bombs	Navy
USA FM 3 19-30	Physical Security	Army
USAF 'ECFDG'	Entry Control Facilities Design Guide	Air Force
COMDTINST M5530.1B	Physical Security Program	Coast Guard

## **APPENDIX B - FENCE AND GATE NOTIONAL DESIGN DETAILS**

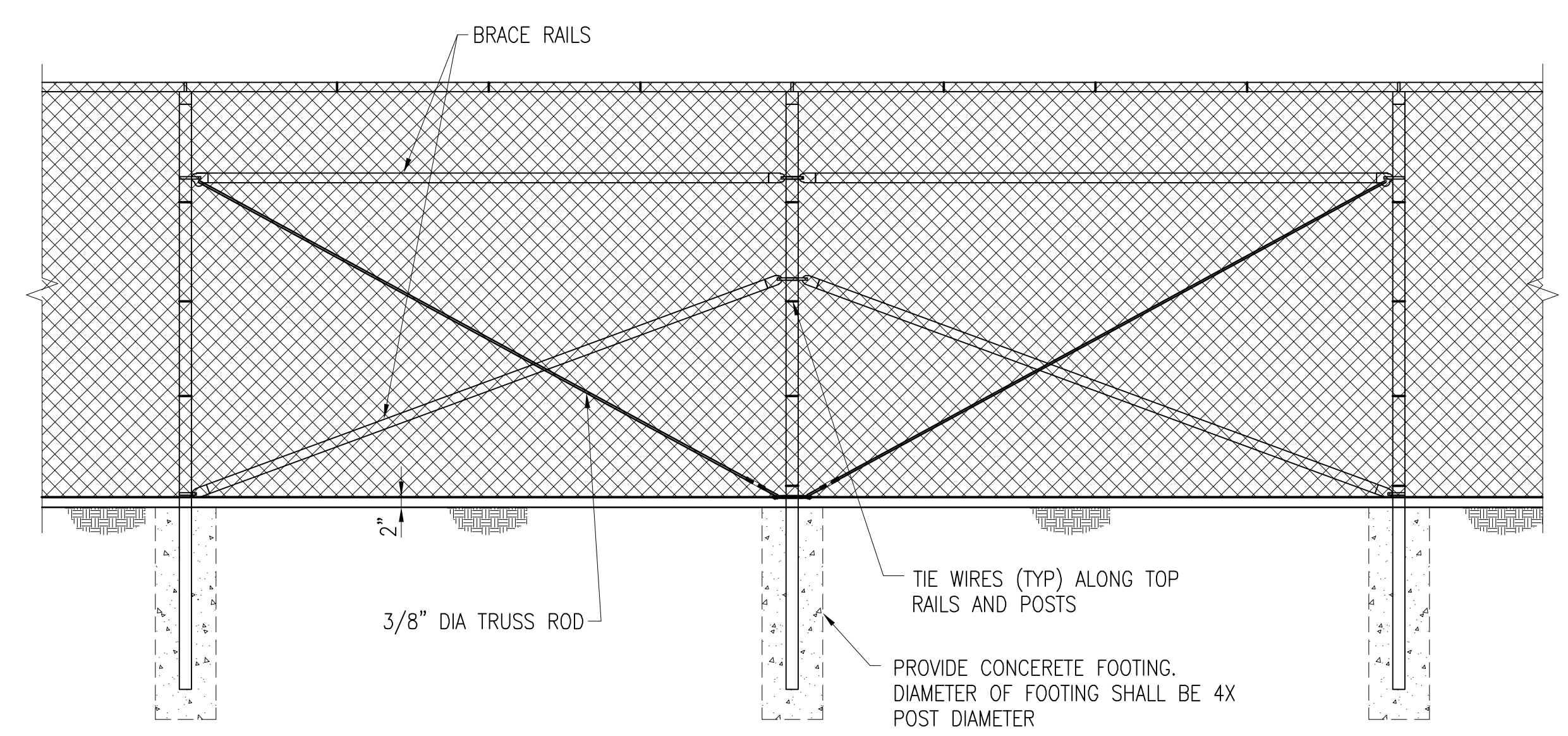
The notional design details in this appendix illustrate general layouts for each type of fence or gate. These illustrations are not intended to depict the importance or size of each element.

FILE NAME: P:\Core Projects\ATP-FSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\452005-UFC-700.dwg LAYOUT NAME: S-700 PLOTTED: Tuesday, August 28, 2007 - 3:22pm



**TYPICAL FENCE AND CORNER PANEL ELEVATION**

SCALE: 1" = 1'-0"

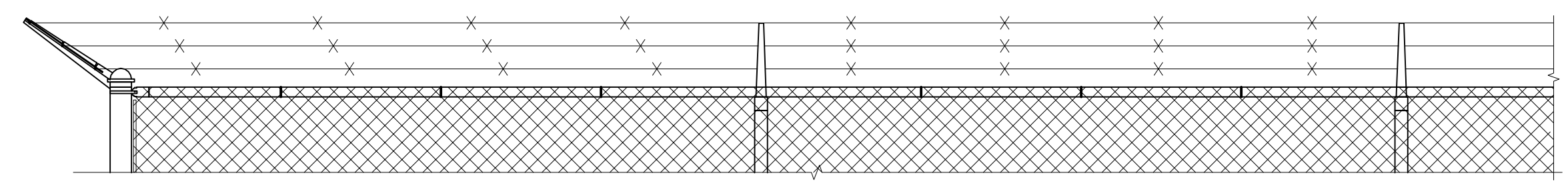


**TYPICAL FENCE AND BRACED PANEL ELEVATION**

SCALE: 1" = 1'-0"

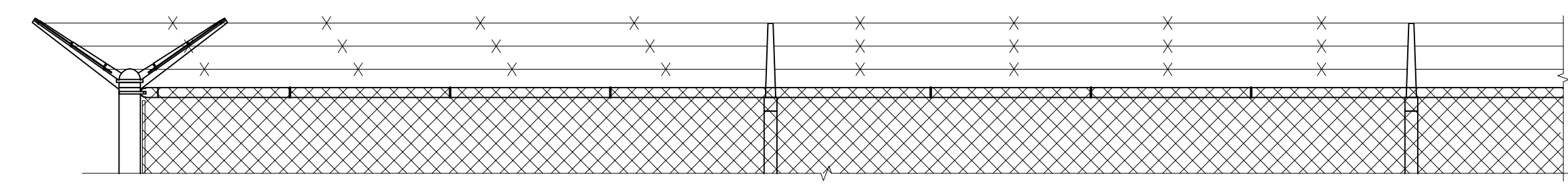
**NOTE (1):** A BOTTOM RAIL CAN BE ADDED FOR SECURITY, IT SHALL BE INSTALLED APPROX 3" ABOVE GRADE (A MINIMUM OF 2" AND A MAXIMUM OF 4"). HARDWARE SHALL BE WELDED OR SHOT NAILED TO POSTS AND RAILS IN ORDER TO SECURE IN PLACE. ATTACH FABRIC TO NEW BOTTOM RAIL TO ELIMINATE POSSIBILITY OF PEELING UP FABRIC.

**NOTE (2):** SOME LOCATIONS MAY REQUIRE 8' OF FABRIC.



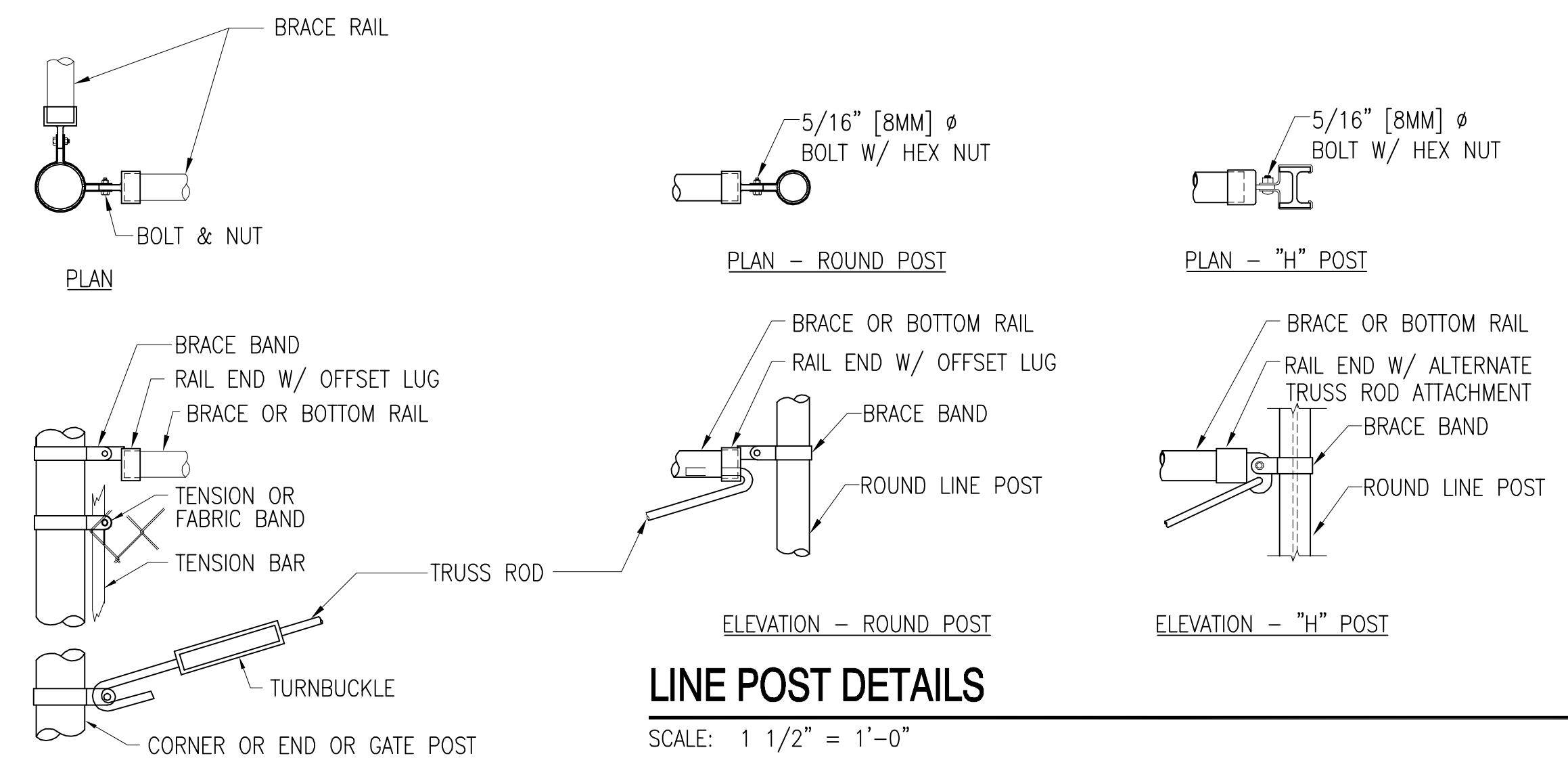
**TYPICAL 3 STRAND BARBED WIRE AND SINGLE EXTENSION ARM CONFIGURATION**

SCALE: 1" = 1'-0"



**TYPICAL 6 STRAND BARBED WIRE AND DOUBLE EXTENSION ARM CONFIGURATION**

SCALE: 1" = 1'-0"

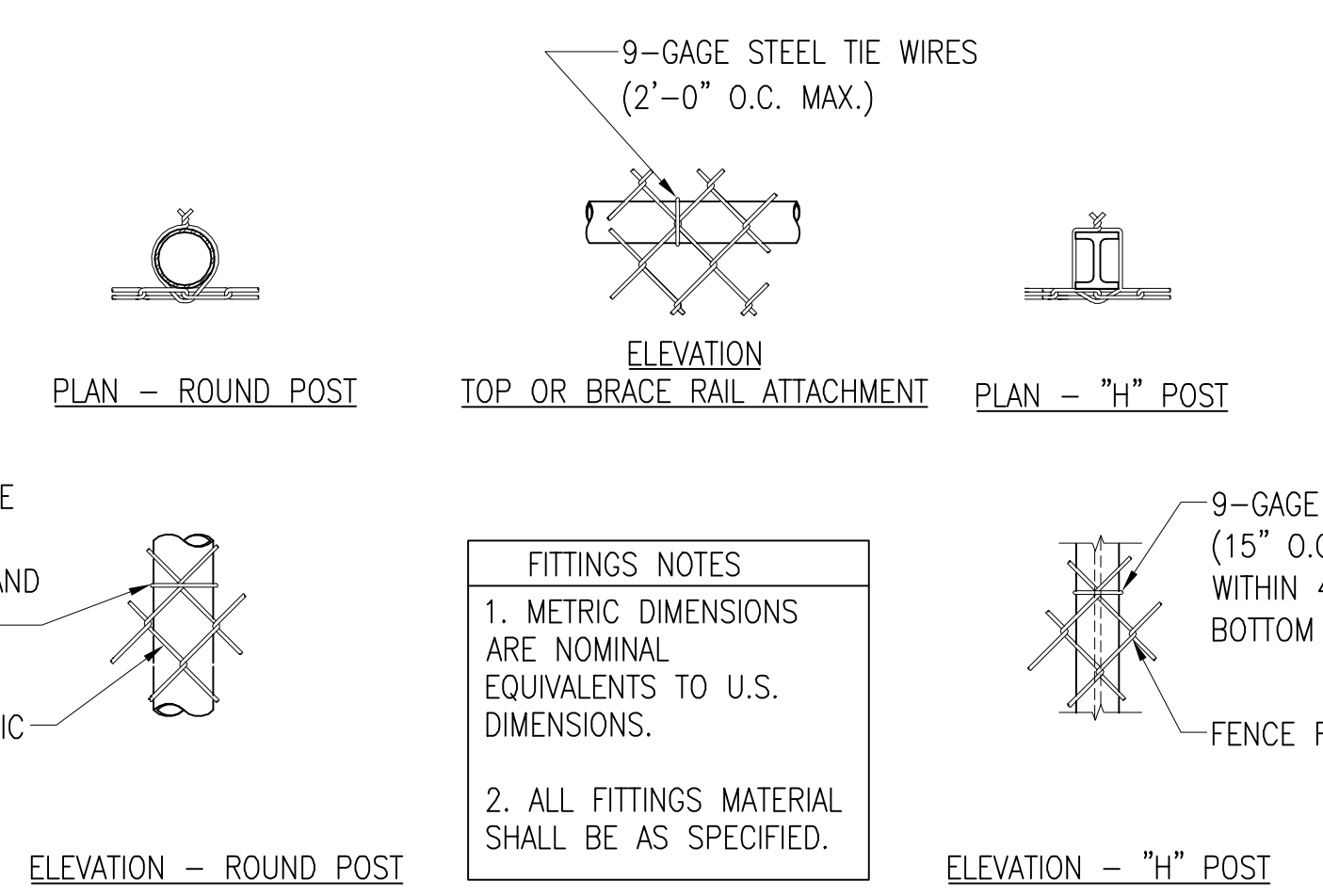
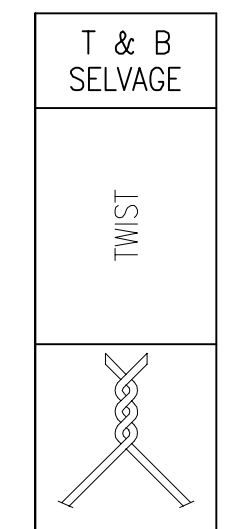


**LINE POST DETAILS**

SCALE: 1 1/2" = 1'-0"

**CORNER OR END POSTS**

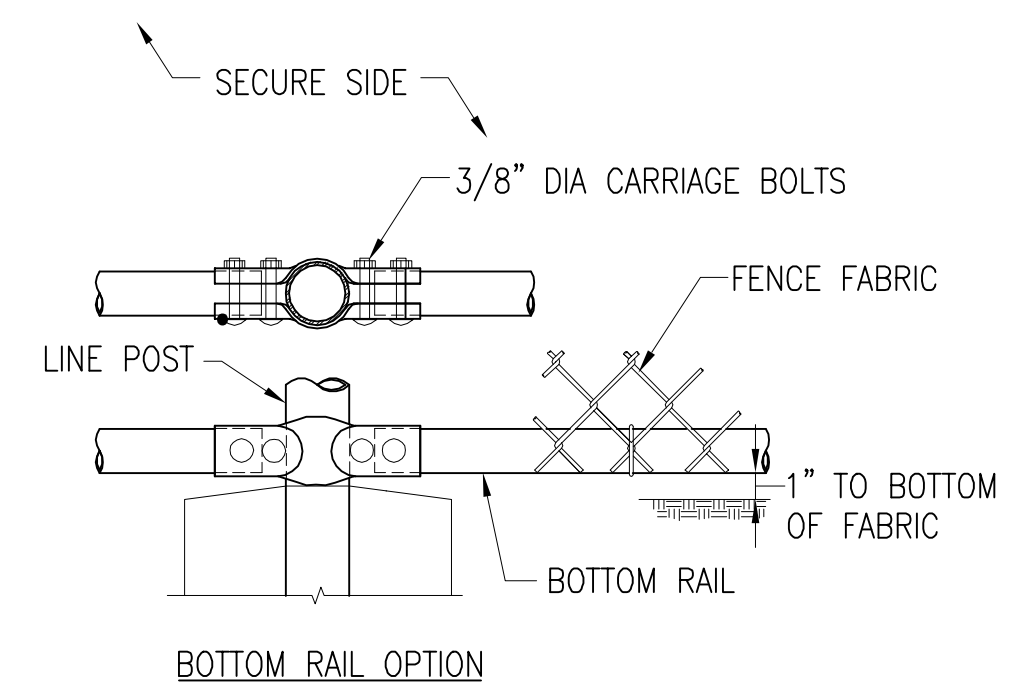
SCALE: 1 1/2" = 1'-0"



**FITTINGS NOTES**

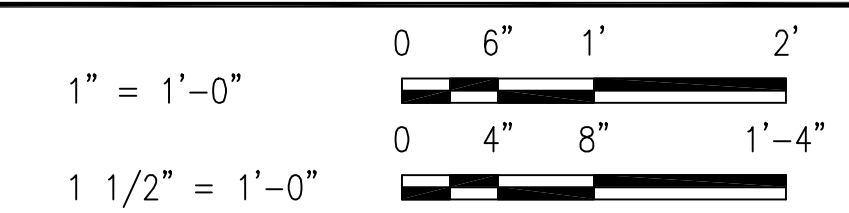
1. METRIC DIMENSIONS ARE NOMINAL EQUIVALENTS TO U.S. DIMENSIONS.

2. ALL FITTINGS MATERIAL SHALL BE AS SPECIFIED.



**BOTTOM RAIL OPTION**

**GRAPHIC SCALES**



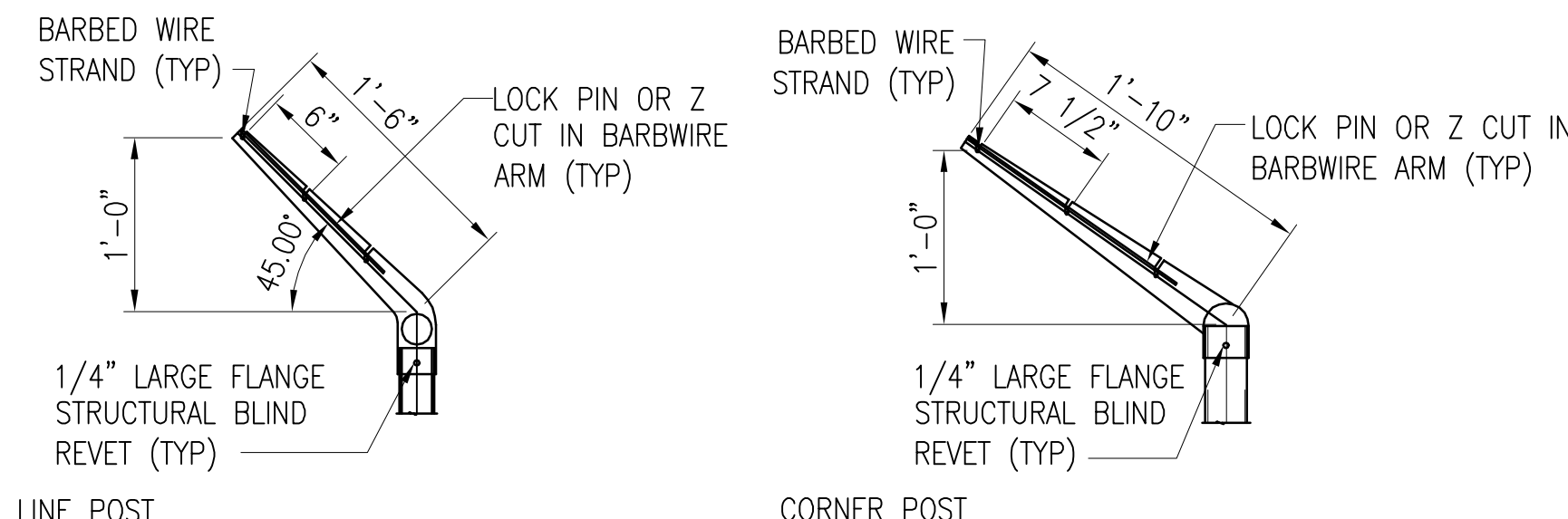
UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

CHAIN LINK FENCE AND DETAILS

UFC-700

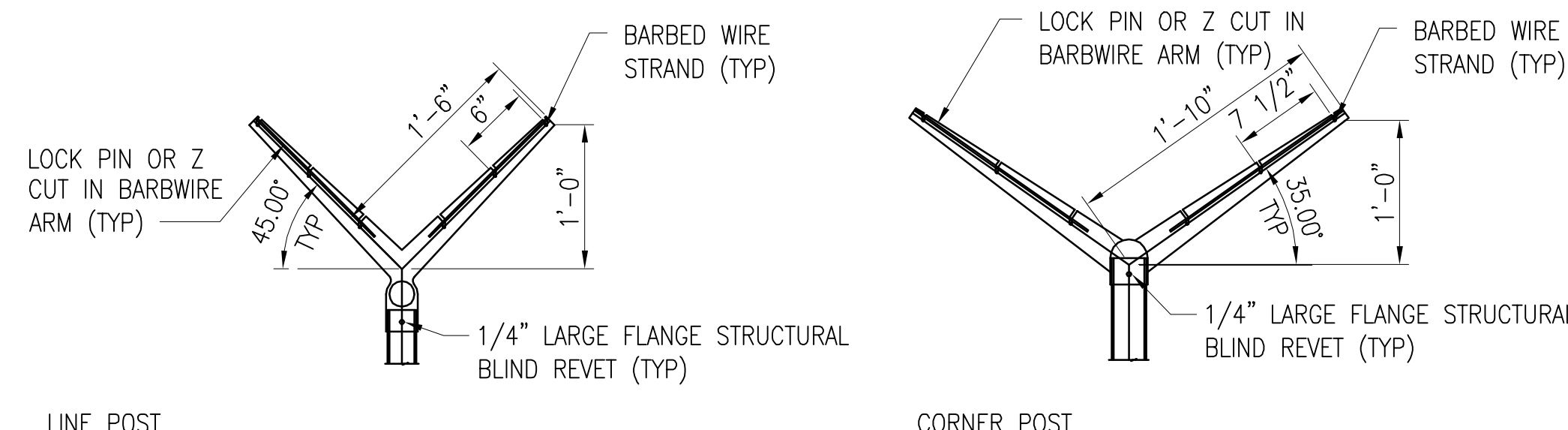
DRAWING REVISION: 24 AUGUST 2007

FILE NAME: P:\Core Projects\ATP-FSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\52005-UFC-701.dwg LAYOUT NAME: #=## PLOTTED: Tuesday, August 28, 2007 - 3:25pm



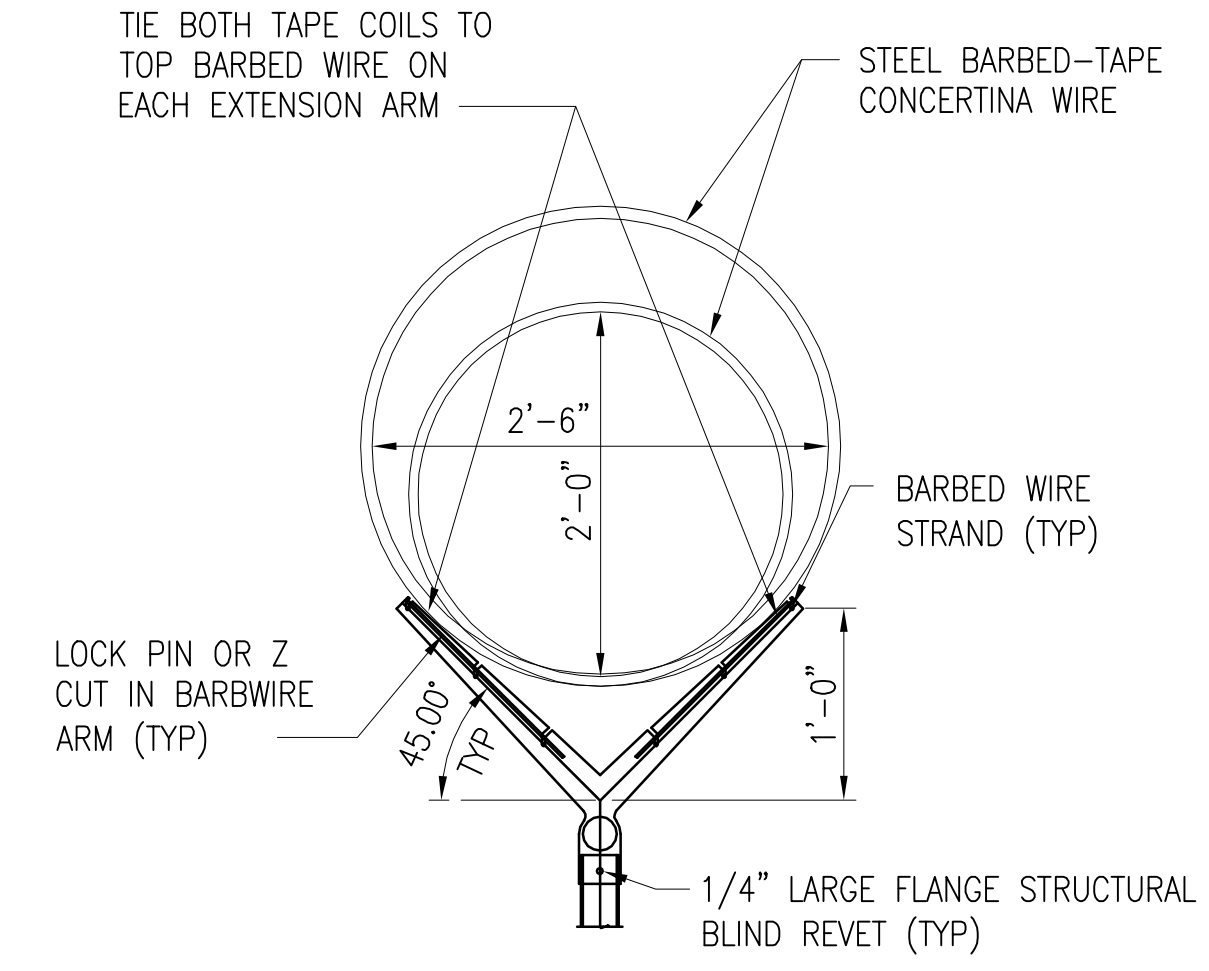
**SINGLE EXTENSION ARM DETAILS**

SCALE: 1" = 1'-0"



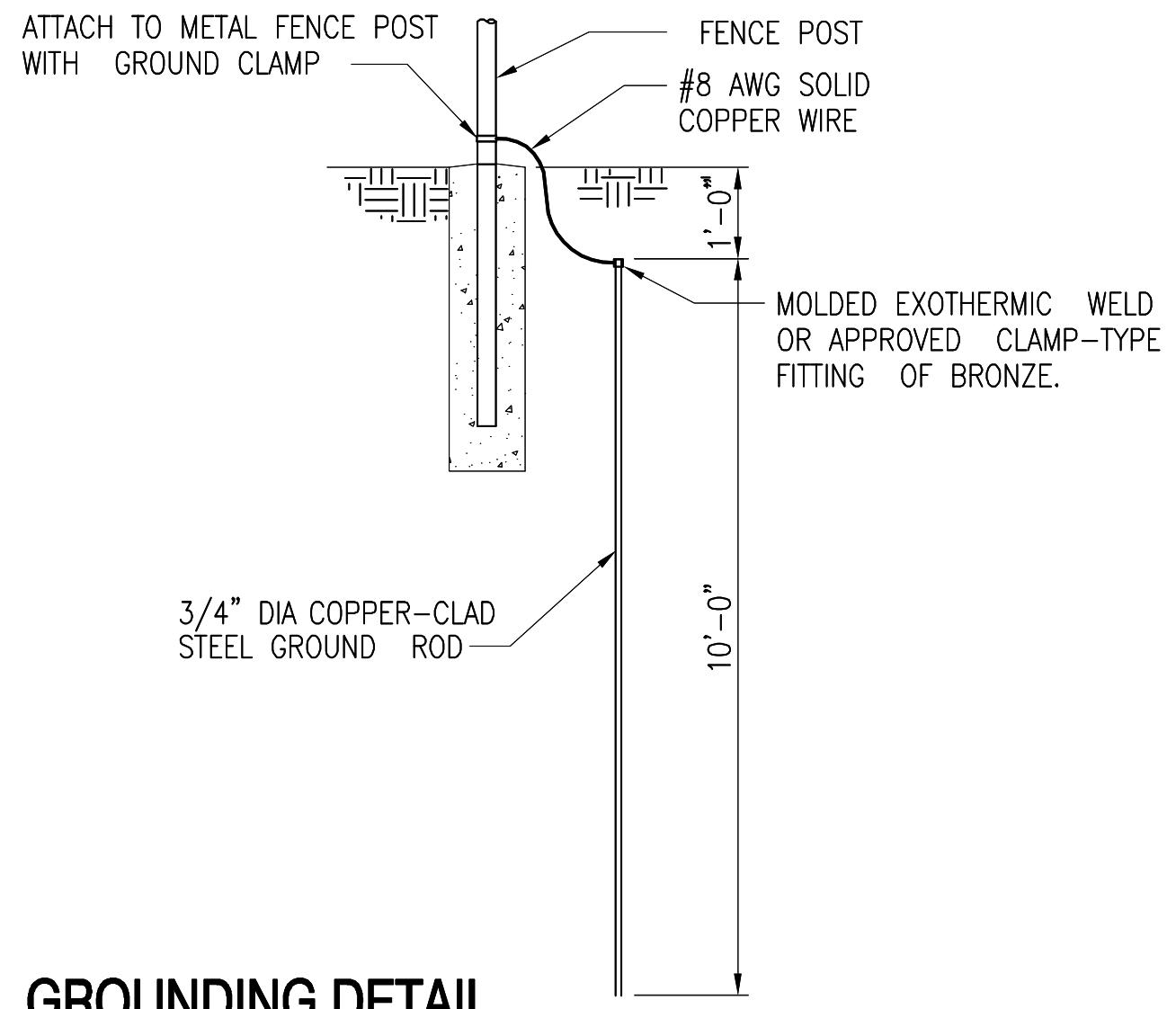
**DOUBLE EXTENSION ARM DETAILS**

SCALE: 1" = 1'-0"



**CONCERTINA WIRE MOUNTING**

SCALE: 1" = 1'-0"



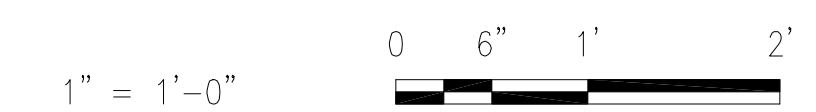
**GROUNDING DETAIL**

NO SCALE

**CHAIN LINK FENCING NOTES**

1. **FABRIC:** THE STANDARD FENCE FABRIC SHALL BE VINYL, ZINC OR ALUMINUM-COATED STEEL WIRE CHAIN LINK WITH MESH OPENINGS NOT LARGER THAN TWO INCHES PER SIDE AND A TWISTED AND BARBED SELVAGE AT TOP AND BOTTOM IN ACCORDANCE WITH THE SPECIFICATIONS. UTILIZE 6-GAUGE FOR BASE PERIMETER OR HEIGHTENED SECURITY ZONES AND 9-GAUGE FOR BASE INTERIOR OR WHEN JOINING AN EXISTING FENCE WHICH IS ALREADY 9-GAUGE.
2. **FABRIC TIES:** ONLY 12-GAUGE STEEL TIES SHALL BE USED. COATING OR PLATING WILL BE ELECTROLYTICALLY COMPATIBLE WITH THE FENCE FABRIC TO INHIBIT CORROSION.
3. **REINFORCEMENT:** TENSION WIRES SHALL BE INSTALLED AND INTERWOVEN (OR AFFIXED WITH FABRIC TIES) ALONG THE TOP & BOTTOM OF THE FENCE FOR STABILIZATION OF THE FENCE FABRIC.
4. **FENCE HEIGHT:** CHAIN LINK FABRIC SHALL BE 7' HIGH WITH AN ADDITIONAL 1' IN HEIGHT COMPOSED OF 3 STRANDS OF BARBED WIRE. THE TOTAL FENCE HEIGHT SHALL BE 8'.
5. **GROUND CLEARANCE:** BOTTOM OF THE FENCE FABRIC SHALL BE WITHIN TWO INCHES OF FIRM SOIL.
6. **TOP GUARDS:** A TOP GUARD IS AN OVERHANG OF BARBED WIRE ALONG THE TOP OF A FENCE, FACING OUTWARD (AWAY FROM PROTECTED SITE) AND UPWARD AT APPROX. 45° ANGLE. 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. THREE STRANDS OF 12-GAUGE BARBED WIRE, EQUALLY SPACED, SHALL BE INSTALLED ON THE SUPPORTING ARMS.
7. **FENCE POSTS:** SHALL BE ASTM F1043 OR F1083 ROUND PIPE OR SQUARE TUBE AND SHALL BE GALVANIZED IN ACCORDANCE WITH THE SPECIFICATIONS. FENCE POST SPACING AND SIZE (DIAMETER) SHALL BE DETERMINED IN ACCORDANCE WITH CHAIN LINK FENCE MANUFACTURERS' INSTITUTE (WLG 2445). SPACING SHALL NOT EXCEED 10'-0" OC. SIZE (DIAMETER) SHALL NOT BE LESS THAN THAT SPECIFIED.

**GRAPHIC SCALES**

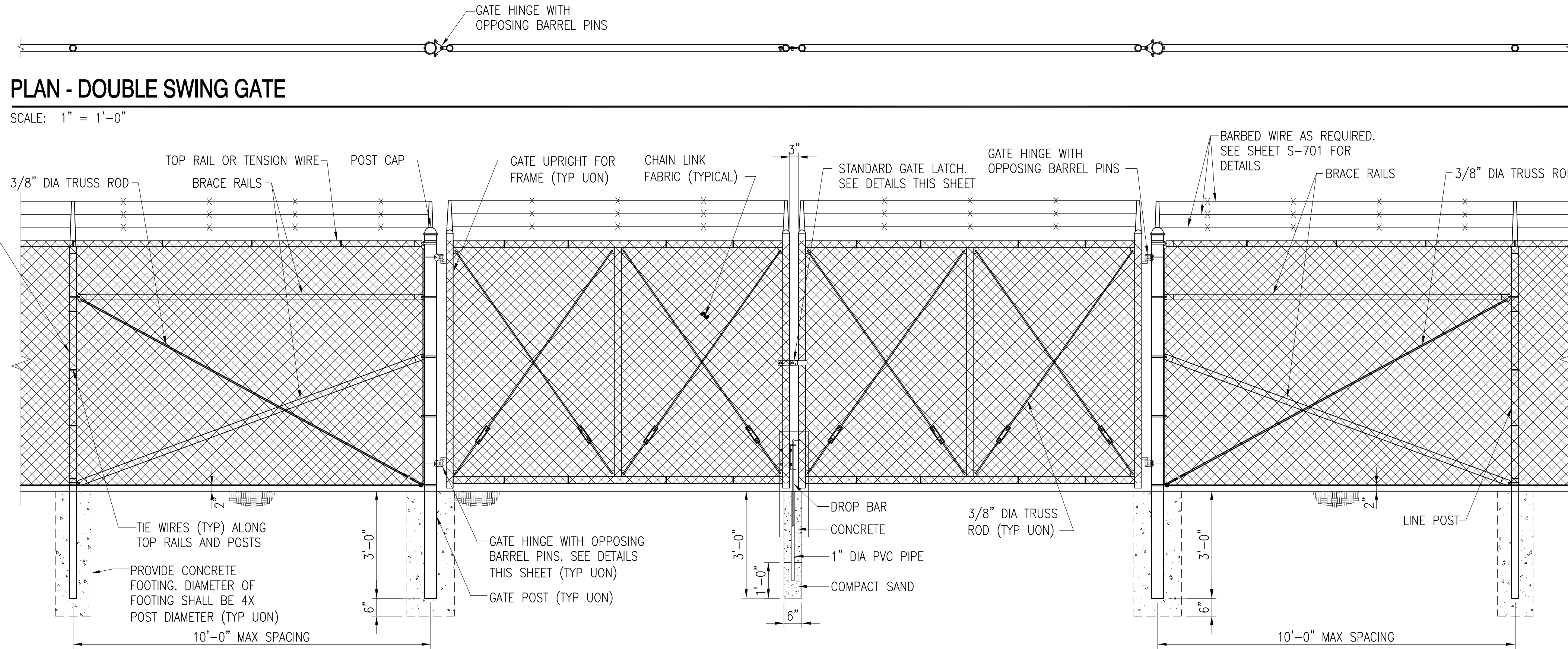


UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

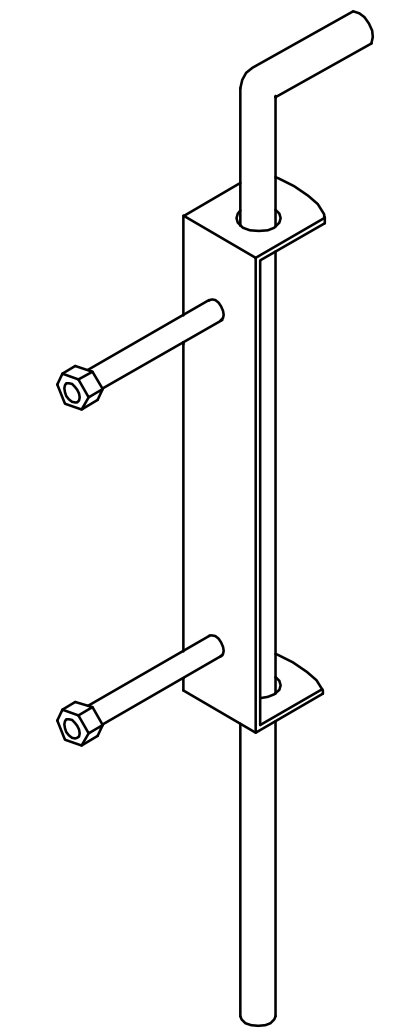
BARBED WIRE ARRANGEMENT DETAILS

UFC-701

DRAWING REVISION: 24 AUGUST 2007



NOTE: PROVIDE ONE DROP BAR FOR EACH LEAF (TYP). ASSOCIATED GALV SLEEVES TO BE INSTALLED FLUSH WILL GRADE AT FULLY OPEN AND CLOSED POSITIONS. CONTRACTOR SHALL PROVIDE 6" LAYER OF V.D.O.T. #10 STONE BELOW BOTTOM OF SLEEVE TO ALLOW FOR DRAINAGE.

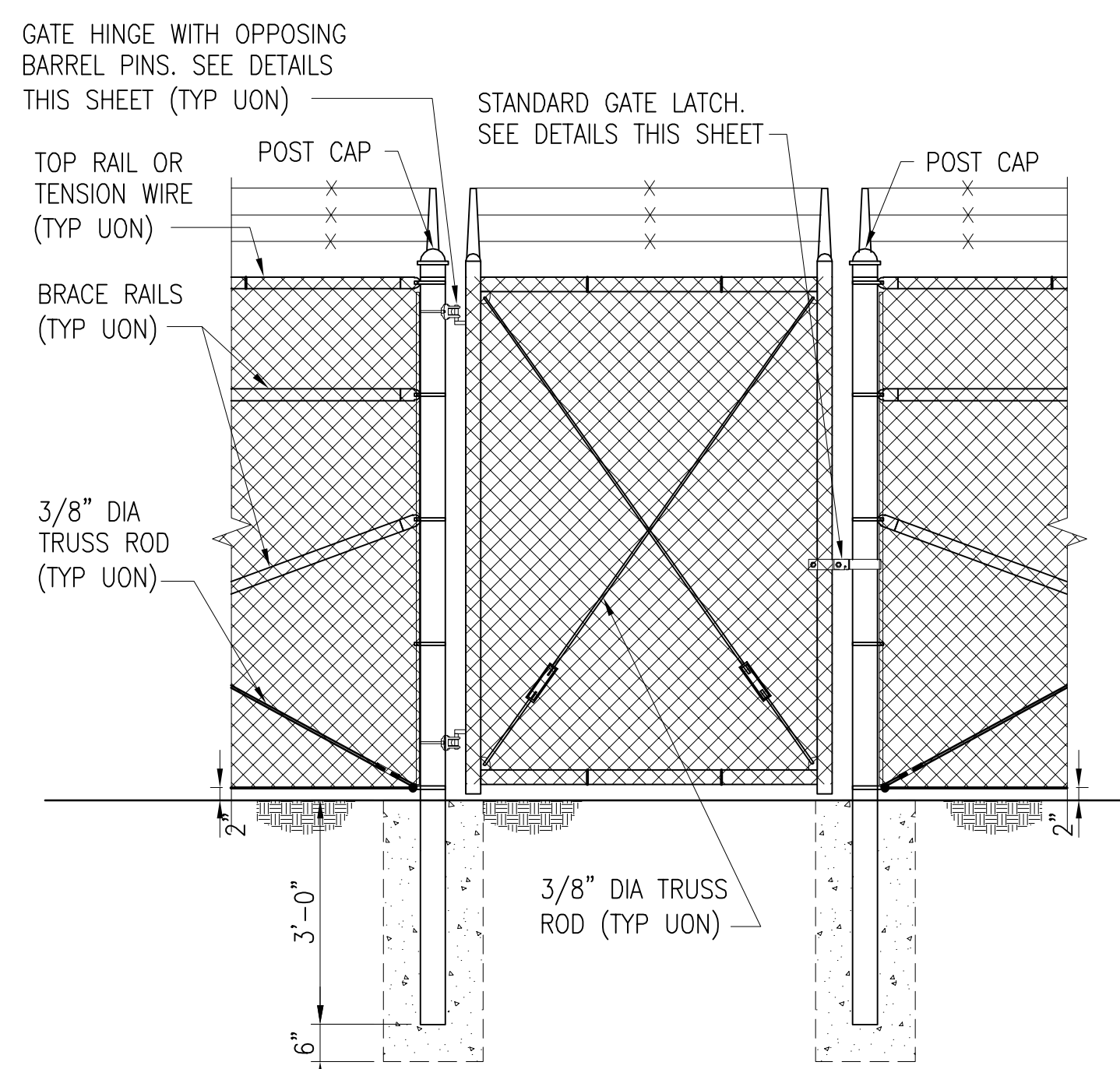


**TYPICAL DOUBLE SWING GATE ELEVATION**

SCALE: 1/2" = 1'-0"

**PLAN SINGLE SWING GATE**

SCALE: 1" = 1'-0"



**TYPICAL FENCE SINGLE SWING GATE ELEVATION**

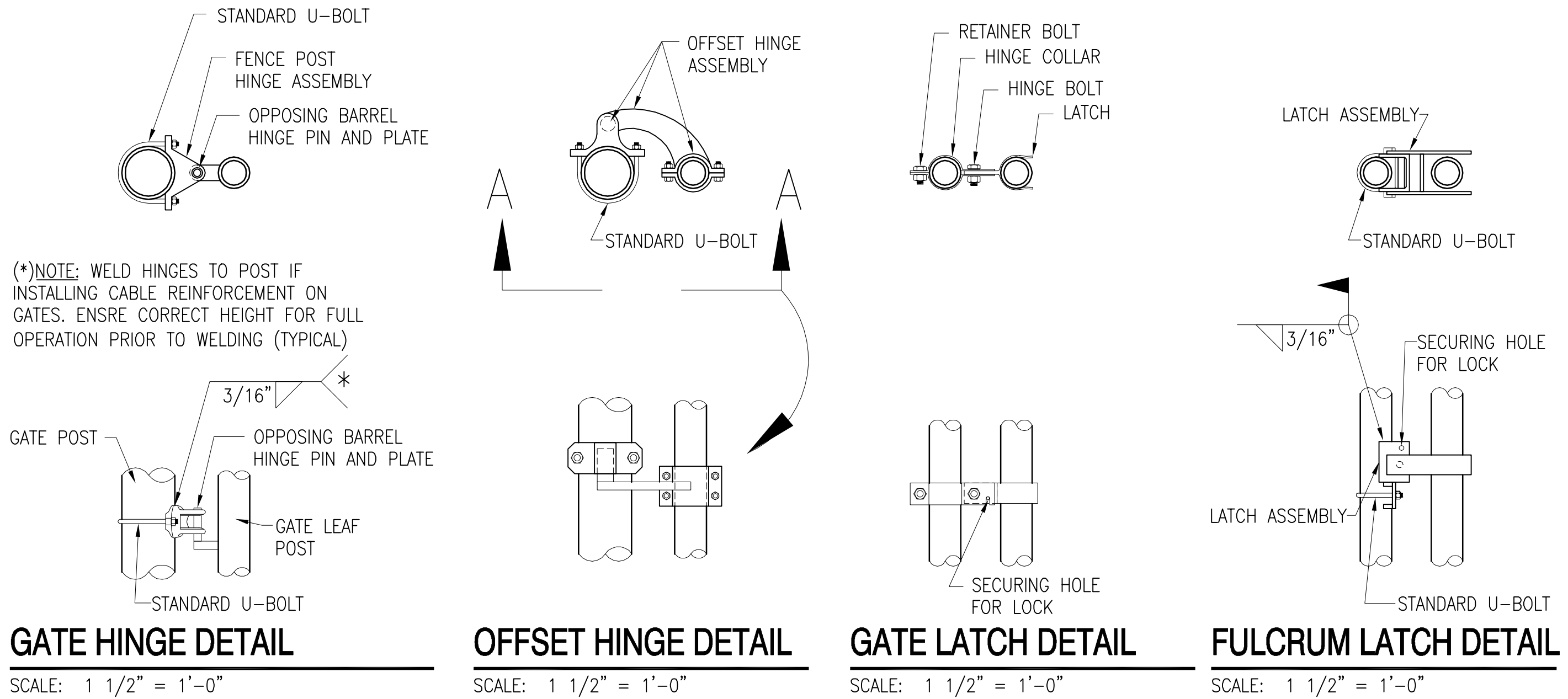
SCALE: 1/2" = 1'-0"

SINGLE OR DOUBLE LEAF GATES		
NOM HEIGHT (H)	UPRIGHT HT (U)	FRAME HT (F)
NOM HT INCLUDING BARBED WIRE	ACTUAL DIM	ACTUAL DIM
8'-0" [2438MM]	7'-10" [2388MM]	6'-8 1/2" [2045MM]

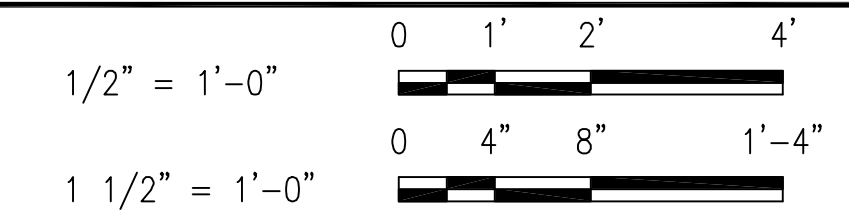
SINGLE LEAF GATES		
OPENING	GATE POSTS	HINGE SPACE (S)
FACE TO FACE	SQUARE & ROUND SIZES	POST TO UPRIGHT
3'-0" [914MM] THROUGH	2.5" [63.5MM] SQ x 3/16" TH OR 2.875" [73MM] OD	FOR SQUARE & ROUND GATE POSTS: 2 1/4" [57MM]
6'-0" [1829MM] THROUGH	4" [102MM] SQ x 3/16" TH OR 4" [102MM] OD	FOR SQUARE & ROUND GATE POSTS: 2 1/4" [57MM]
12'-0" [3657MM] THROUGH	6" [153MM] SQ x 3/16" TH OR 6.625" [168MM] OD	FOR SQUARE & ROUND GATE POSTS: 2 1/4" [57MM]
19'-0" [5790MM] THROUGH	8" [203MM] SQ x 1/4" TH OR 8.625" [219MM] OD	FOR SQUARE & ROUND GATE POSTS: 2 1/4" [57MM]

**GATE POSTS & FOUNDATIONS:** GATE POST SIZE AND ASSOCIATED FOOTING DIAMETER TO BE DETERMINED BY MANUFACTURER, BASED ON LEAF WEIGHT & DIMENSION, BUT NOT LESS THAN DIAMETER SHOWN ON THESE DRAWINGS. MINIMUM FOOTING DIAMETERS (TO BE FILLED W/4000 PSI CONC): 40" Ø FOR 8" POST; 36" Ø FOR 6" POST; 24" Ø FOR 4" POST; OTHER SIZES TO BE DESIGNED BY MFR OR KTR. NO FOOTING WIDTH SHALL BE LESS THAN 4(X) THE POST WIDTH.

**NOTE:** IF GATE HINGES ARE NOT OPPOSING (AS SHOWN ABOVE) OR LEAF IS NOT LOCKED MECHANICALLY TO THE HINGES, WELD AN ANGLE, PLATE, OR BLOCK ABOVE HINGE TO RESTRICT LEAF FROM BEING REMOVED OR LIFTED OFF. RESTRICTION SHALL NOT HINDER OPERATION OF GATE.



**GRAPHIC SCALES**



UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

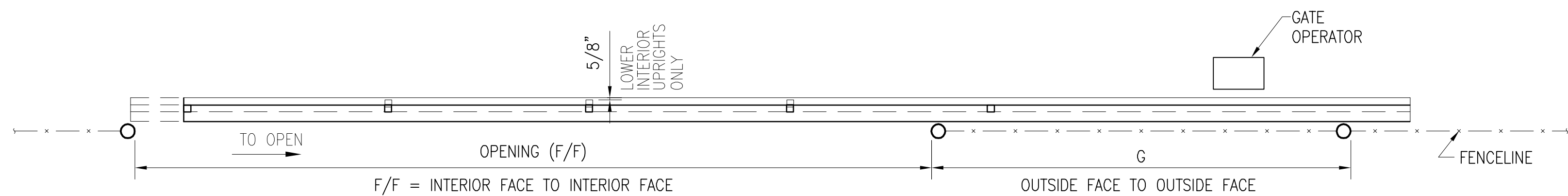
CHAIN LINK SWING GATE AND DETAILS

UFC-702

DRAWING REVISION: 24 AUGUST 2007

FILE NAME: P:\Core Projects\ATP-PSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\452005-UFC-702.dwg LAYOUT NAME: S-702 PLOTTED: Tuesday, August 28, 2007 - 3:25pm

FILE NAME: P:\Core Projects\ATP-FSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\452005-UFC-703.dwg LAYOUT NAME: Layout1 PLOTTED: Tuesday, August 28, 2007 3:23pm



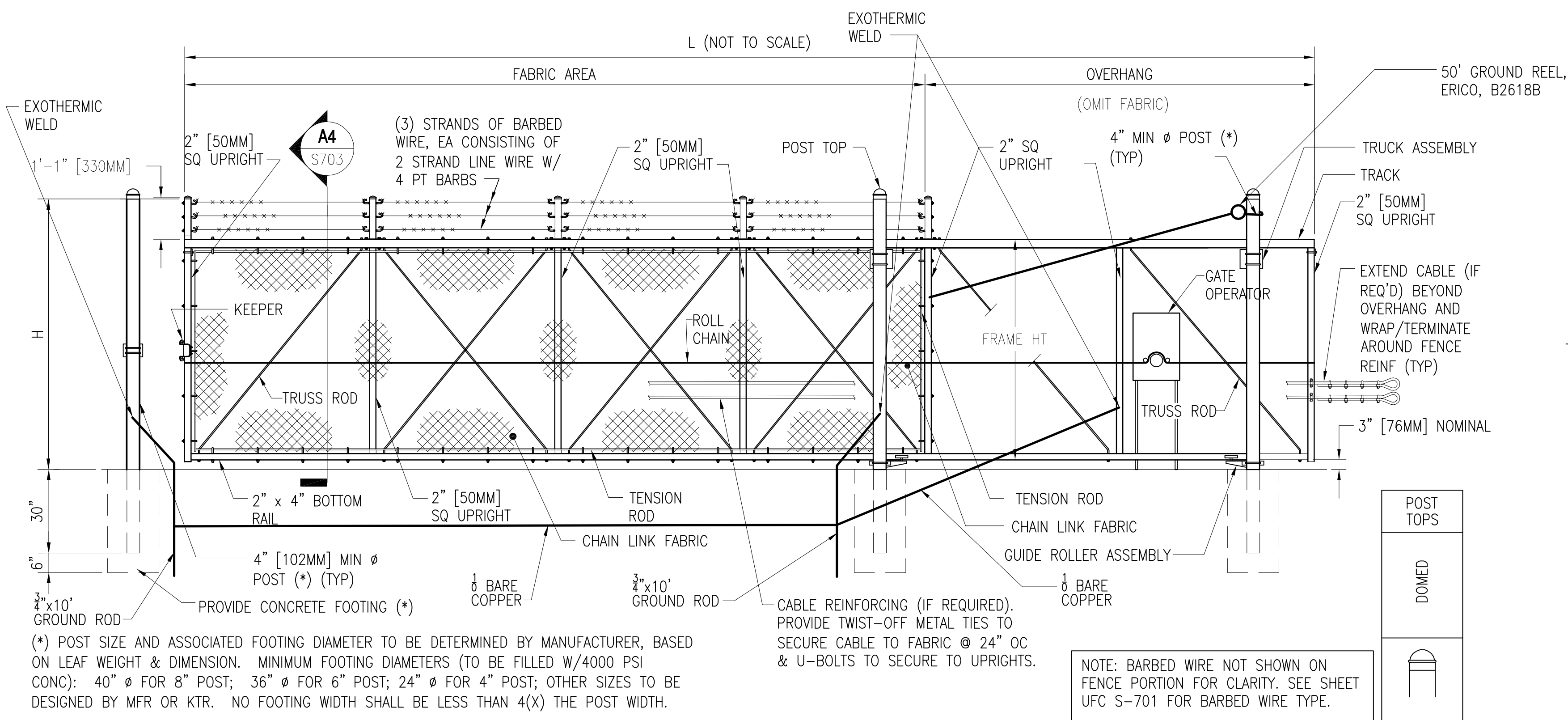
**GATE PLAN**

NOT TO SCALE

SAMPLING OF SIZES:

OPENING (F/F)	NOMINAL HEIGHT (H)	LENGTH (L)	GATE POSTS (G)	BAYS / OVERHANG
37'-0"	8'-0"	53'-3"	16'-0"	5 (FABRIC) / 2 (W/O)
30'-0"	8'-0"	42'-3"	12'-0"	4 (FABRIC) / 2 (W/O)
24'-0"	8'-0"	36'-3"	12'-0"	3 (FABRIC) / 2 (W/O)

**C1**  
CIVIL DWGS S-703



**TYPICAL SINGLE CANTILEVERED SLIDING GATE ELEVATION- (4) BAYS SHOWN**

NOT TO SCALE

WITH ROUND POSTS & WITH BARBED WIRE

**A1**  
S-703 S-703

**SECTION (TYP)**

NOT TO SCALE

**A4**  
S703 S703

**CANTILEVER GATE NOTES**

1. CONSIDERATION: PER PAGE 29 OF UFC 4-22-03. THE GUIDANCE SUGGESTS USING BIPARTING GATES (2 CANTILEVERS MEETING IN CENTER OF THE OPENING WHEN FULLY EXTENDED) FOR ALL OPENINGS OVER 24'. THIS CONFIGURATION CAN ACHIEVE A 48' OPENING. ADDITIONAL SPACE IS REQ'D ON BOTH SIDES, SO NOT IDEAL FOR ALL LOCATIONS. IT DOES ALLOW FOR THE RESTRICTION OF TRAFFIC IN EITHER DIRECTION.

UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

UFC-703

CHAIN LINK CANTILEVERED GATE DETAILS

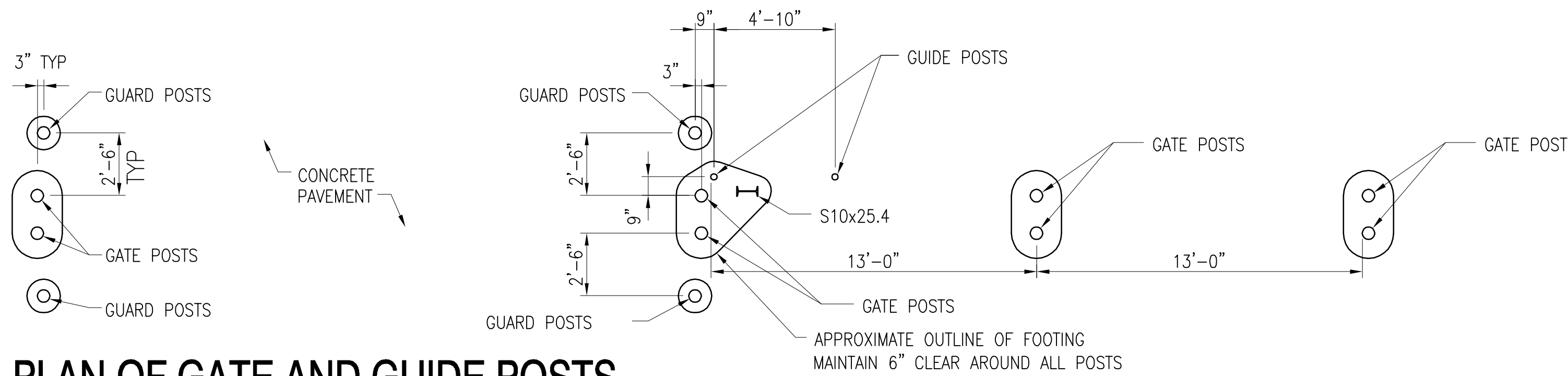
1

2

3

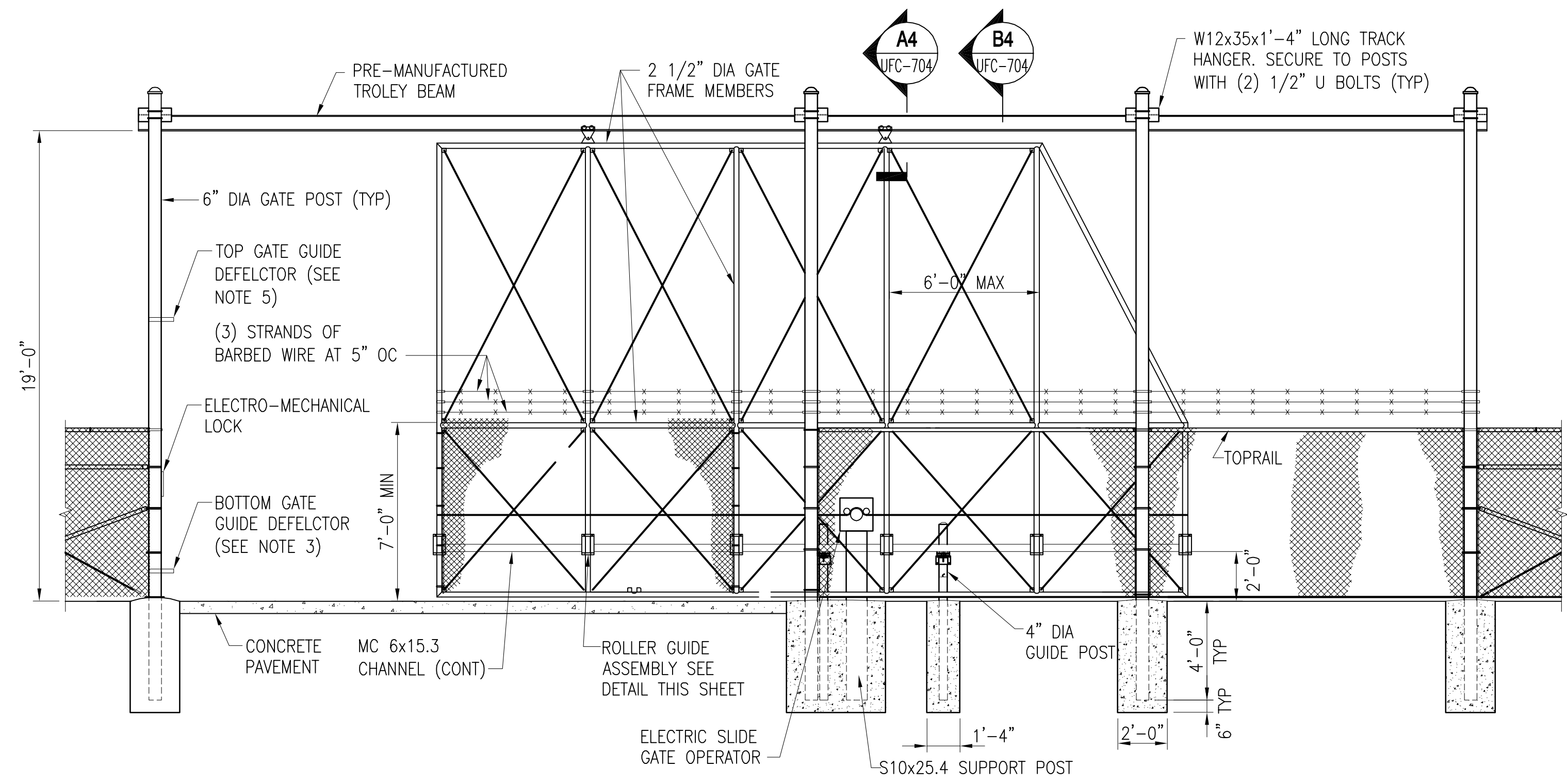
4

5



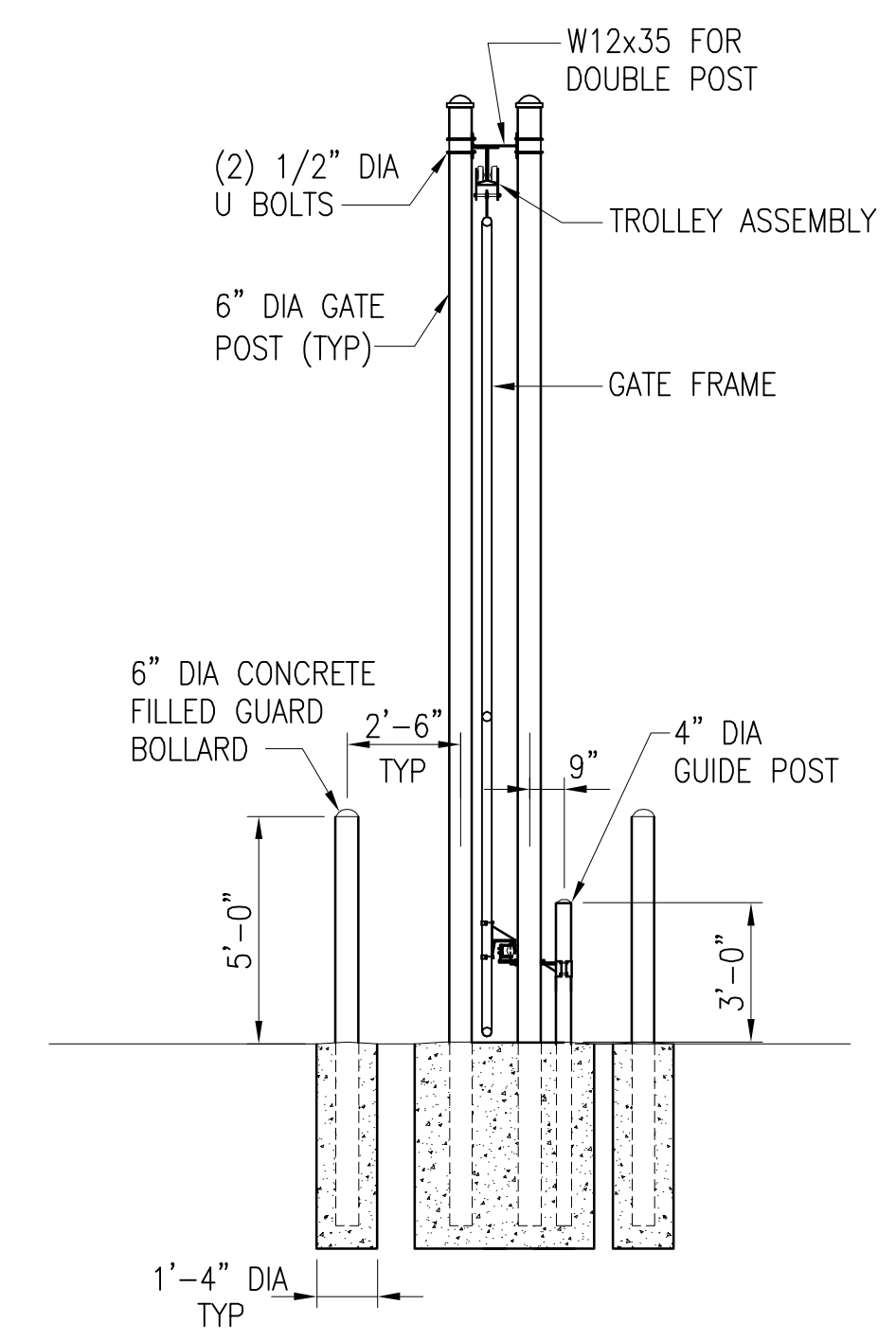
**PLAN OF GATE AND GUIDE POSTS**

SCALE: 3/16" = 1'-0"



**ELEVATION OF OVERHEAD ROLLER GATE**

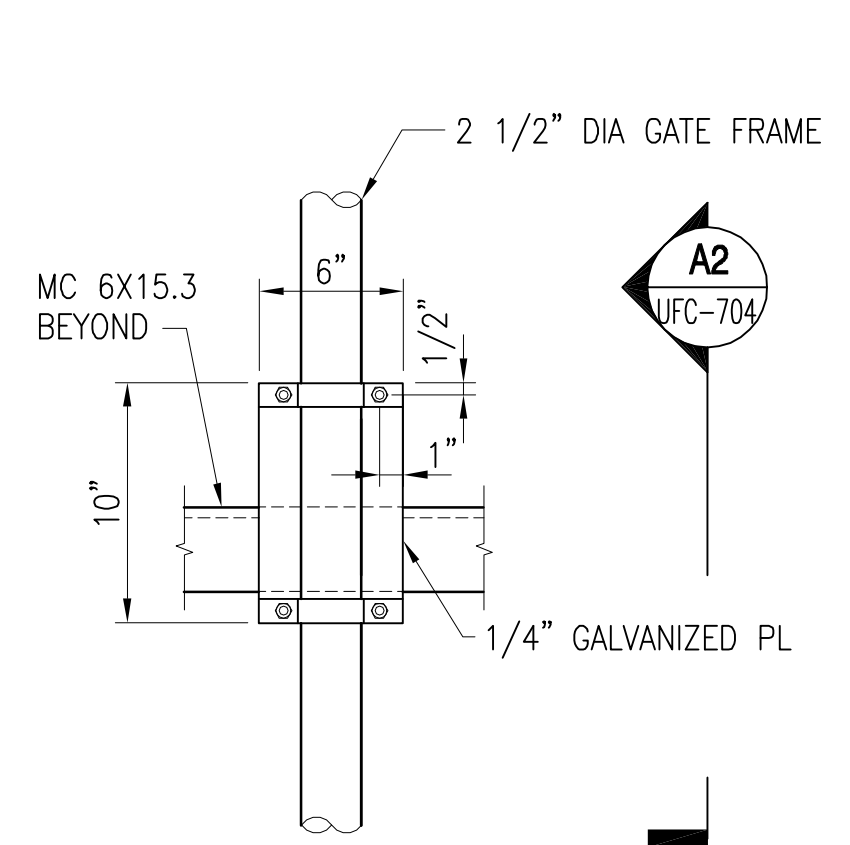
SCALE: 1/4" = 1'-0"



**SECTION**

SCALE: 1/4" = 1'-0"

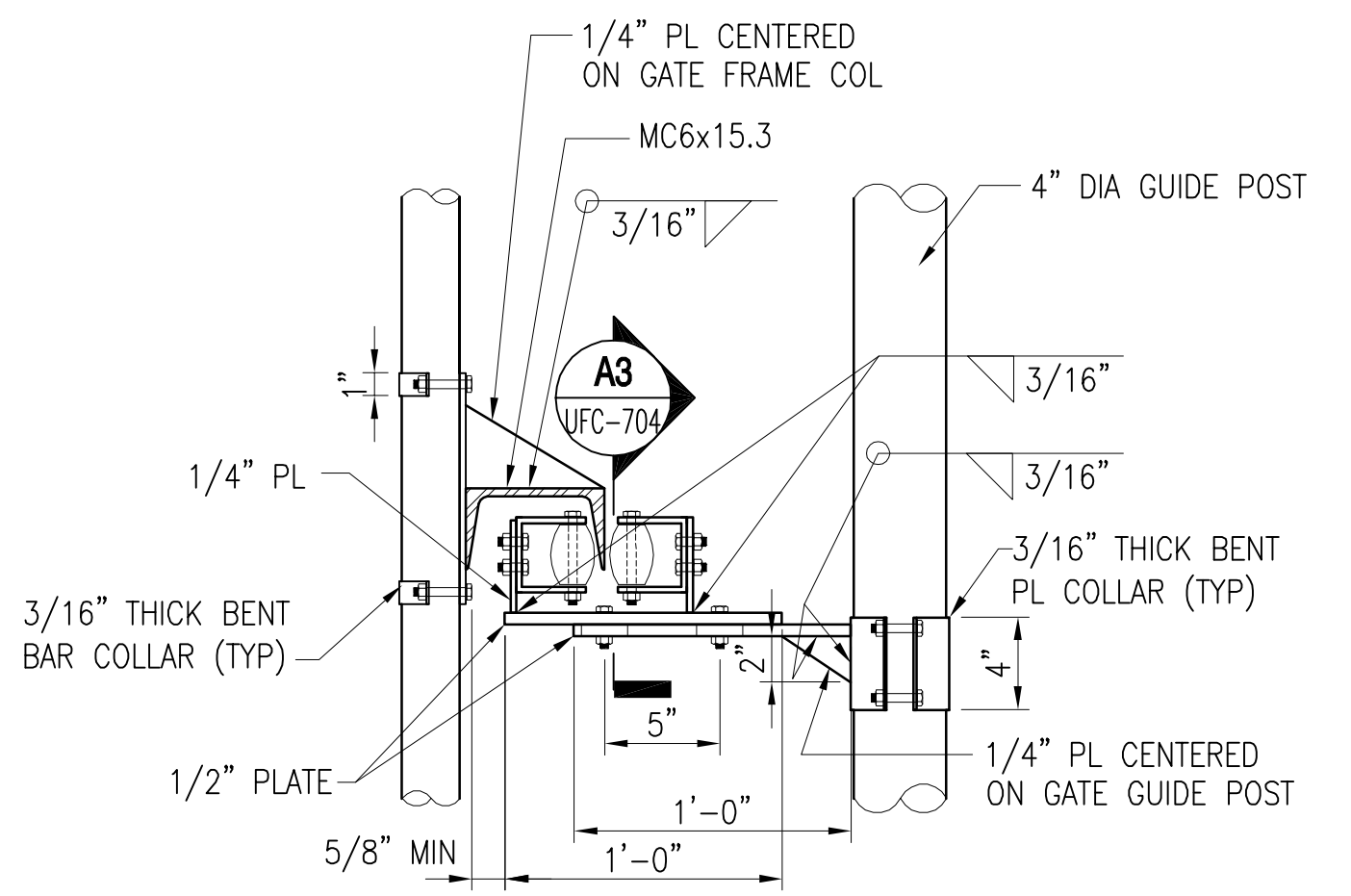
UFC-704 UFC-704



**DETAIL - ROLLER GUIDE ASSEMBLY**

SCALE: 1 1/2" = 1'-0"

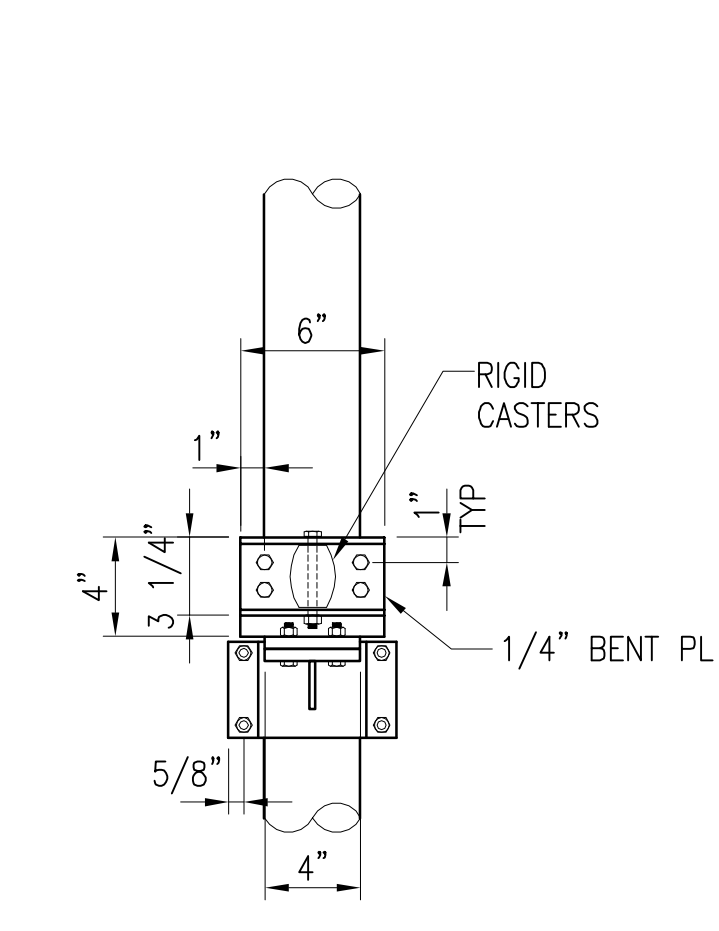
UFC-704 UFC-704



**SECTION**

SCALE: 1 1/2" = 1'-0"

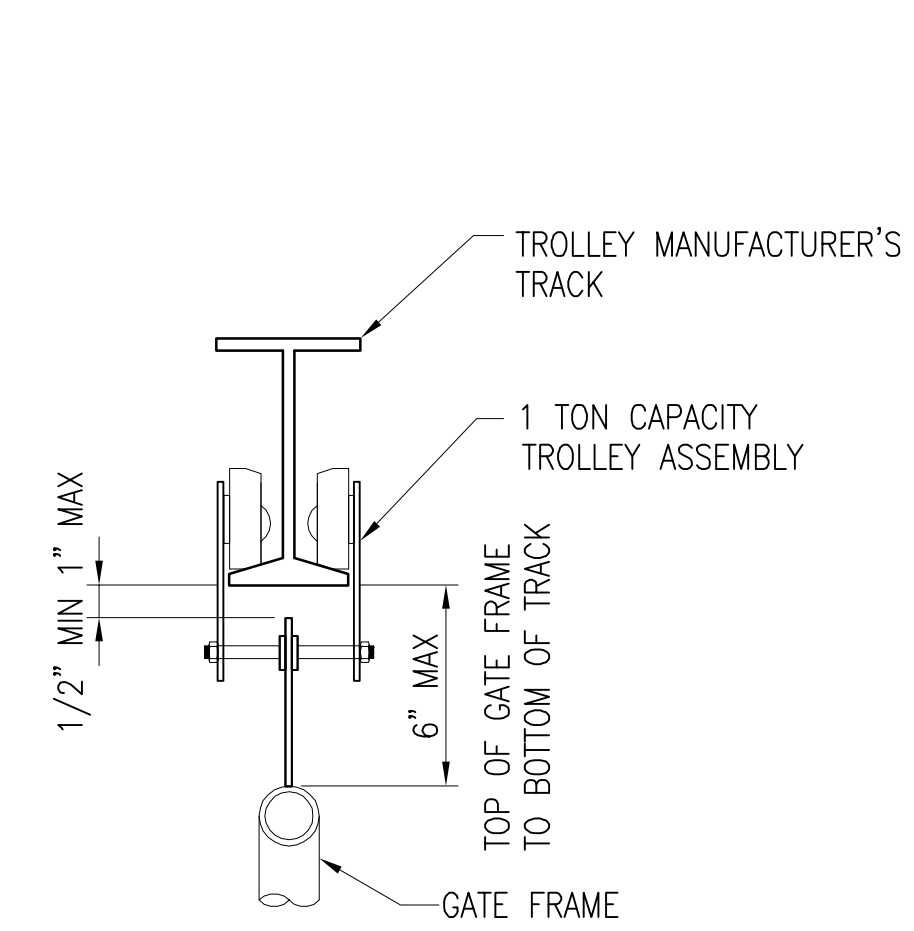
UFC-704 UFC-704



**SECTION**

SCALE: 1 1/2" = 1'-0"

UFC-704 UFC-704



**SECTION**

SCALE: 1 1/2" = 1'-0"

UFC-704 UFC-704

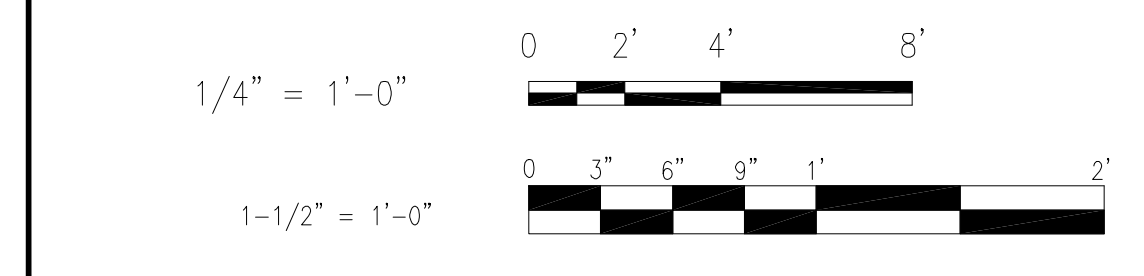
**GENERAL NOTES**

1. THE GATE SHOWN IS TYPICAL. ANY STANDARD COMMERCIAL GATE THAT VARIES ONLY IN NON-ESSENTIAL DETAILS SHALL BE ACCEPTABLE SUBJECT TO APPROVAL.
2. GATE SHALL CONFORM TO ASTM F 1184, TYPE 1, EXCEPT AS EXCEEDED BY THIS DRAWING.
3. GATES SHALL SLIDE ON THE SECURE SIDE.
4. GATES SHALL BE CONSTRUCTED WITH A TROLLEY SYSTEM THAT WILL PREVENT THE GATE FROM BEING ELEVATED OVER 2 INCHES ABOVE THE PAVEMENT.
5. ALL GATE GLIDE DEFLECTORS SHALL BE COMPATIBLE WITH THE MANUFACTURED ELECTRO-MECHANICAL LOCK. THE GUIDE DEFLECTOR SHALL BE DESIGNED FOR THE WIND CONDITIONS WITH 3/8" PLATE AND GALVANIZED.
6. GUARD POSTS SHALL BE NPS 6 STD WEIGHT, GRADE B, STEEL PIPE FILLED WITH CONCRETE. STEEL PIPE SHALL CONFORM TO ASTM A53/53M, TYPE E OR S, GALVANIZED, MINIMUM WALL THICKNESS .312 INCHES.
7. ALL STEEL PLATES, SHAPES AND ACCESSORIES SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A123.
8. ELECTRIC SLIDE GATE OPERATOR SHALL HAVE A MINIMUM 1 HP, PHASE MOTOR.
9. UNLESS OTHERWISE NOTED, ALL BOLTS SHALL BE 3/8" DIAMETER, ASTM A307, GALVANIZED BOLTS.

UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

CHAIN LINK OVERHEAD ROLLER GATE

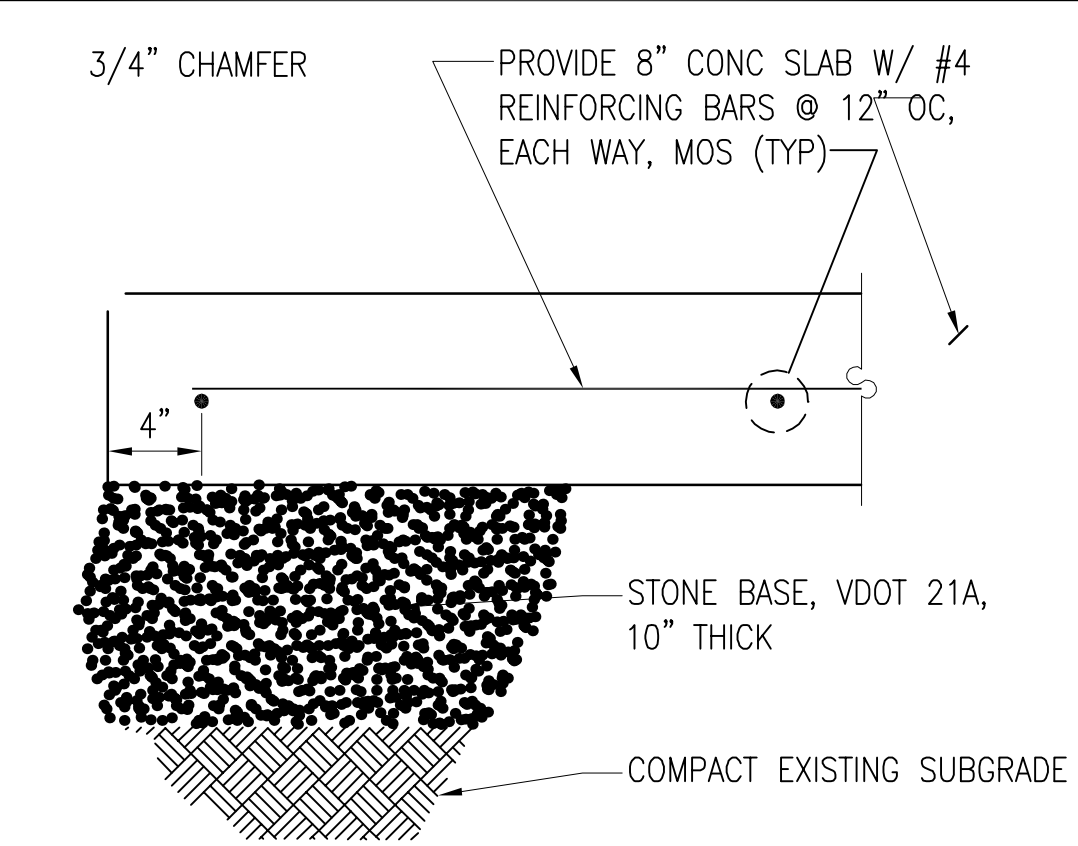
**GRAPHIC SCALES**



UFC-704

FILE NAME: P:\Core Projects\ATP-FSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\562005-UFC-704.dwg LAYOUT NAME: Layout1 PLOTTED: Tuesday, August 28, 2007 3:23pm

FILE NAME: P:\Core Projects\ATFP-FSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\452005-UFC-705.dwg LAYOUT NAME: Layout1 PLOTTED: Tuesday, August 28, 2007 3:26pm

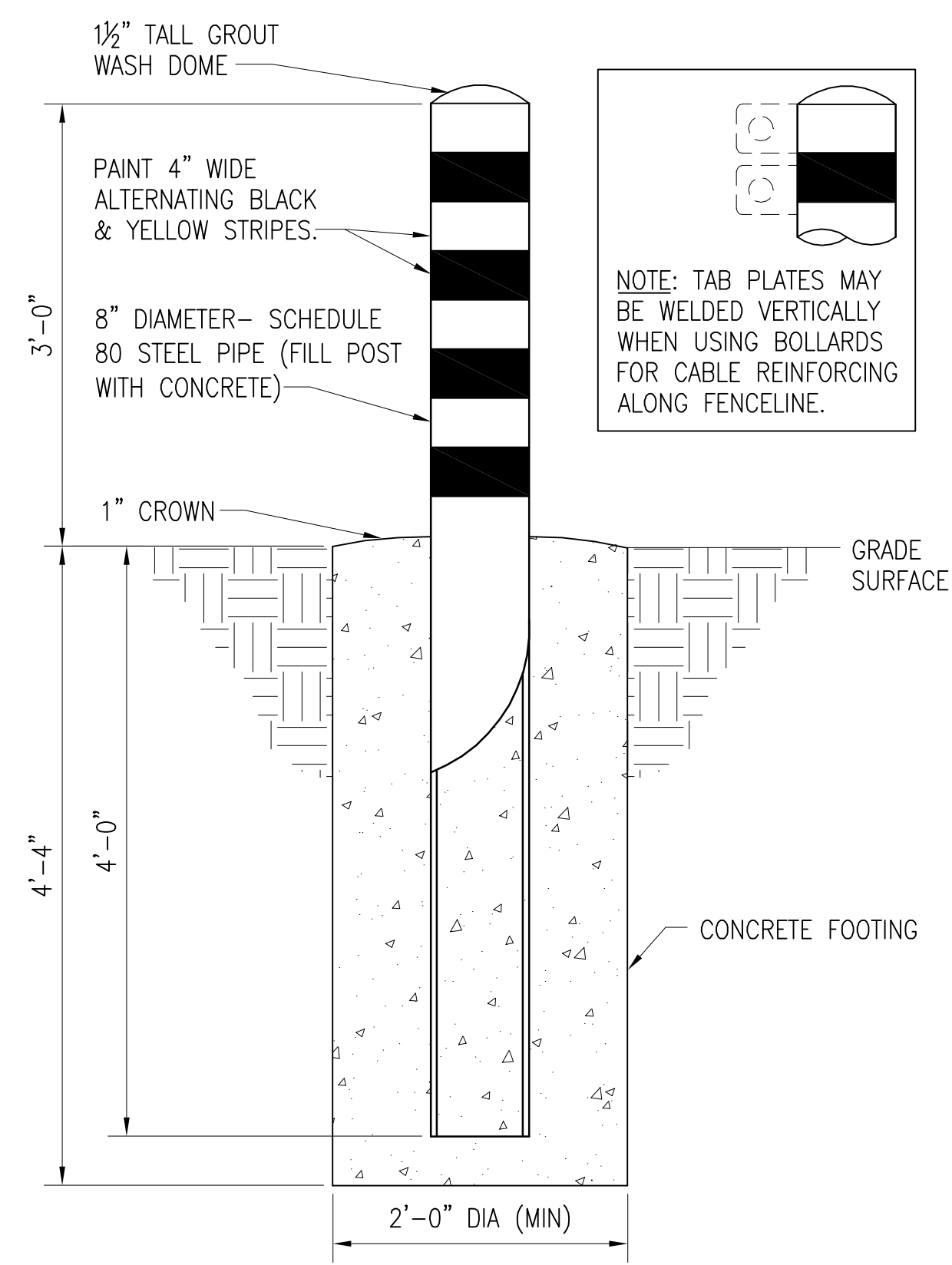


**TURNSTILE MOUNTING SLAB**  
SCALE: 1-1/2" = 1'-0"  
C2  
C-705 | C-705

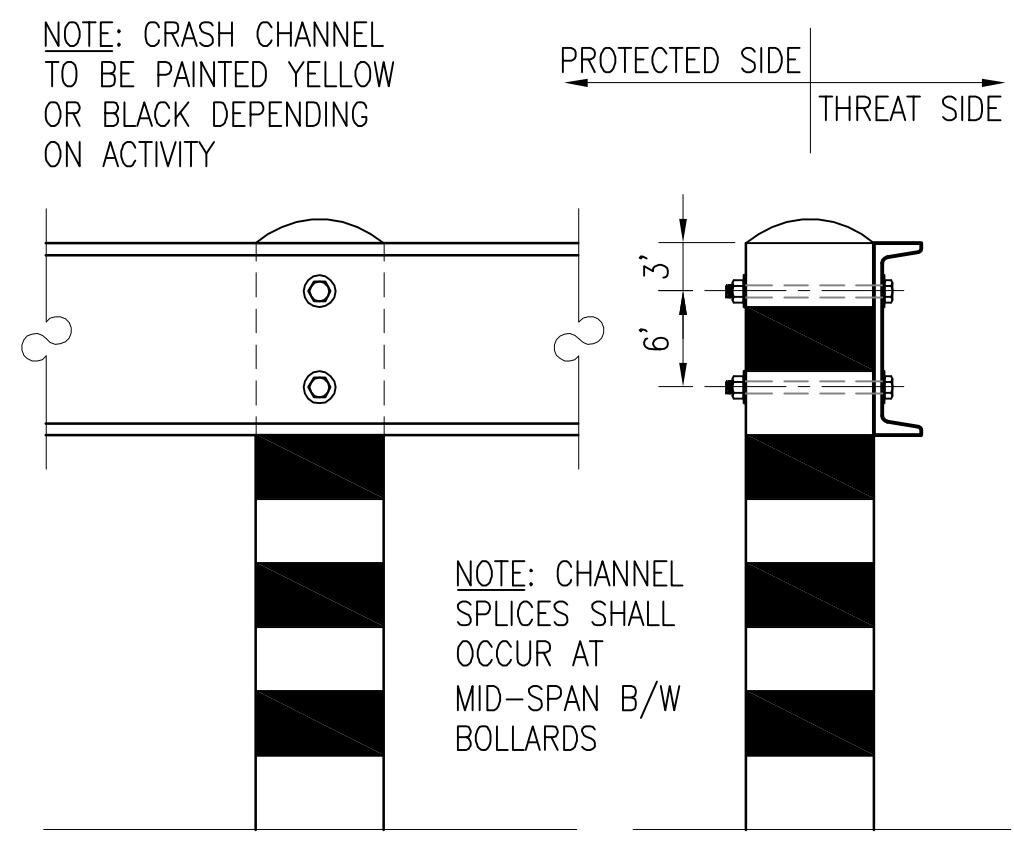
**TURNSTILE NOTES:**

- TURNSTILE SHALL BE COMPOSED OF CARBON STEEL. ALL MATERIALS SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123.
- TURNSTILE SHALL HAVE BI-DIRECTIONAL CONTROLS: IN THE CASE OF A POWER FAILURE, OUTBOUND TRAFFIC SHALL BE SET TO "FAIL SAFE"; THE INBOUND TRAFFIC WILL HAVE A "FAIL LOCK" MECHANISM (UNLESS OTHERWISE DIRECTED BY THE ACTIVITY VIA THE CONTRACTING OFFICER).
- PROVIDE CARD READER MOUNTING PLATES FOR BOTH SIDES (INBOUND & OUTBOUND) OF TURNSTILE. CARD READER WILL BE INSTALLED BY THE ACTIVITY AT A LATER DATE.
- BRACE BARRIER POST AT TOP TO ADJACENT VERTICAL SURFACE.
- ALLOW 5 INCH CLEARANCE ABOVE TOP OF TURNSTILE TO REMOVE LIFT-OFF TYPE TOP COVER.
- CONCRETE MOUNTING SLAB MUST BE LEVEL WITHIN 1/4". SEE DETAIL C2 THIS SHEET FOR CONC MOUNTING PAD.
- CONTRACTOR SHALL PROVIDE AN ELECTRICAL 3-ROTOR FULL HEIGHT TURNSTILE AS MANUFACTURED BY TOMSED, MODEL THT-100ECP(3), OR APPROVED EQUAL.
- TURNSTILE SHALL HAVE FINISH TO MATCH ADJACENT FENCEWORK: POWDER COATED BLACK FOR ORNAMENTAL FENCE AND GALVANIZED FOR CHAIN-LINK.
- INSTALL 3 STRANDS BARBED WIRE OR CONCERTINA WIRE OVER TOP CHANNEL OF TURNSTILE (BETWEEN ADJACENT FENCE POSTS) TO HINDER SCALING UNIT.

NOTE: STEEL PIPE FOR BOLLARDS SHALL CONFORM TO ASTM A53, TYPE E OR S, GALVANIZED.

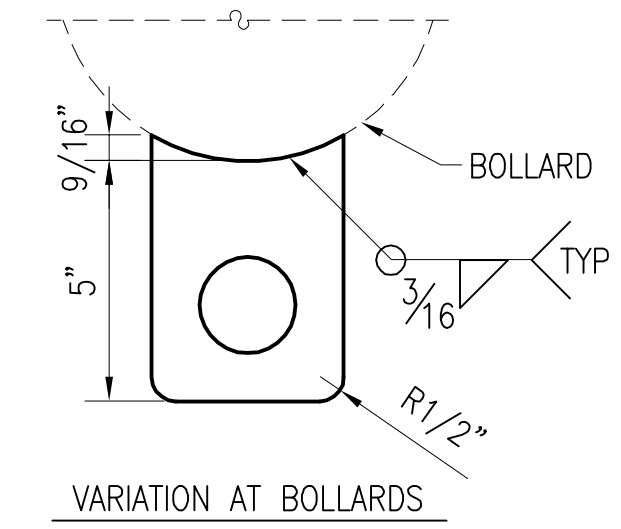
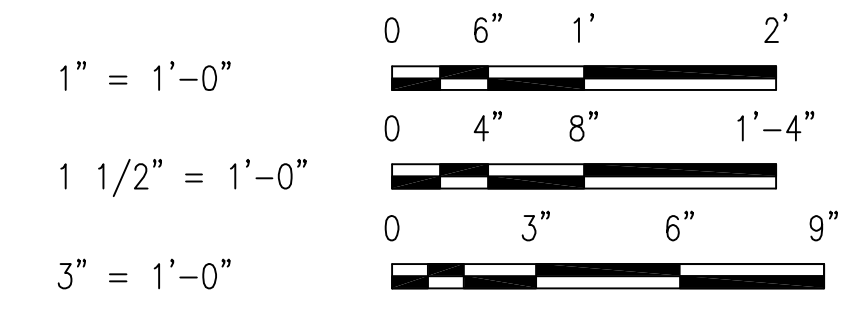


**CONC FILLED BOLLARD ~ FOOTING**  
SCALE: 1" = 1'-0"  
B3  
VARIOUS | UFC-705



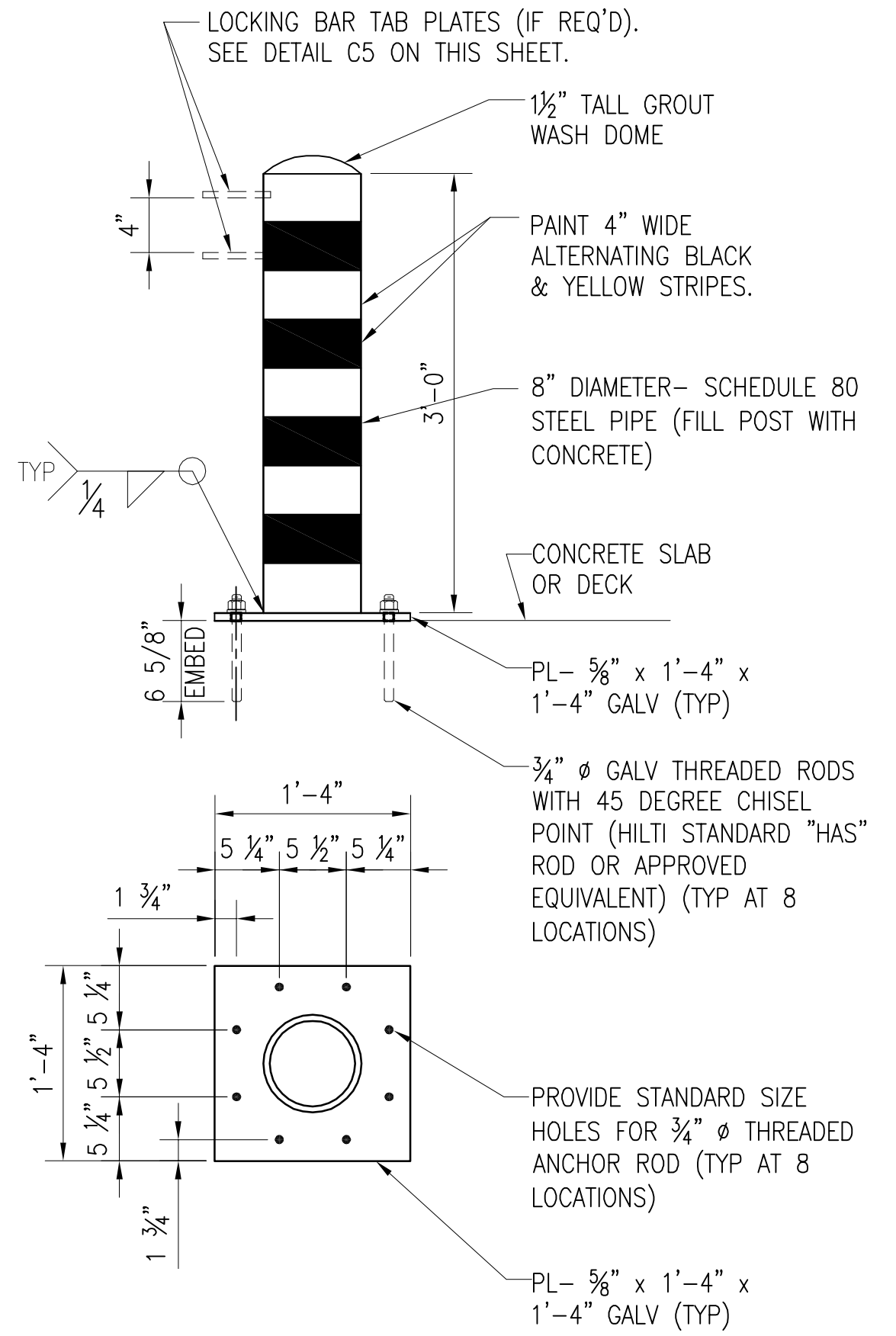
**CHANNEL FOR BOLLARDS**  
SCALE: 1" = 1'-0"  
A3  
CIVIL DWGS | UFC-705

**GRAPHIC SCALES**



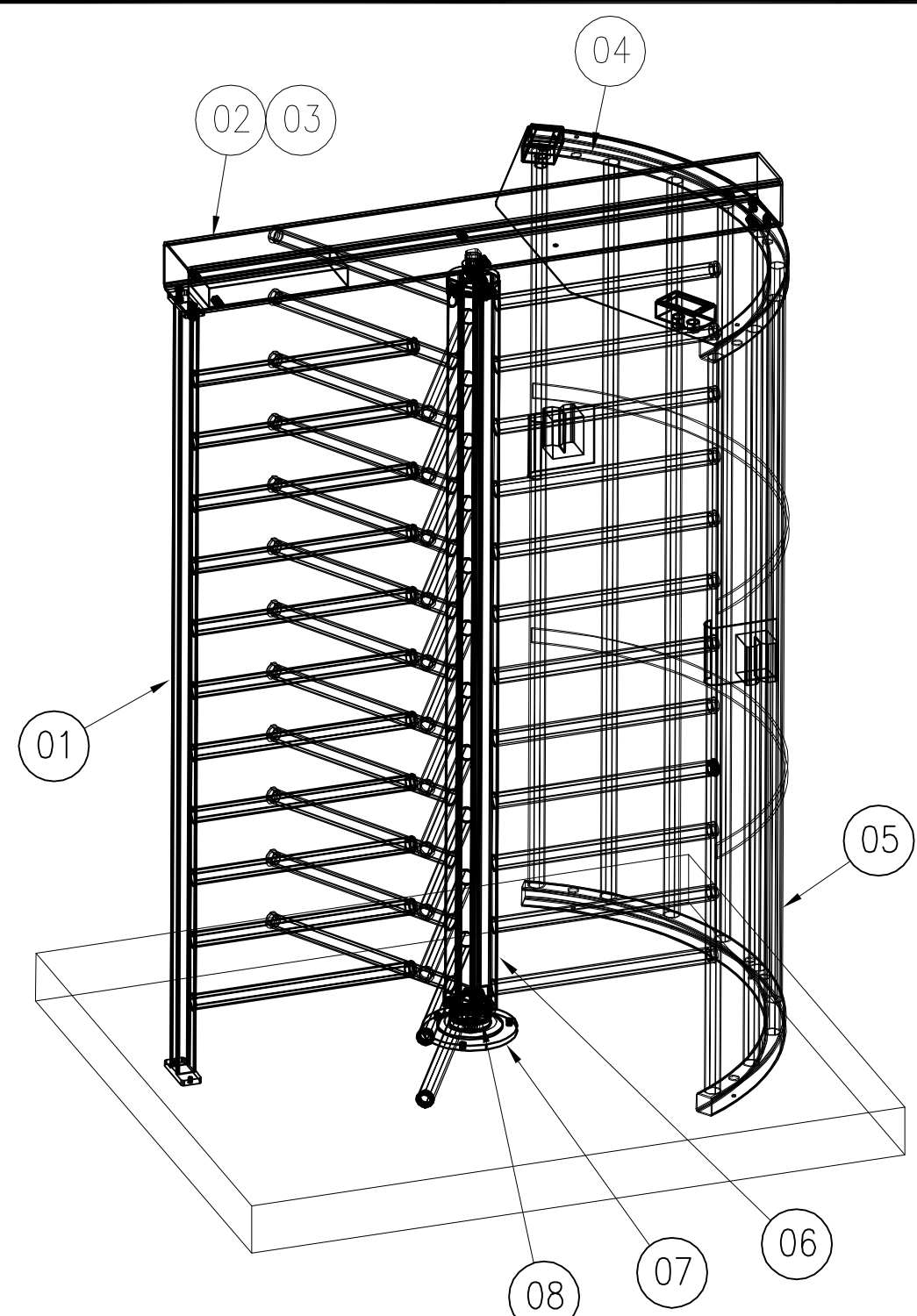
**TAB PLATE DETAIL**  
SCALE: 3" = 1'-0"  
C5  
UFC-705 | UFC-705

NOTE: CONTRACTOR SHALL HAVE PLATED BOLLARD CONNECTION ANALYZED AND STAMPED BY A REGISTERED ENGINEER FOR IT BE USED FOR ATFP PURPOSES.



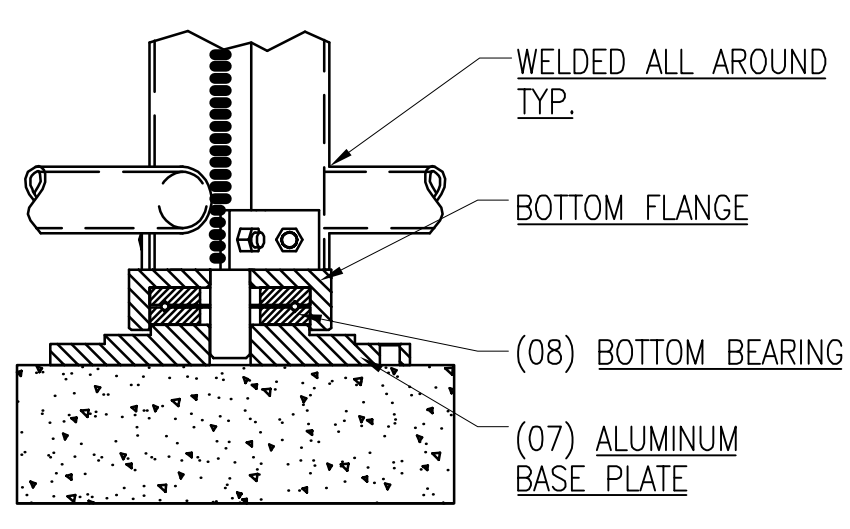
**CONC FILLED BOLLARD ~ PLATE**  
SCALE: 1" = 1'-0"  
A4  
CIVIL DWGS | UFC-705

**TURNSTILE SKETCHES:**

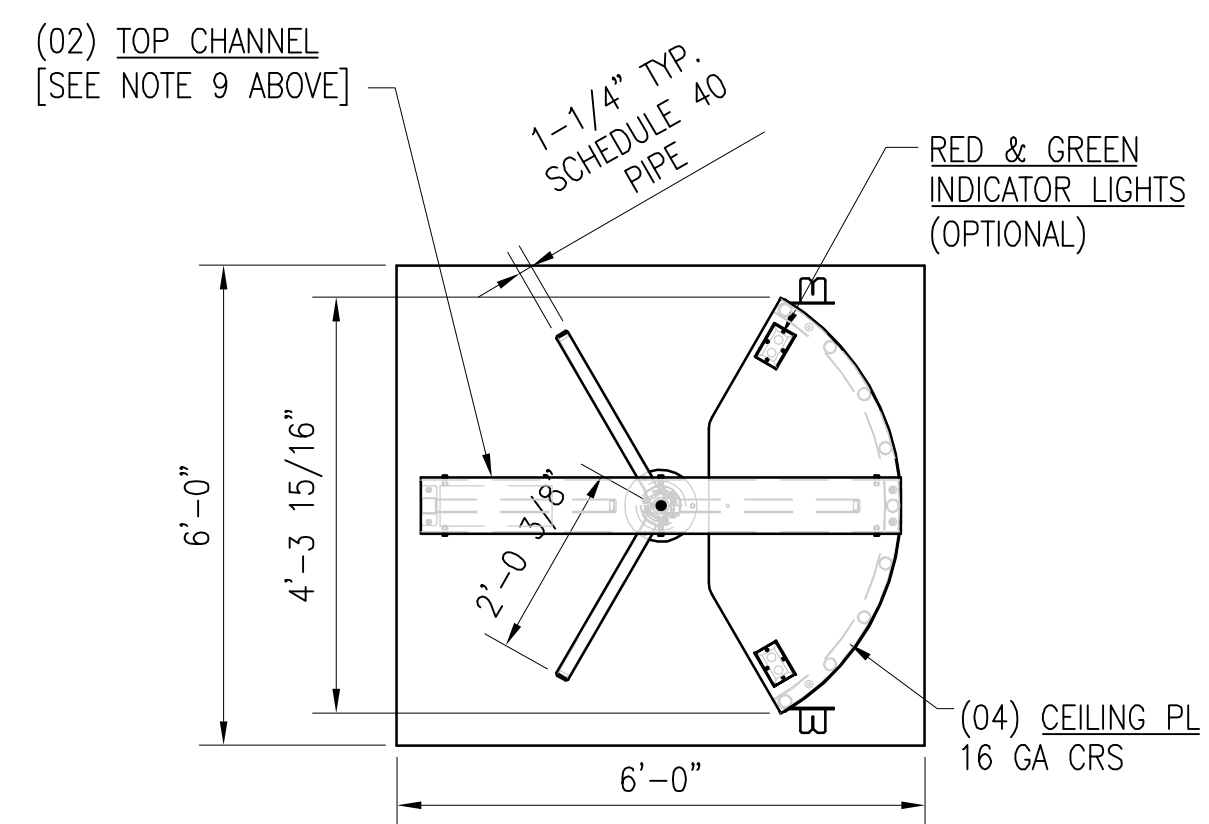


**ISOMETRIC**

NOT TO SCALE

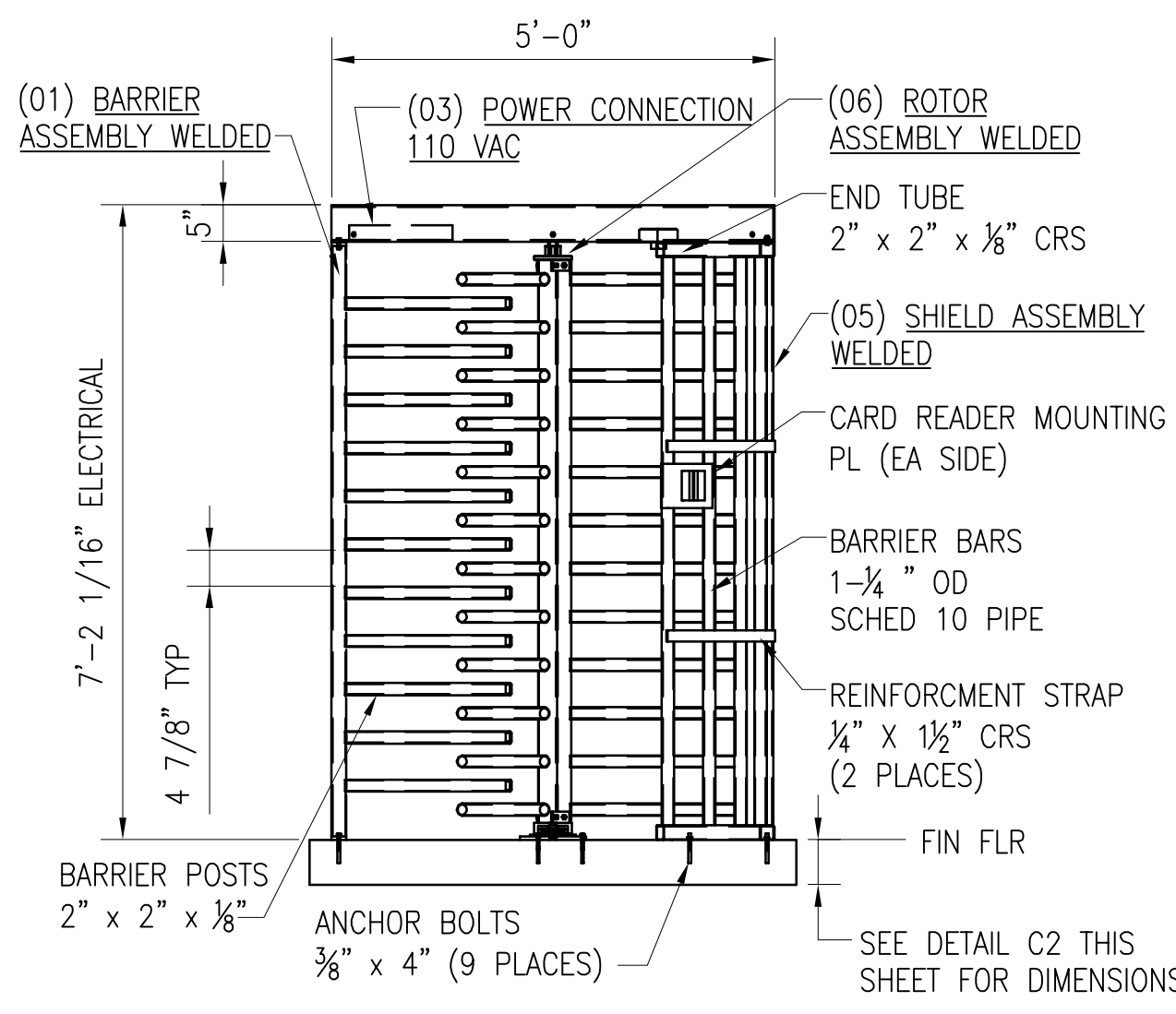


**BOTTOM BEARING DETAIL**  
NOT TO SCALE



**PLAN VIEW**

NOT TO SCALE



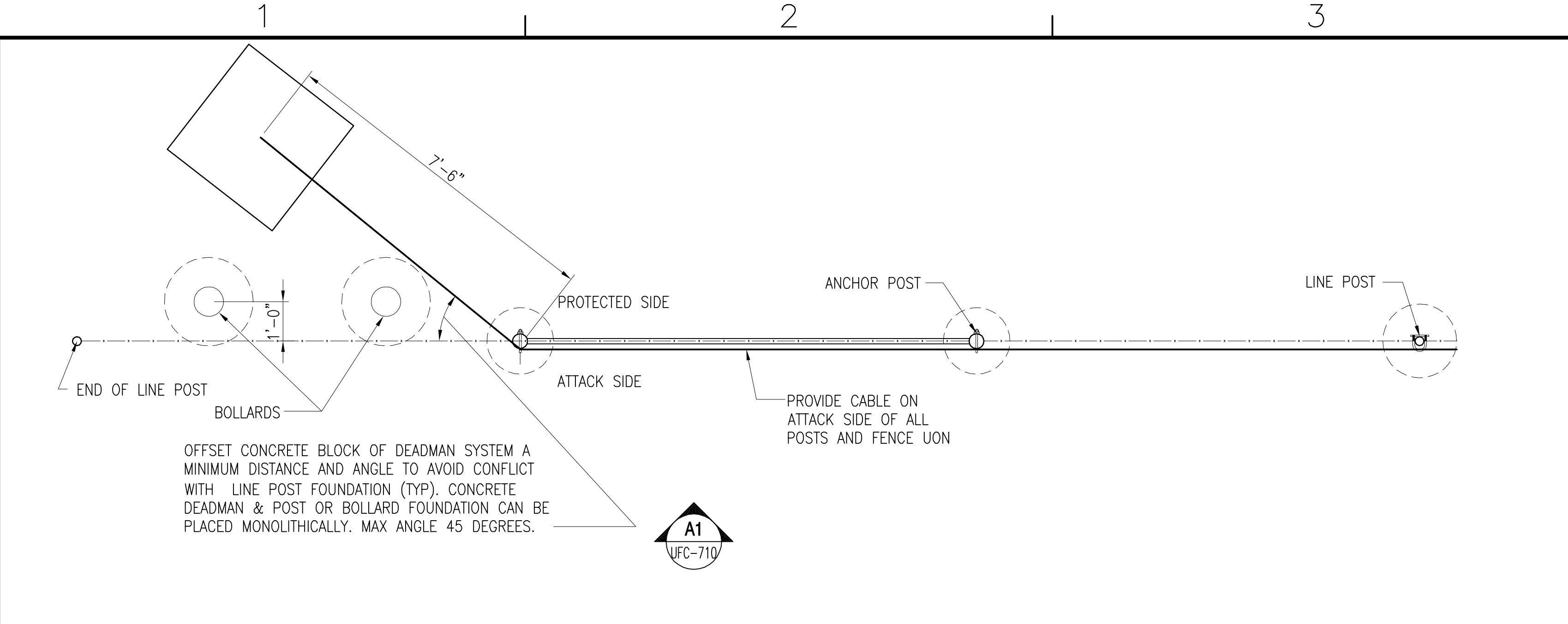
**ELEVATION VIEW**

NOT TO SCALE

UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

TYPICAL TURNSTILE AND BOLLARD DETAILS

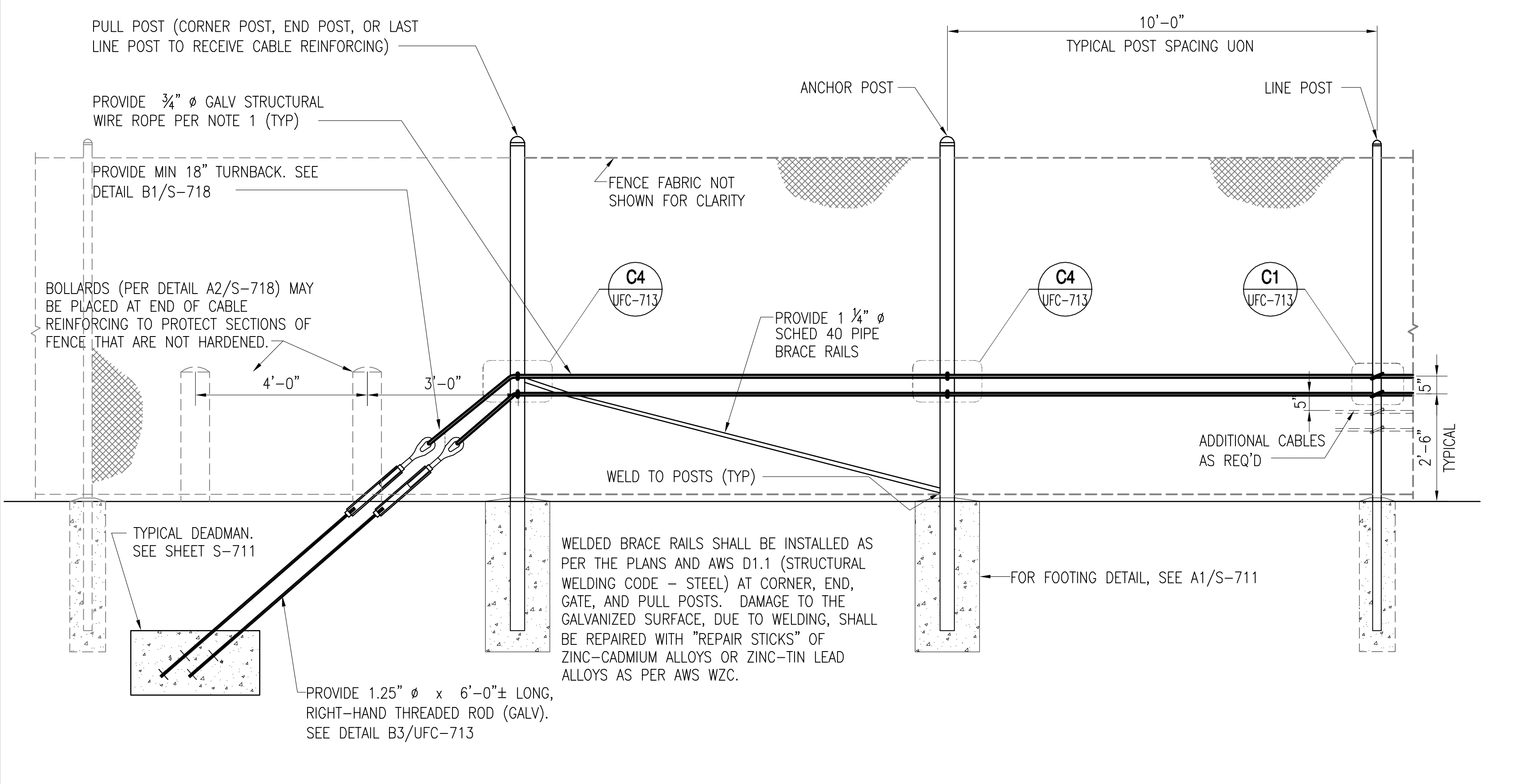
FILE NAME: P:\Core Projects\ATP-FSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\452005-UFC-710.dwg LAYOUT NAME: ### PLOTTED: Tuesday, August 28, 2007 - 3:27pm



**TYPICAL PLAN OF END POST DEADMAN AND LINE POST LAYOUT**

SCALE: 1/2" = 1'-0"

NOTE: FOR RETROFITTING OF EXIST CLF, CABLE CAN BE PLACED ON THE ATTACK SIDE OF THE FENCE FABRIC. FOR NEW CONSTRUCTION, CABLE SHALL BE INSTALLED ON ATTACK SIDE OF POST, BETWEEN POST AND FABRIC.



**TYPICAL ELEVATION OF END POST DEADMAN AND LINE POST LAYOUT**

SCALE: 1/2" = 1'-0"



**LAYOUT OF REINFORCING**

DESIGNER OF RECORD TO LOCATE DEADMEN ON SITE PLANS, SATISFYING SPACING CRITERIA, OVERLAPS, AND FENCE CORNERS / TURNING POINTS. AT GATES IT IS DESIRABLE TO HAVE TRAFFIC ON EITHER SIDE OF A MEDIAN TO OPERATE AND PROTECT INDEPENDENTLY (NOT UTILIZING THE SAME DEADMAN SYSTEMS). THEREFORE DEADMEN SHOULD BE PLACED IN THE MEDIAN TO ANCHOR THE GATE REINFORCING FOR EACH SIDE OF THE ROAD. IF THERE IS NO PHYSICAL MEDIAN (MERELY PAINTED LINES), LIMITED ROOM, OR UTILITY CONFLICTS THAT DO NOT ALLOW FOR DEADMEN PLACEMENT BETWEEN THE GATES, ENSURE THAT THE CABLING FOR BOTH GATES ARE CONNECTED-- EITHER DIRECTLY OR VIA AN INTERMEDIATE CABLE WHICH CREATES AN INTEGRAL CABLE SYSTEM ACROSS THE ENTIRE GATE AREA.

**MODIFICATIONS TO TYPICAL DESIGN**

NOTE FOR CONTRACTOR: IF LARGER DESIGN THREATS OR CUSTOMER REQUESTS INDICATE A NEED FOR GREATER SECURITY, MORE 3/4" Ø CABLES CAN BE UTILIZED OR THE CABLES CAN BE UPGRADED TO 1" Ø. BOTH SCENARIOS REQUIRE THE DEADMAN (WHICH WILL NEED TO BE LARGER) TO BE DESIGNED BY A PROFESSIONAL ENGINEER TO SATISFY THE CRITERIA OUTLINED IN REINF NOTE 18 ON THIS SHEET. FOR BIDDING PURPOSES, ESTABLISH A UNIT COST FOR ADDITIONAL EXCAVATION AND NEW CONCRETE PER CUBIC FOOT.

IF 1" Ø CABLE IS USED, SPECIFICATIONS SHALL MATCH REINF NOTE 1 ON THIS SHEET, EXCEPT THE CABLE SHALL HAVE A MINIMUM BREAKING STRENGTH OF 70,000 POUNDS (35 TONS). OTHER COMPONENTS, SUCH AS EYEBOLTS, U-BOLTS, ROPE CLIPS, THIMBLES, AND OTHER ASSOCIATED HARDWARE SHALL BE SIZED ACCORDINGLY.

**REINFORCING NOTES**

- REINFORCING CABLES SHALL BE U.S. DOMESTIC 3/4" Ø 6x19 CLASS WIRE ROPE, REGULAR LAY, EXTRA IMPROVED PLOW STEEL (EIP), INDEPENDENT WIRE ROPE CORE (IWRC), CONFORMING TO ASTM A1023 AND GALVANIZED IN ACCORDANCE WITH ASTM A475 CLASS A, & HAVE A MINIMUM BREAKING STRENGTH OF 40,000 POUNDS (20 TONS). CABLES WITH A BLACK VINYL COATING, SHALL NOT BE IMPREGNATED.
- CABLES SHALL BE CONTINUOUS FROM DEADMAN TO DEADMAN. NO SPLICES IN CABLE SHALL BE ALLOWED. CABLE BARRIER SHALL BE INSTALLED BETWEEN FENCE POST AND FENCE FABRIC AS PER PLANS. U-BOLTS SHALL BE INSTALLED PERPENDICULAR TO THE LAY OF THE STRANDS OF THE WIRE ROPE AND SHALL BE TIGHTENED AFTER SAG IN CABLE BARRIER HAS BEEN REMOVED. UNLESS INDICATED OTHERWISE, CONCRETE DEADMAN SPACING SHALL BE AT MAXIMUM 200' INTERVALS & TURNING POINTS (EXTERNAL CORNERS).
- WIRE ROPE ENDS SHALL TERMINATE AROUND TURNBUCKLES, GATE POSTS OR EXTRA HEAVY-DUTY WIRE ROPE THIMBLES (AT GATES). THESE TERMINATIONS REQUIRE 18" MINIMUM OF ROPE FOR TURN BACK AND A MINIMUM OF (4)- CLIPS EACH (EQUAL SPACING).
- CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO ORDERING MATERIALS.
- DEADMEN SHALL BE INSTALLED ON THE SECURED SIDE (INTERIOR) OF THE FENCE; WHILE CABLES SHALL BE INSTALLED ON THE EXTERIOR SIDE OF POST.
- PROVIDE NECESSARY SLACK IN CABLES (GATES ONLY) TO ALLOW FOR FULL SWING OF ALL GATE LEAVES.
- OFFSET DEADMAN SYSTEMS FROM FENCELINE (PLAN VIEW) TO AVOID CONFLICT WITH EXISTING FENCE POSTS.
- ALLOW EPOXY ANCHOR BOLTS (MIN 2 DAYS) & CONCRETE DEADMEN (MIN 7 DAYS) TO CURE, PRIOR TO APPLYING LOADS (INSTALLING TURNBUCKLES & STRAIGHTENING CABLES).
- ALL WELDING SHALL BE DONE IN ACCORDANCE WITH AWS D1.1. ALL WELD MATERIAL SHALL BE E70XX ELECTRODES.
- STRUCTURAL STEEL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE NINTH EDITION OF THE AISC "MANUAL OF STEEL CONSTRUCTION FOR ALLOWABLE STRESS DESIGN.
- STRUCTURAL STEEL SHALL CONFORM TO ASTM A36 AND SHALL HAVE A MINIMUM YIELD STRESS OF 36,000 PSI.
- ALL STRUCTURAL STEEL MEMBERS AND HARDWARE USED IN CABLE ANCHORING SYSTEM SHALL BE HOT-DIPPED GALVANIZED. ANY AREAS WHERE COATING IS DAMAGED OR REMOVED SHALL BE COVERED WITH A ZINC RICH COMPOUND.
- TURNBUCKLES SHALL BE 1 1/4"x18", TYPE I, GALVANIZED IN ACCORDANCE WITH ASTM F1145.
- WIRE ROPE CLAMPS SHALL BE TYPE I, GALVANIZED, AND CONFORM TO FS FF-C-450.
- ALL THREADED RODS, U-BOLTS, AND BOLTS SHALL CONFORM TO ASTM A307 AND SHALL BE INSTALLED WITH F844 WASHERS AND A563 NUTS. ENTIRE BOLT ASSEMBLY SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
- ZINC RICH COMPOUND FOR REPAIRS SHALL BE 95% METALLIC ZINC, BY WEIGHT IN DRIED FILM; CONFORMING TO FED SPEC DOD-P-21035A & MEETING MILITARY SPEC MIL-P-26915A. INSTALL AT LEAST TWO COATS, 4 MILS MIN TOTAL THICKNESS.
- ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ACI 318. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI. THE MINIMUM CONCRETE COVER SHALL BE 3", UNLESS OTHERWISE NOTED.
- DESIGN CRITERIA:  
UFC 4-022-03 "SECURITY ENGINEERING: FENCES AND GUARD FACILITIES"  
  
NFESC UG-2031-SHR "USER'S GUIDE ON PROTECTION AGAINST VEHICLE BOMBS" (5/98)
- AT CABLE REINFORCING GATES, PROVIDE TWIST-OFF METAL TIES TO SECURE CABLE TO GATE FABRIC @ 24" OC & U-BOLTS TO SECURE TO GATE UPRIGHTS. MODIFY AS NEEDED TO FACILITATE OPERATION OF GATE.

**GRAPHIC SCALES**

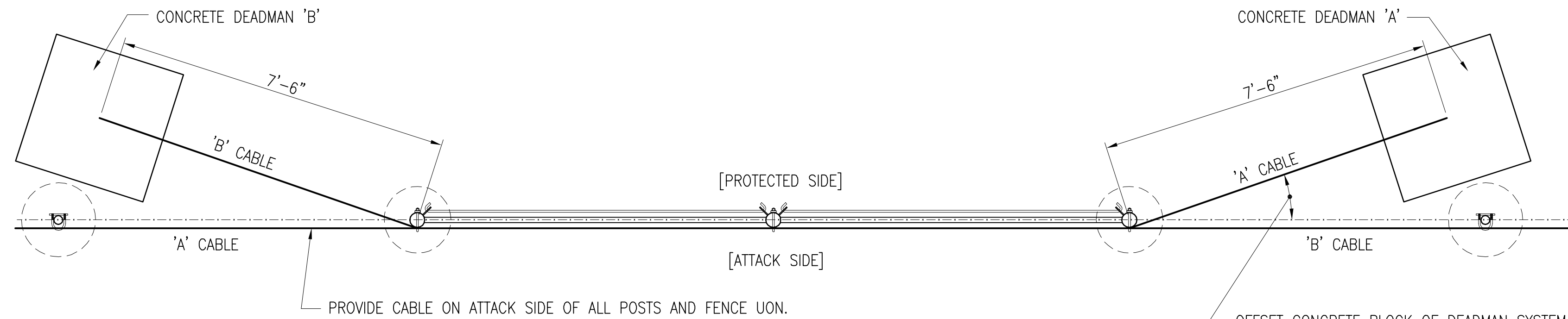


UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

UFC-710

DRAWING REVISION: 24 AUGUST 2007

1 2 3 4 5

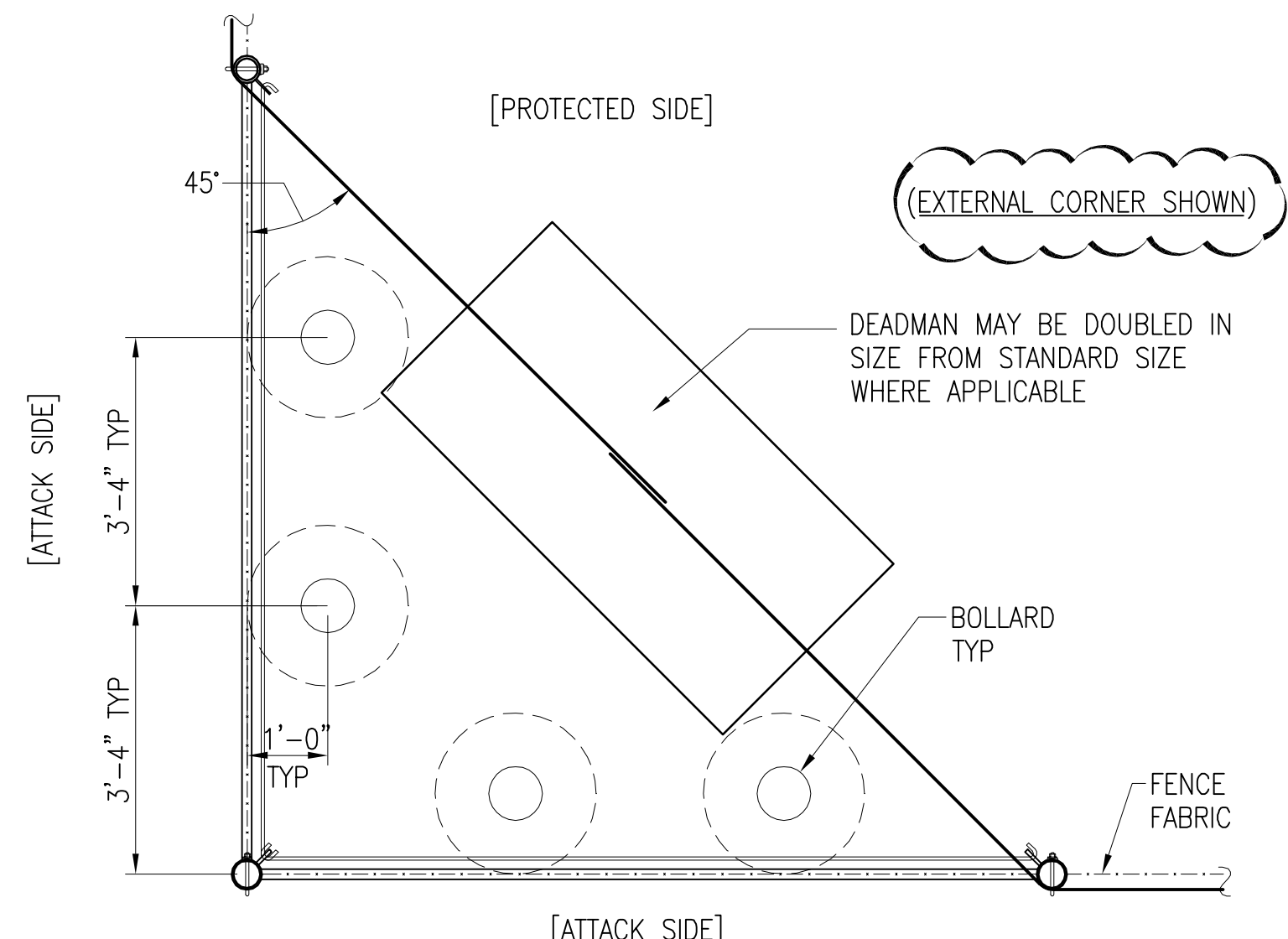


NOTE: FOR RETROFITTING OF EXIST CLF, CABLE CAN BE PLACED ON THE ATTACK SIDE OF THE FENCE FABRIC. FOR NEW CONSTRUCTION, CABLE SHALL BE INSTALLED ON ATTACK SIDE OF POST, BETWEEN POST AND FABRIC.

**TYPICAL PLAN OF DEADMAN AND LINE POST LAYOUT**

SCALE: 1/2" = 1'-0"

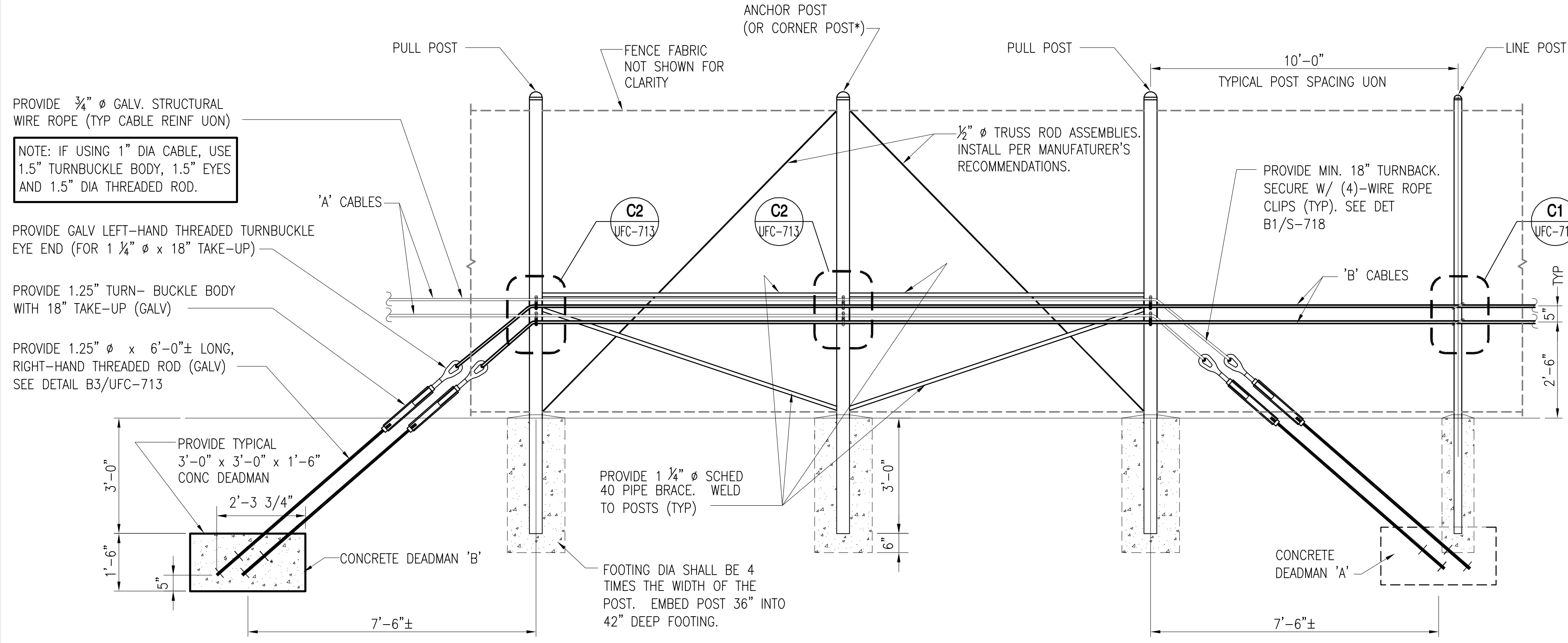
A1  
UFC-711



**TYPICAL PLAN OF TURNING POINT POST LAYOUT**

SCALE: 1/2" = 1'-0"

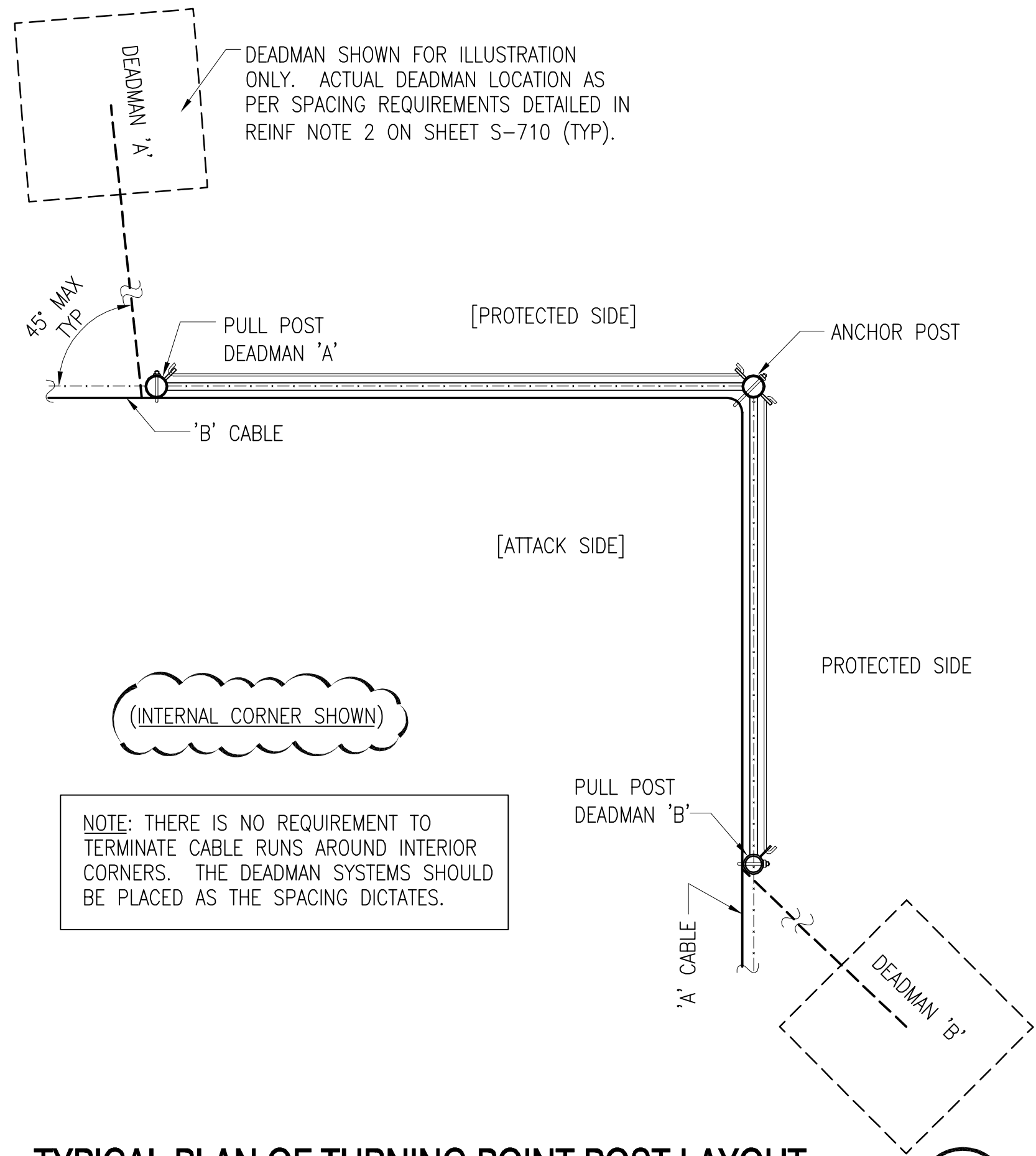
C4  
CIVIL DWGS UFC-711



**TYPICAL ELEVATION OF DEADMAN AND LINE POST LAYOUT**

SCALE: 1/2" = 1'-0"

A1  
CIVIL DWGS UFC-711



**TYPICAL PLAN OF TURNING POINT POST LAYOUT**

NOT TO SCALE

A4  
CIVIL DWGS UFC-711

**GRAPHIC SCALES**

1/2" = 1'-0"

0 1' 2' 4'

UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

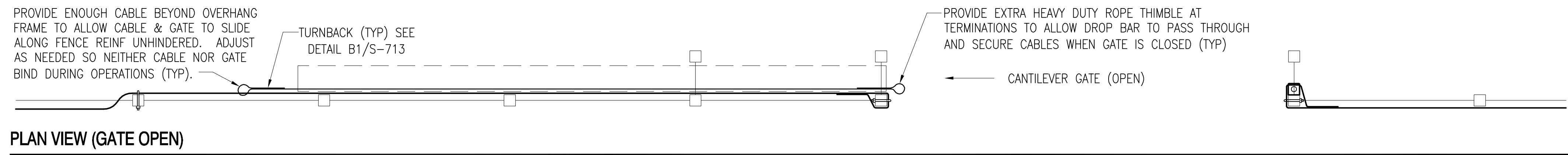
TYPICAL CABLE REINF CHAIN LINK FENCE-DEADMAN AND LINE POST

UFC-711

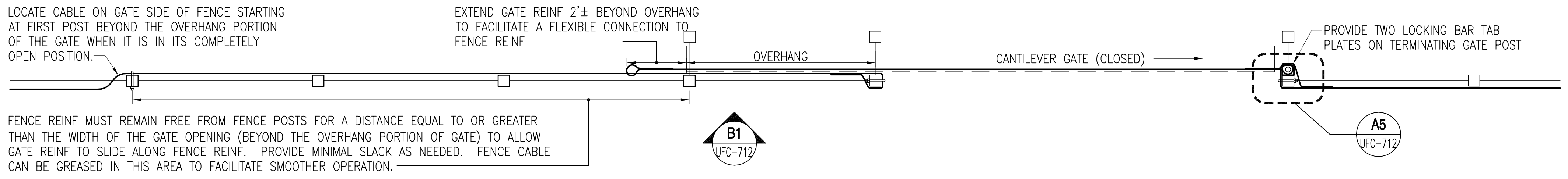
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DRAWING REVISION: 24 AUGUST 2007

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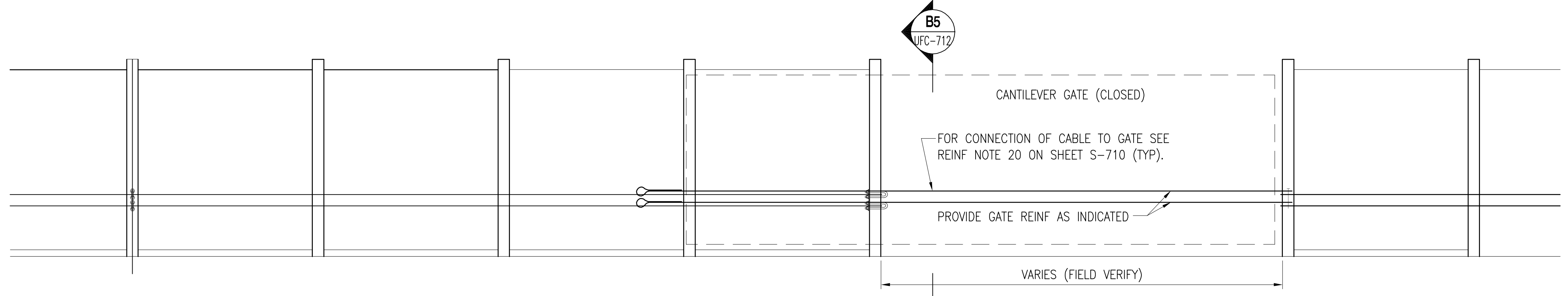


**PLAN VIEW (GATE OPEN)**



**PLAN VIEW (GATE CLOSED)**

SCALE: 1/2" = 1'-0"

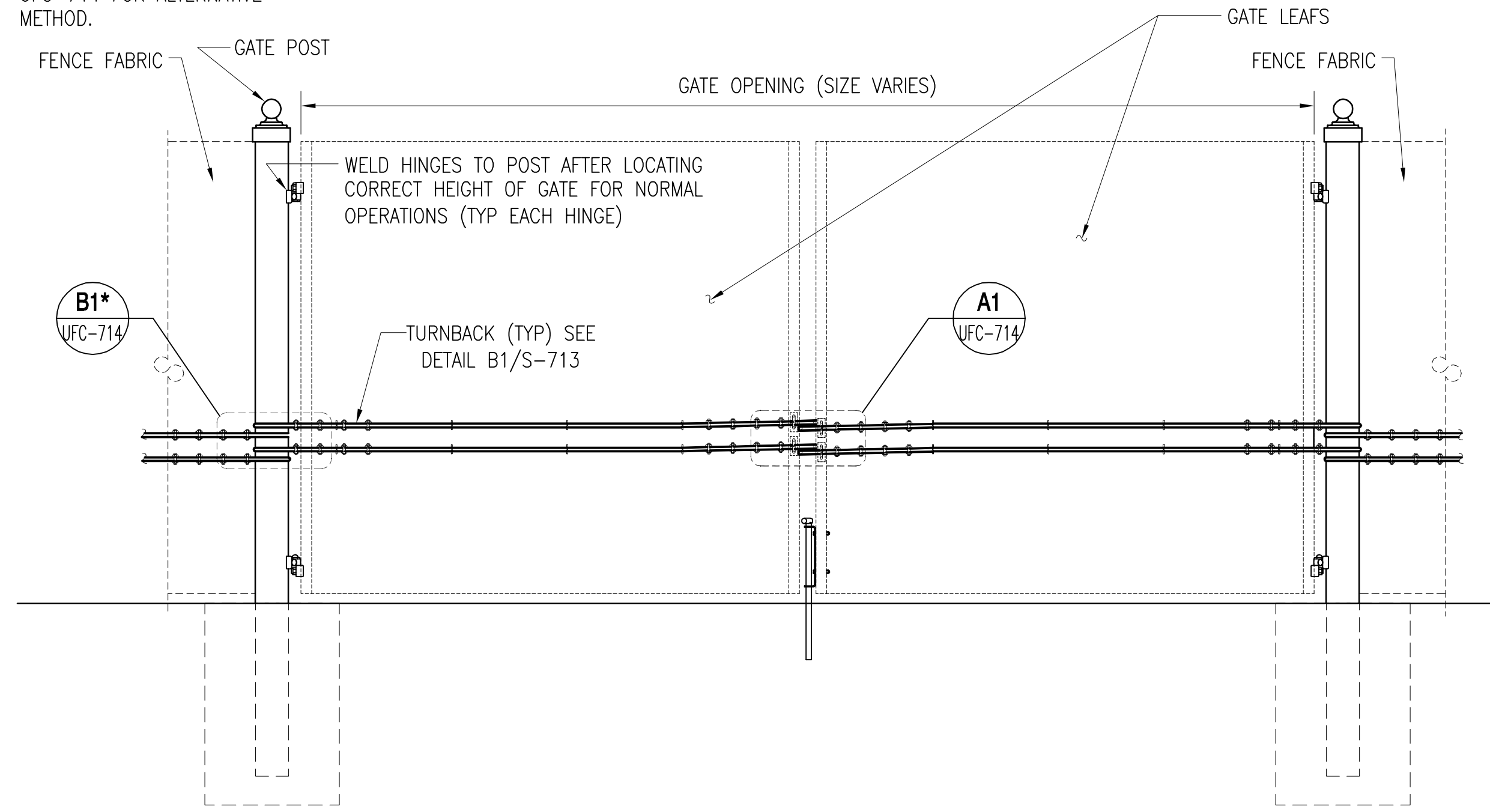


**ELEVATION - TYPICAL CABLE REINFORCING CANTILEVER SLIDE GATE**

SCALE: 1/2" = 1'-0"

CIVIL DWGS UFC-712

\*NOTE: SEE DETAIL D1 ON SHEET UFC-714 FOR ALTERNATIVE METHOD.

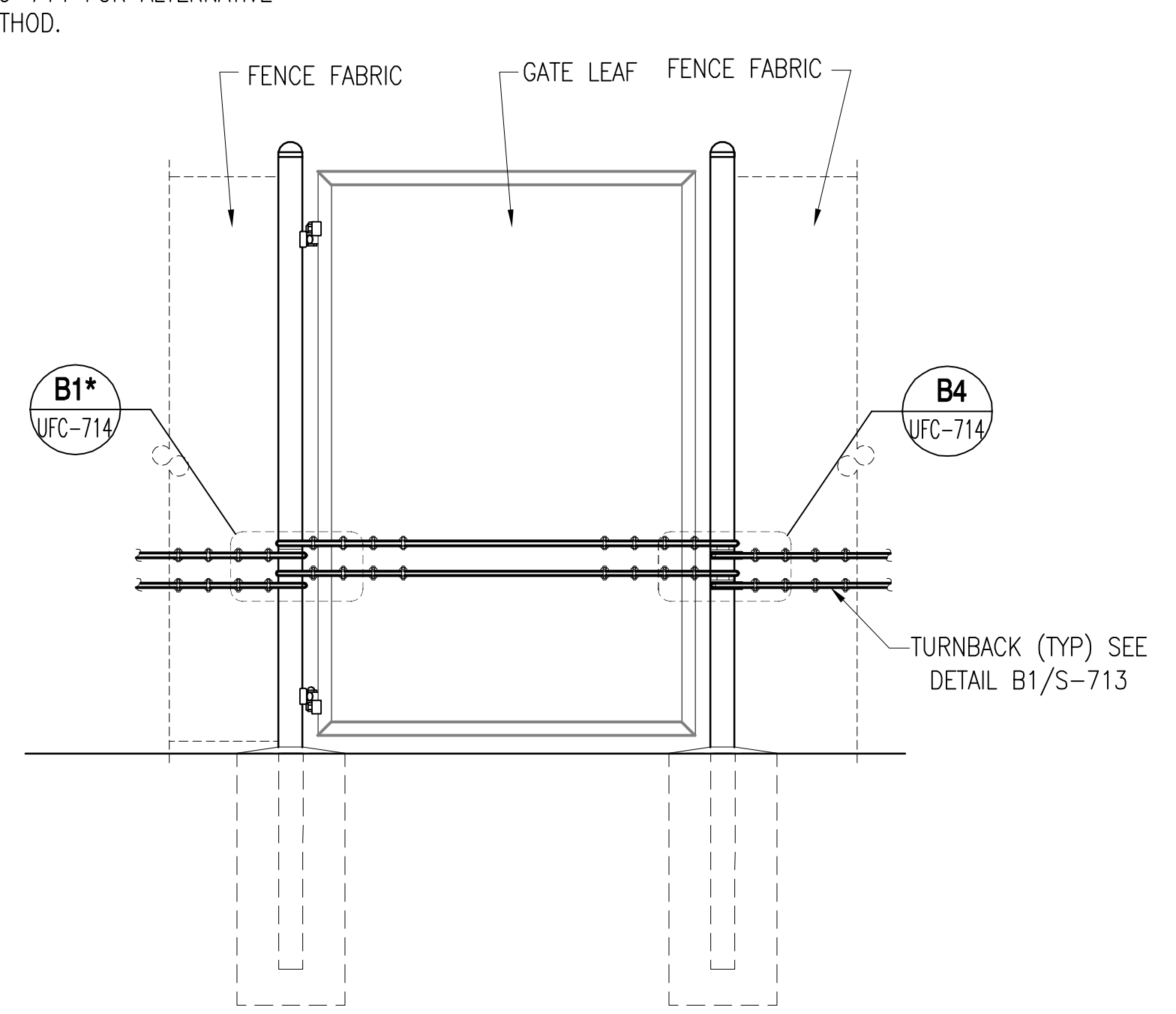


**ELEVATION - TYP CABLE REINFORCING DOUBLE FOR SWING GATE**

SCALE: 1/2" = 1'-0"

CIVIL DWGS UFC-712

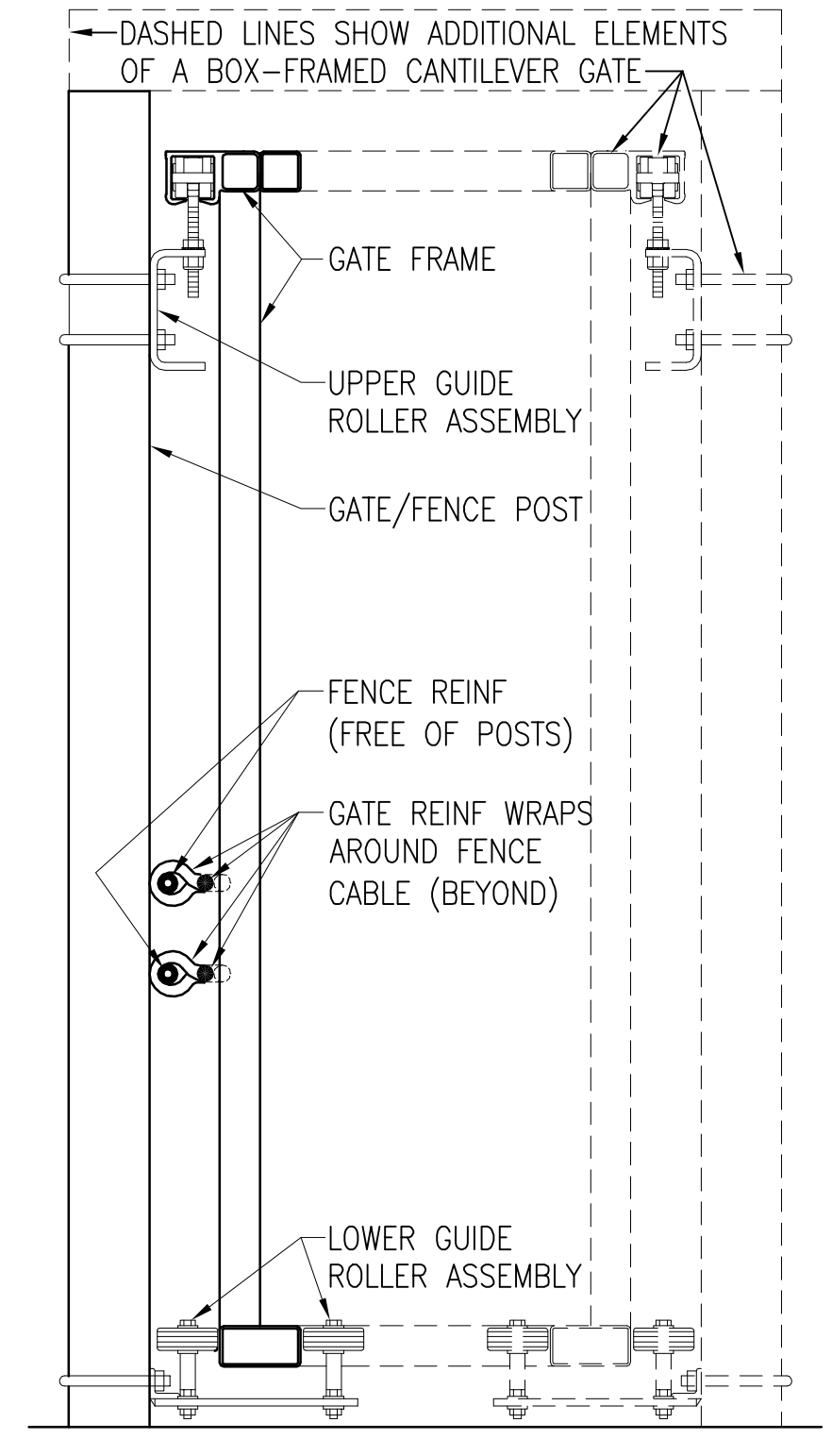
\*NOTE: SEE DETAIL D1 ON SHEET UFC-714 FOR ALTERNATIVE METHOD.



**ELEVATION - TYP CABLE REINF SINGLE SWING GATE**

SCALE: 1/2" = 1'-0"

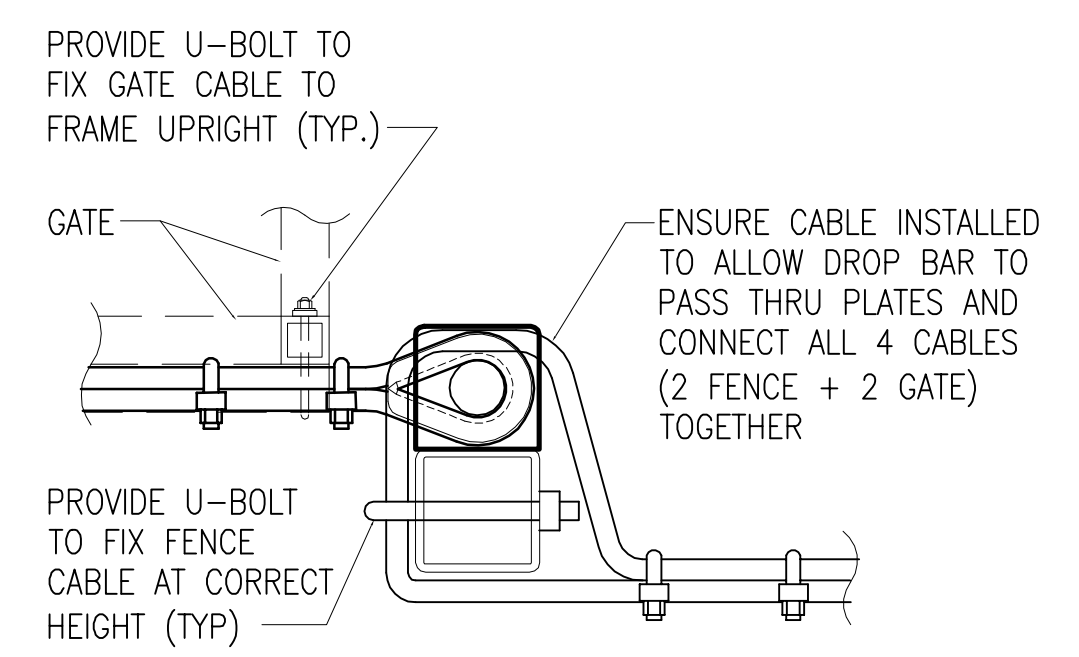
CIVIL DWGS UFC-712



**GATE SECTION**

SCALE: 1/2" = 1'-0"

CIVIL DWGS UFC-712

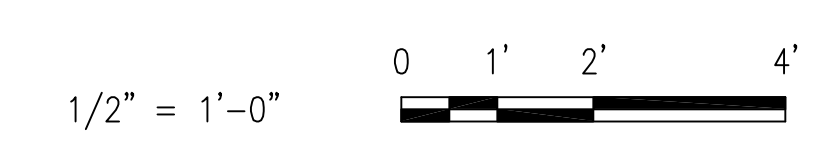


**GATE SECTION**

NOT TO SCALE

CIVIL DWGS UFC-712

**GRAPHIC SCALES**

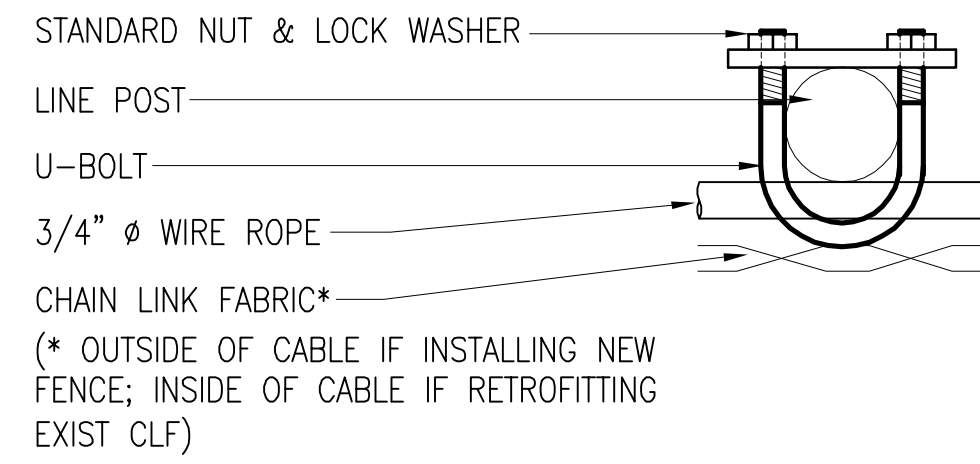


UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

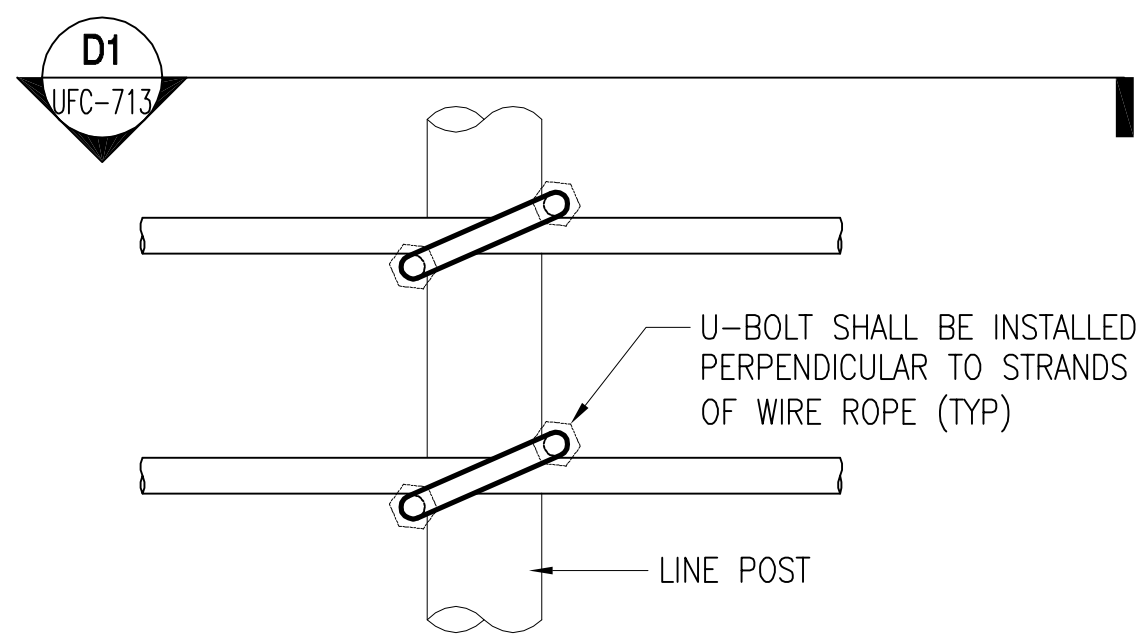
TYPICAL CABLE REINFORCED CHAIN LINK FENCE - GATES

UFC-712

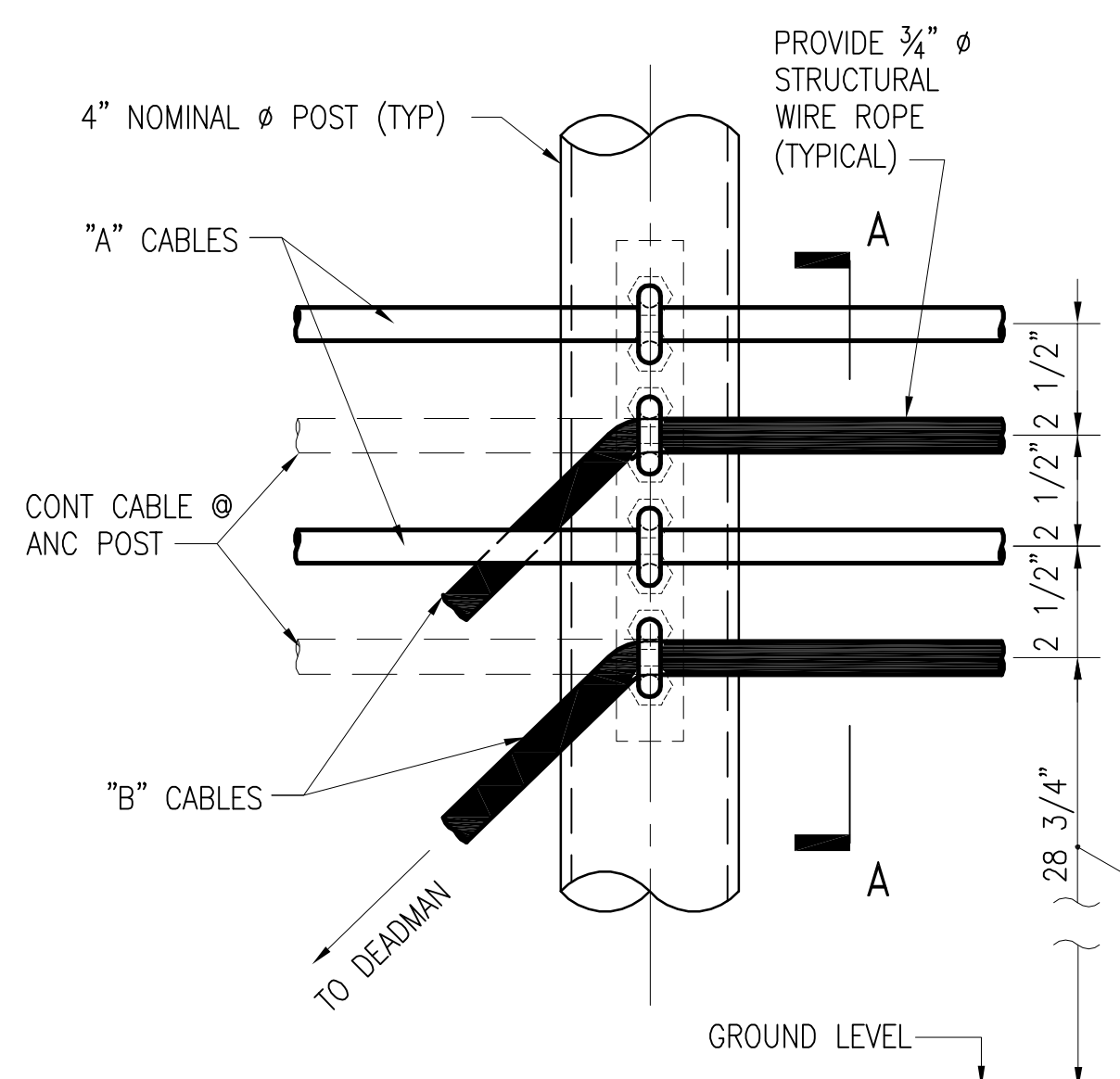
DRAWING REVISION: 24 AUGUST 2007



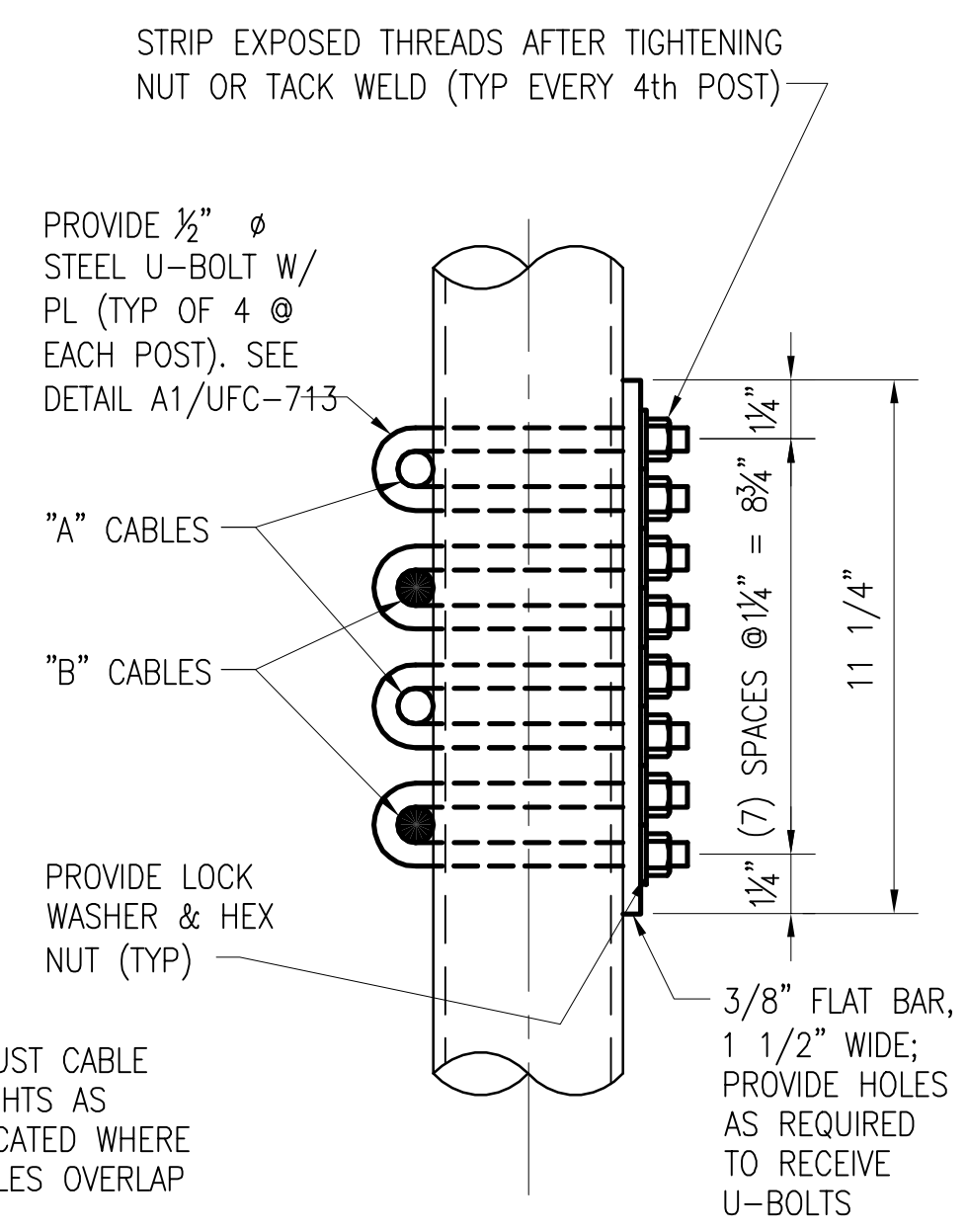
**PLAN**  
SCALE: 3" = 1'-0"  
UFC-713



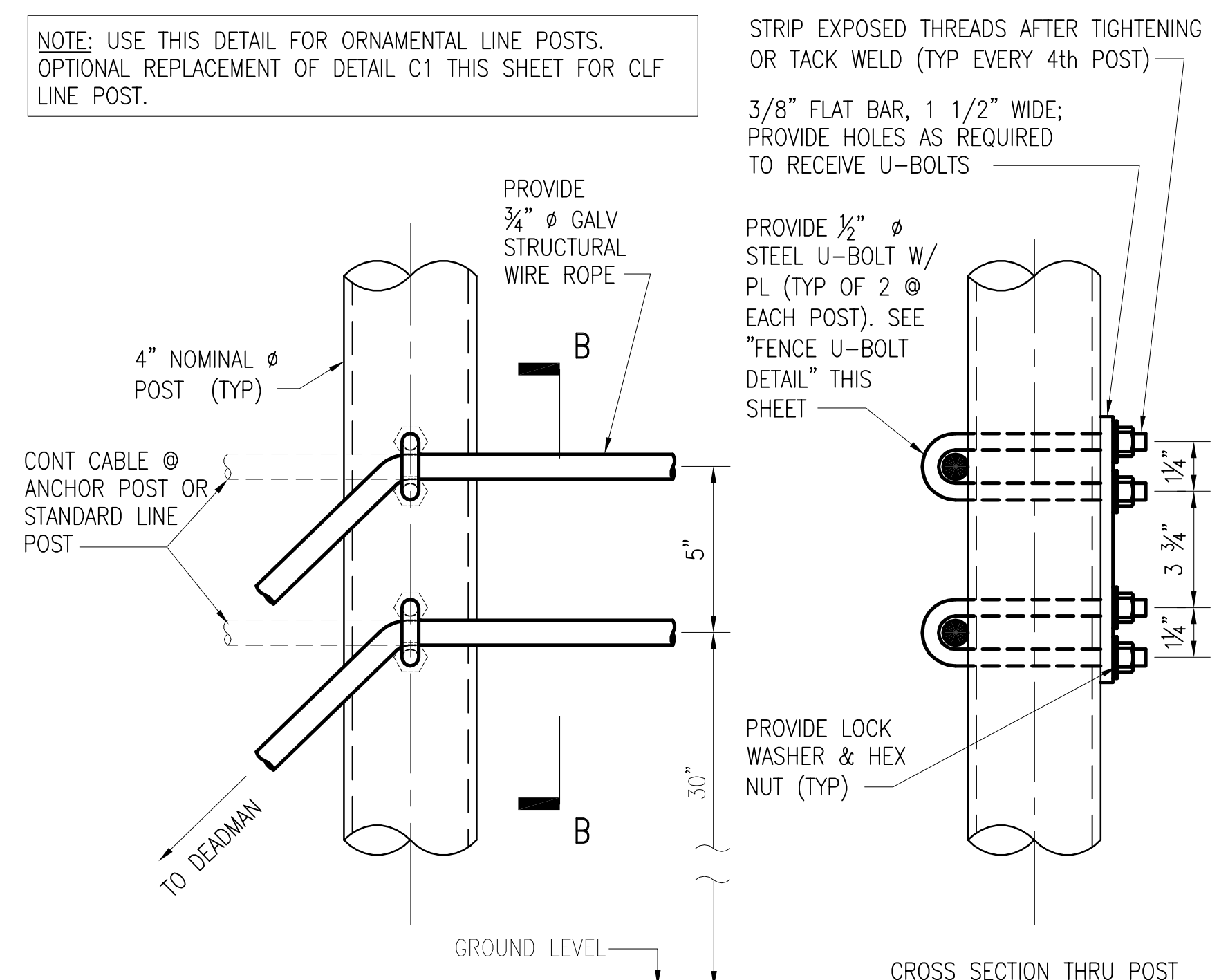
**LINE POST DETAIL (CLF ONLY)**  
SCALE: 3" = 1'-0"  
UFC-711, UFC-710, UFC-713



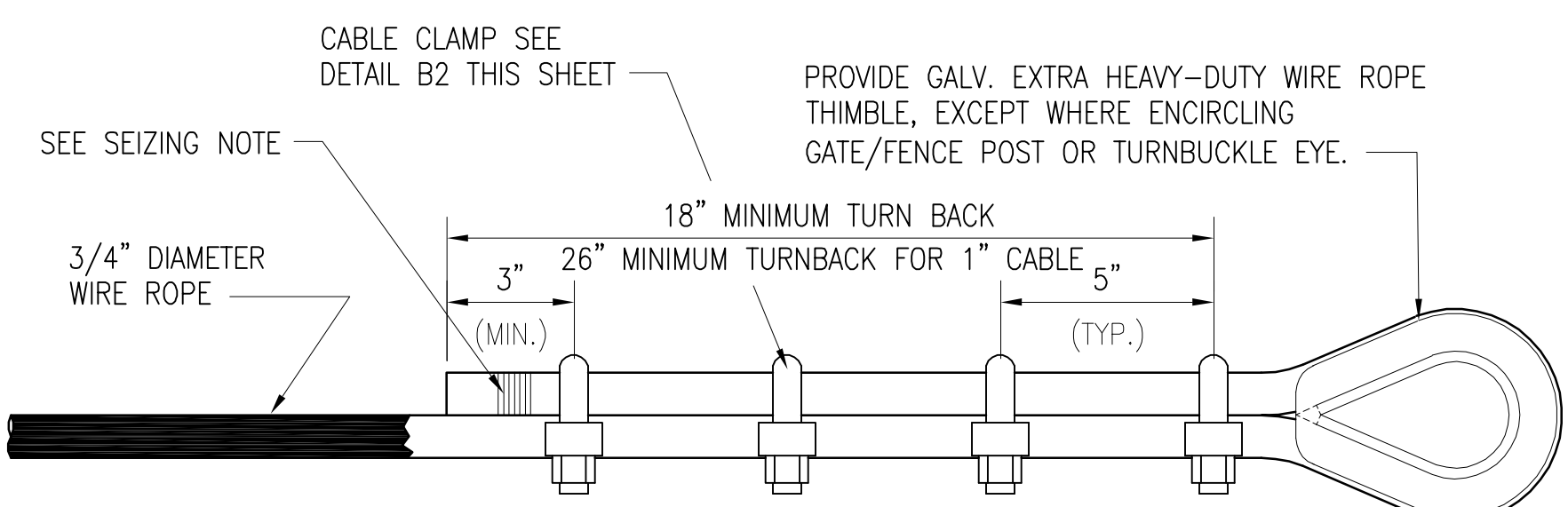
**CABLE ANCHORAGE DETAIL @ PULL & ANCHOR POST W/ OVERLAPPING CABLES**  
SCALE: 3" = 1'-0"  
UFC-710, UFC-713



**SECTION A - A**



**CABLE ANCHORAGE DETAIL @ PULL & ANCHOR POST**  
SCALE: 3" = 1'-0"  
UFC-711, UFC-713

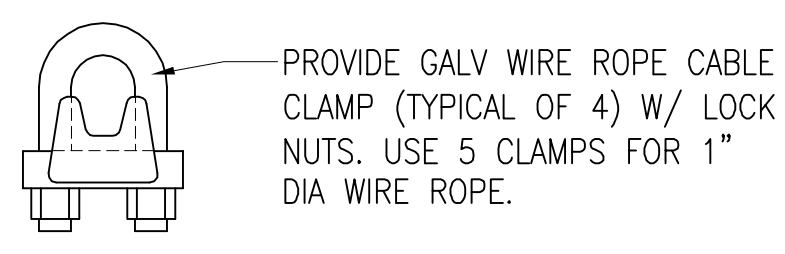


**ORNAMENTAL FENCE NOTE:** STRIP VINYL COATING OFF WIRE ROPE IN AREA OF CLIPS AND THIMBLE (APPROX. LAST 4'-6").

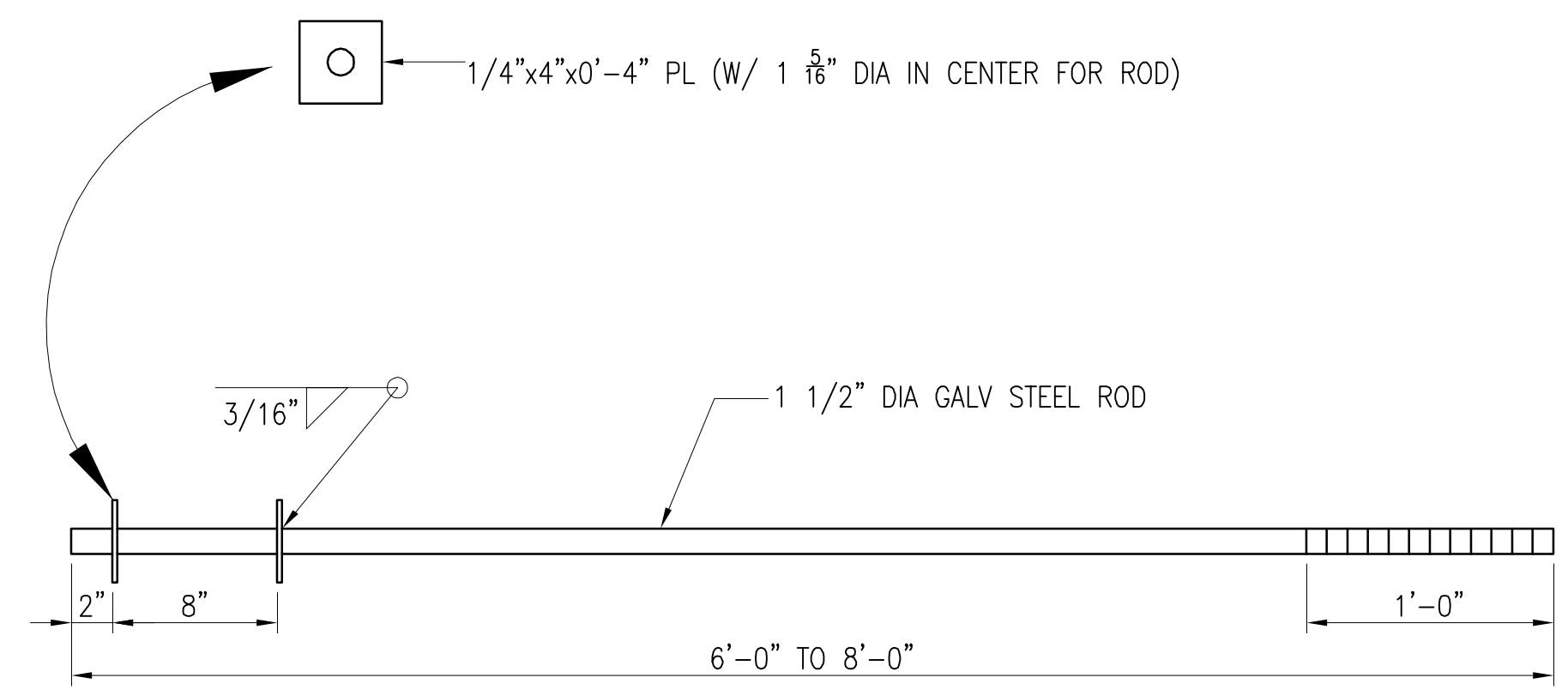
**NOTE (ALL FENCE TYPES):** INSTALL SADDLE OF CLIPS ON LIVE SIDE (AS SHOWN), SEIZE CUT END OF WIRE ROPE, AND TORQUE NUTS PER MANUFACTURER'S RECOMMENDATIONS (TYP).

**SEIZING NOTE:** WIND SEIZING WIRE IN A TIGHT SPIRAL AROUND THE ROPE END TO A 1" LENGTH OF SEIZING. TWIST THE TWO ENDS OF THE SEIZING WIRE AT THE CENTER OF THE SEIZING LENGTH. USE ZINC COATED STEEL WIRE.

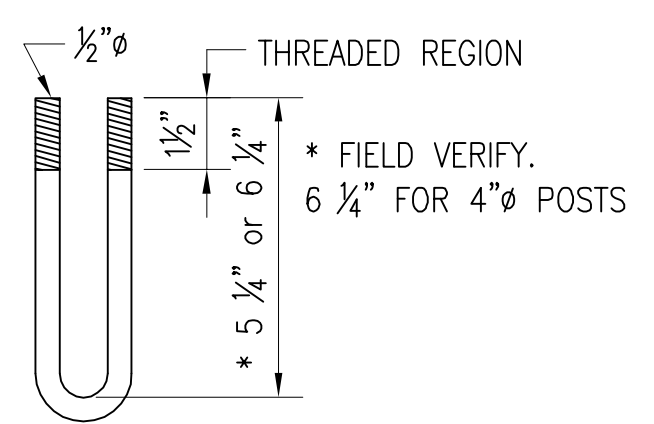
**TYPICAL TURNBACK AND CLAMP DETAIL**  
SCALE: 3" = 1'-0"  
UFC-710, UFC-711, UFC-712, UFC-720, UFC-721, UFC-722, UFC-713



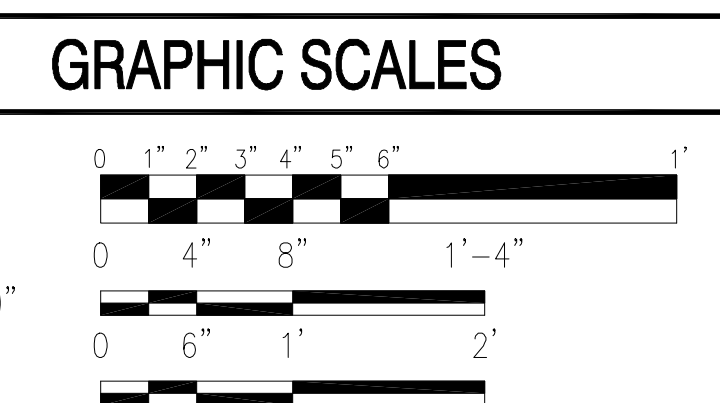
**CLAMP DETAIL**  
NOT TO SCALE  
UFC-713, UFC-713



**DEADMAN ANCHOR ROD**  
SCALE: 1 1/2" = 1'-0"  
UFC-710, UFC-711, UFC-713



**FENCE U-BOLT DETAIL**  
SCALE: 3" = 1'-0"  
UFC-713, UFC-713



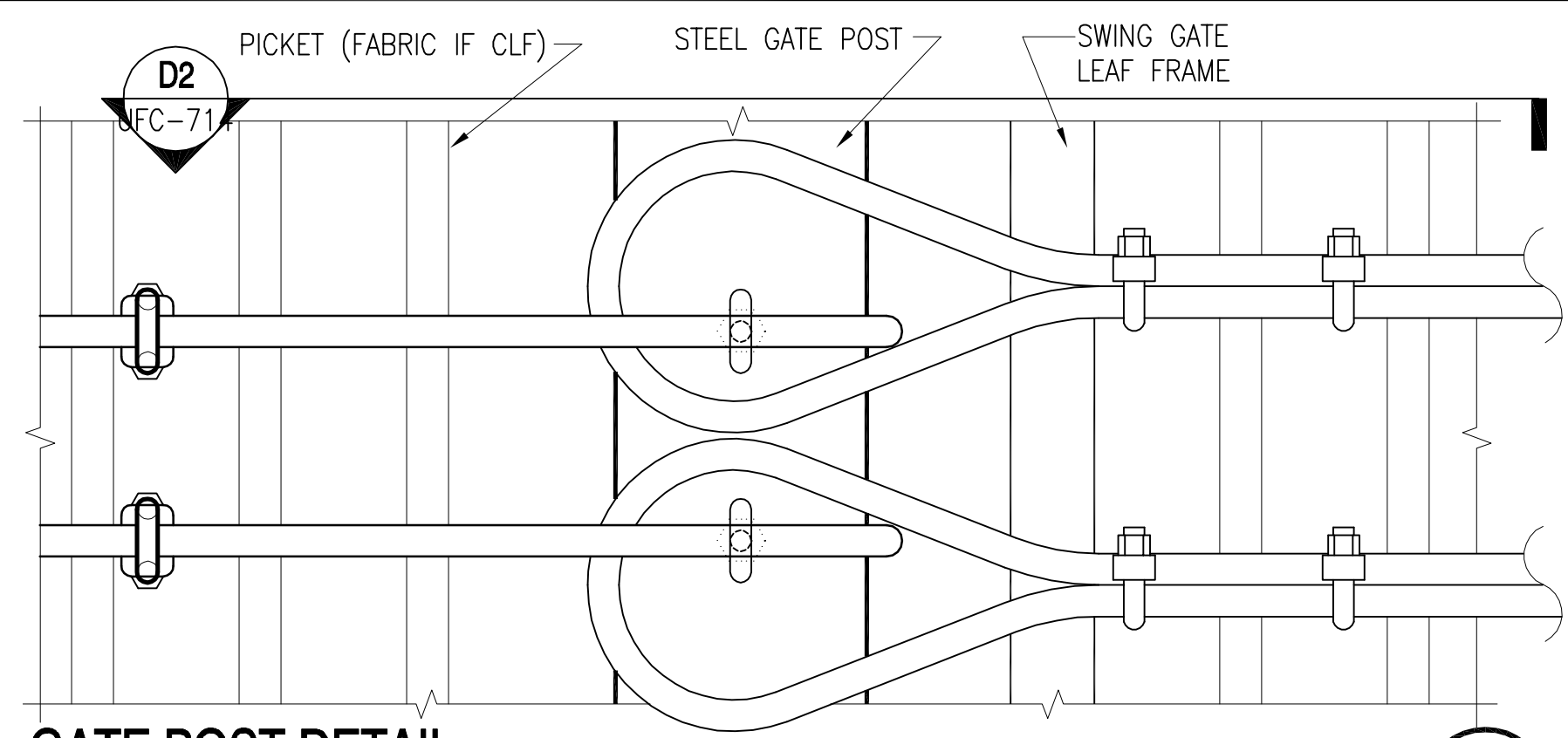
UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

UFC-713

DRAWFORM REVISION: 24 AUGUST 2007

FILE NAME: P:\Core Projects\ATP-FSE\452005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\452005-UFC-713.dwg LAYOUT NAME: Layout1 PLOTTED: Tuesday, August 28, 2007 3:37pm

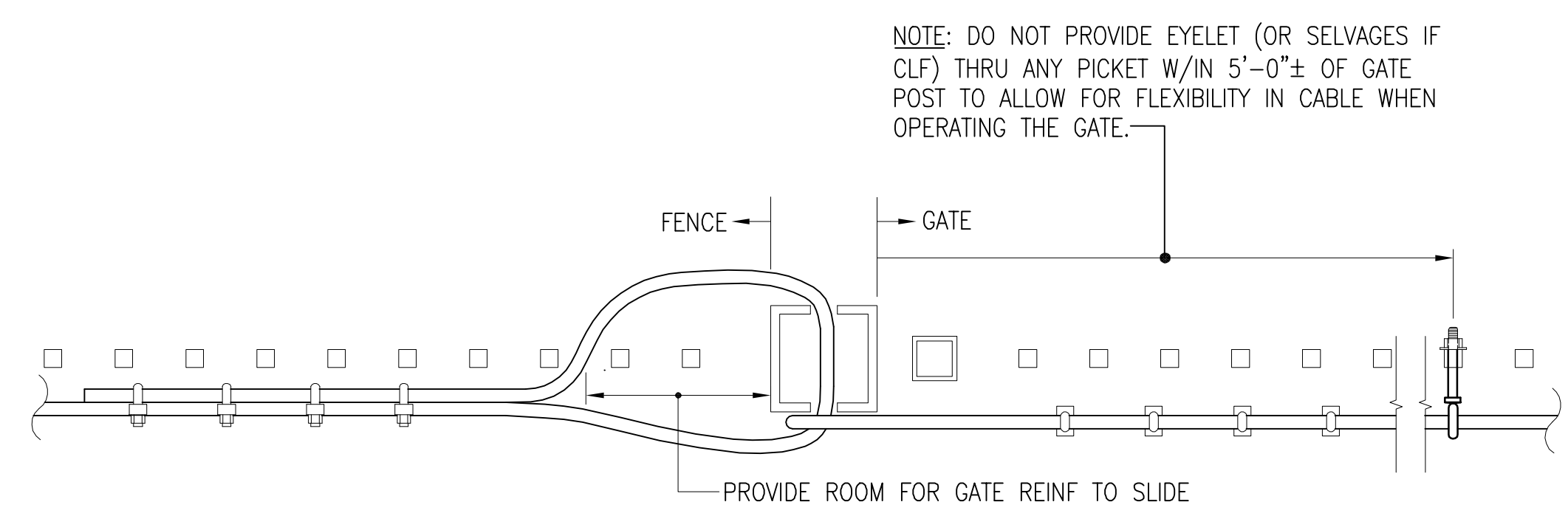
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**GATE POST DETAIL**

SCALE: 3" = 1'-0"

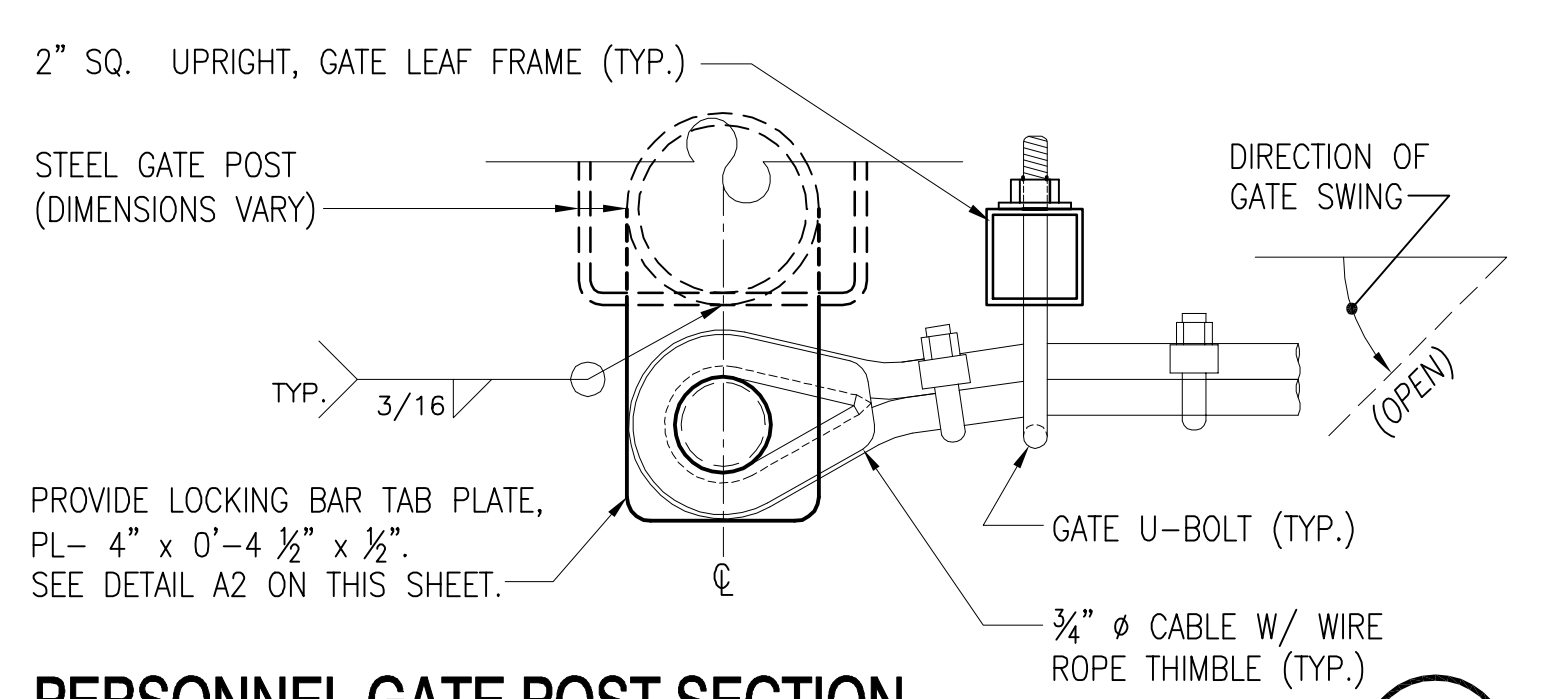
UFC-712, UFC-714 & UFC-722



**ALTERNATIVE CABLE LASHING - ORNAMENTAL SHOWN (CLF SIMILAR)**

SCALE: 1 1/2" = 1'-0"

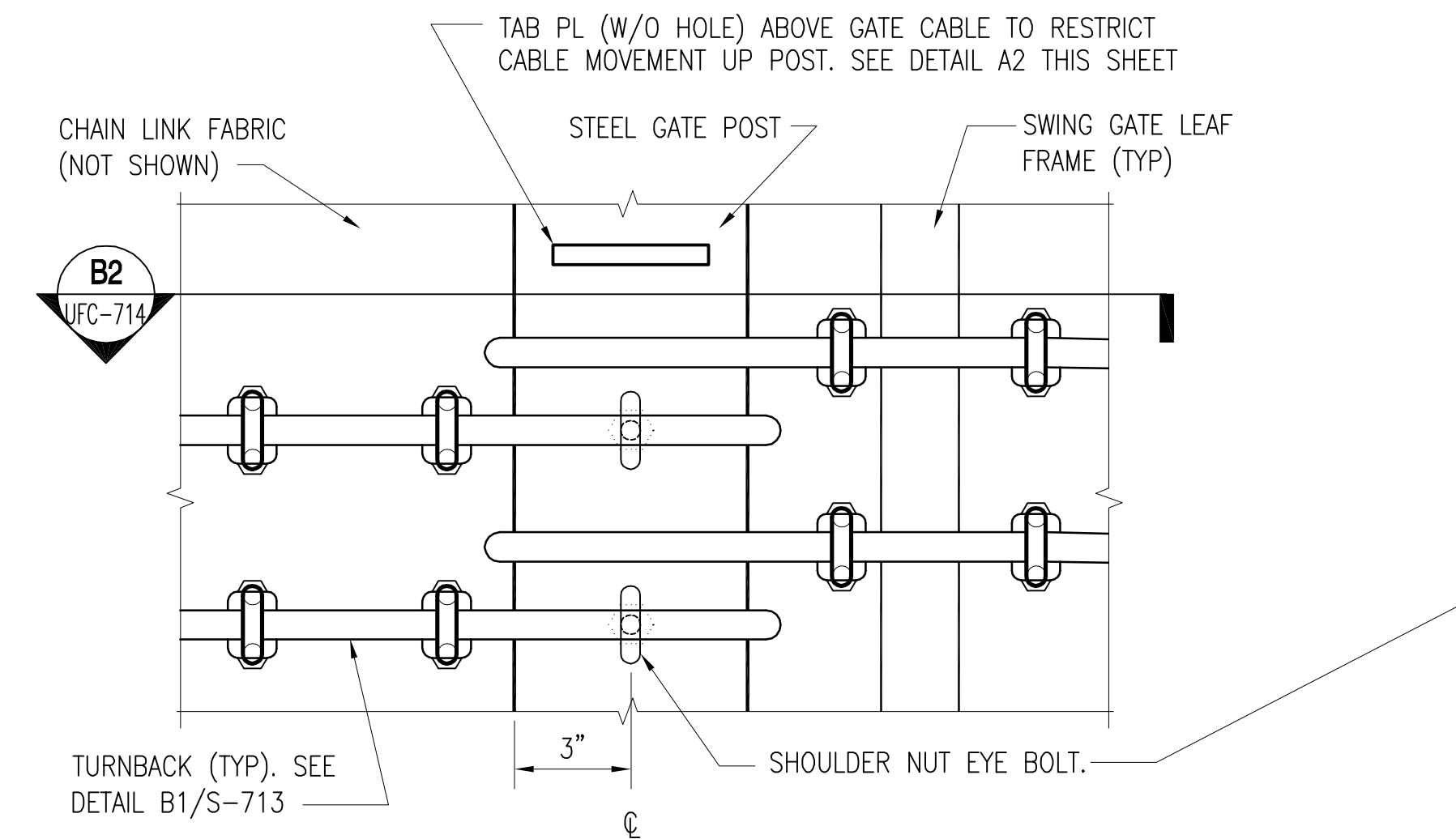
UFC-714



**PERSONNEL GATE POST SECTION**

SCALE: 3" = 1'-0"

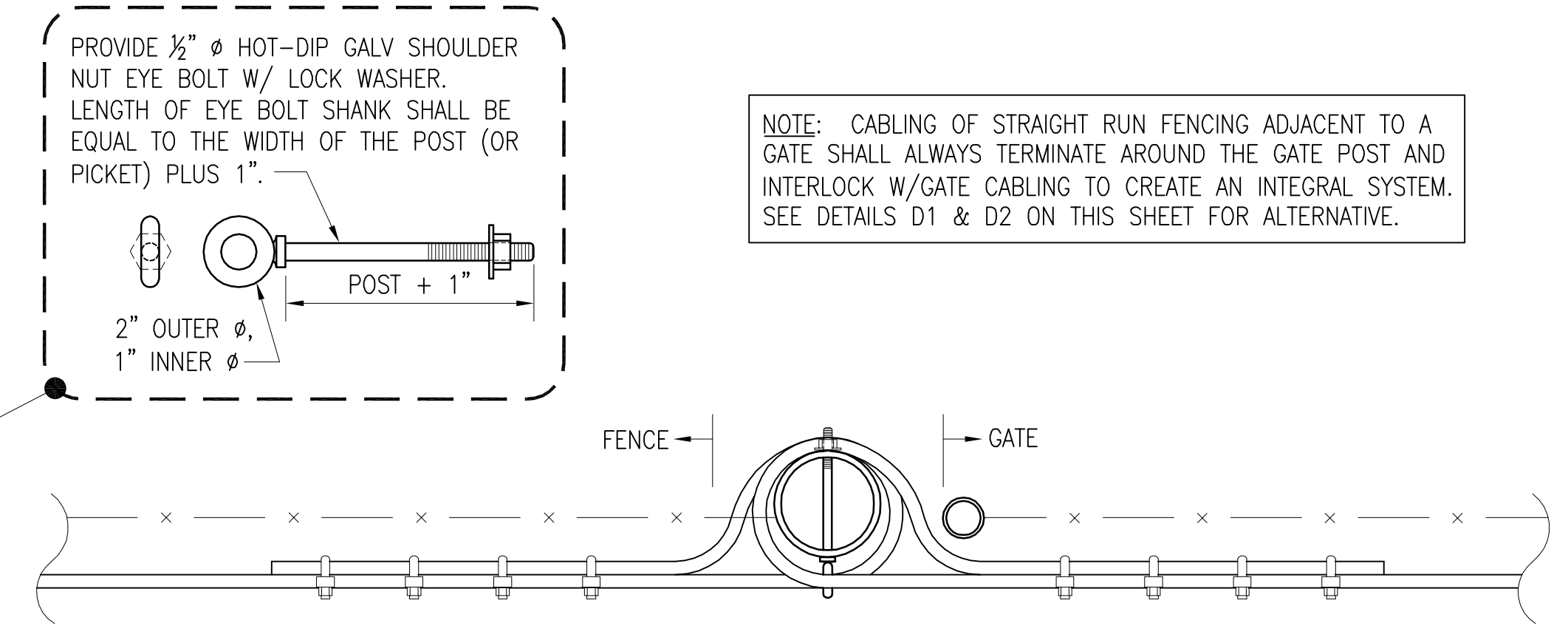
UFC-714



**GATE POST DETAIL**

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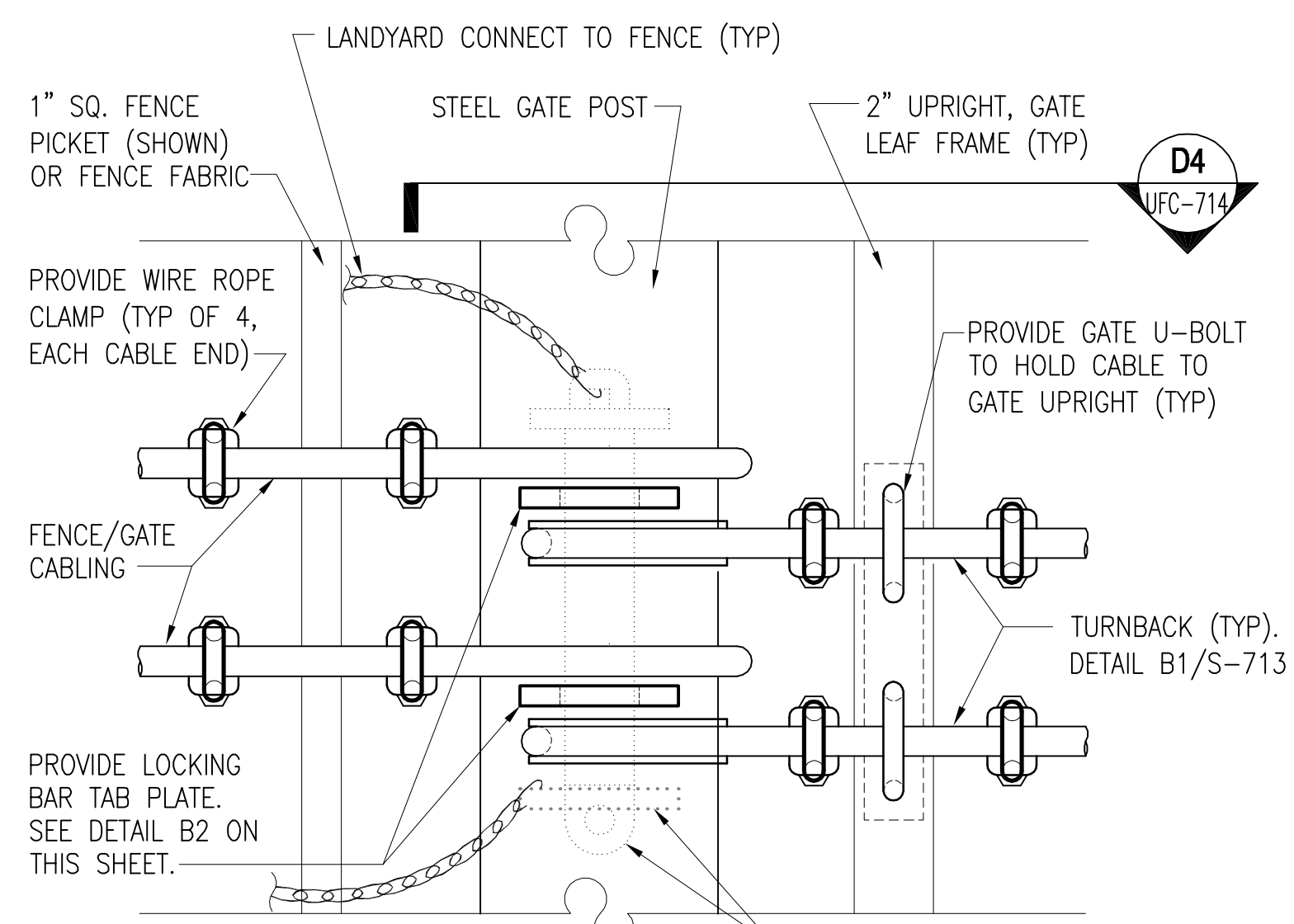
UFC-712 & UFC-722



**SECTION**

SCALE: 1 1/2" = 1'-0"

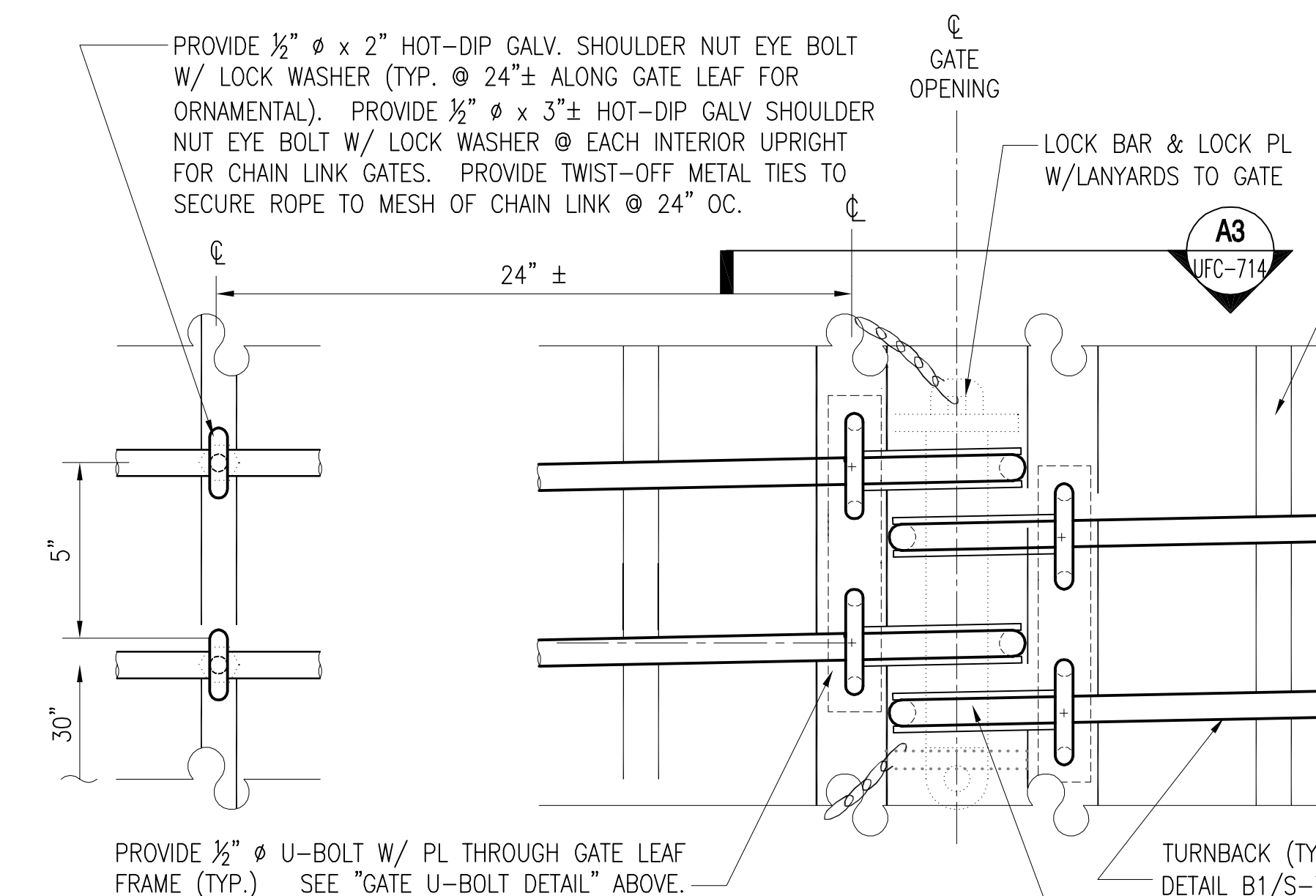
UFC-714



**PERSONNEL GATE POST DETAIL (TYP.)**

SCALE: 3" = 1'-0"

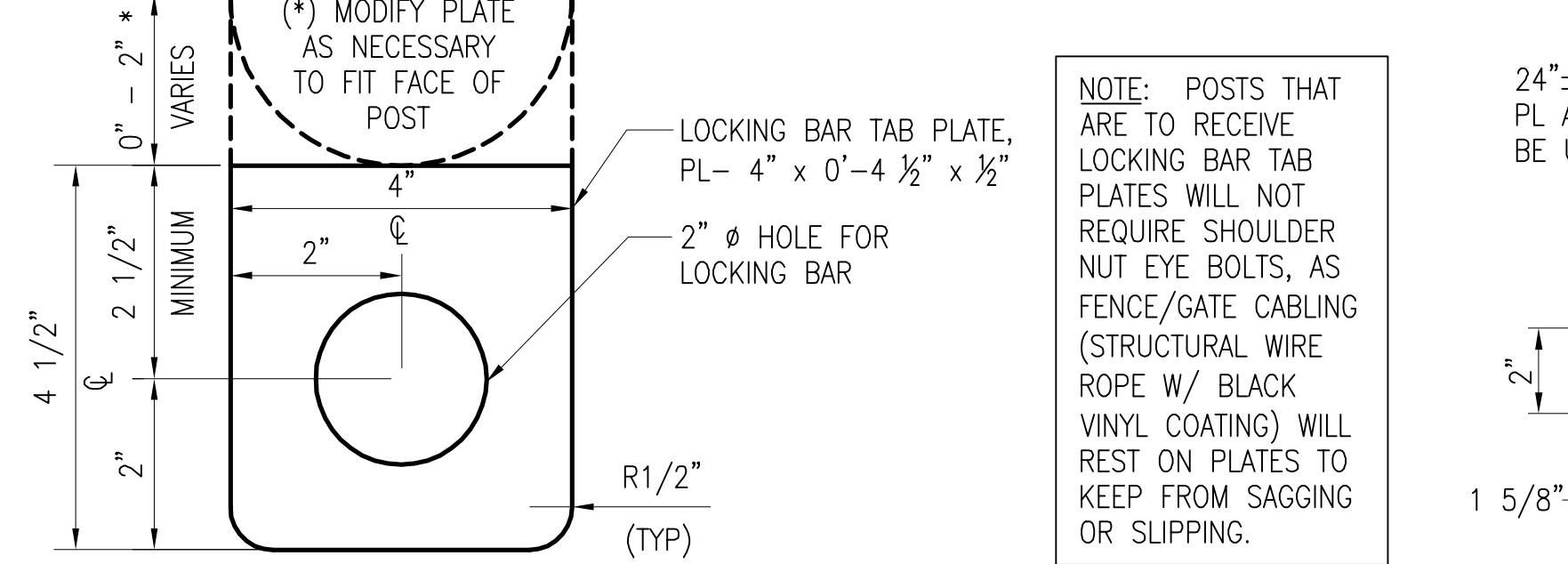
UFC-712 & UFC-722



**DOUBLE GATE LEAF LOCK DETAIL**

SCALE: 3" = 1'-0"

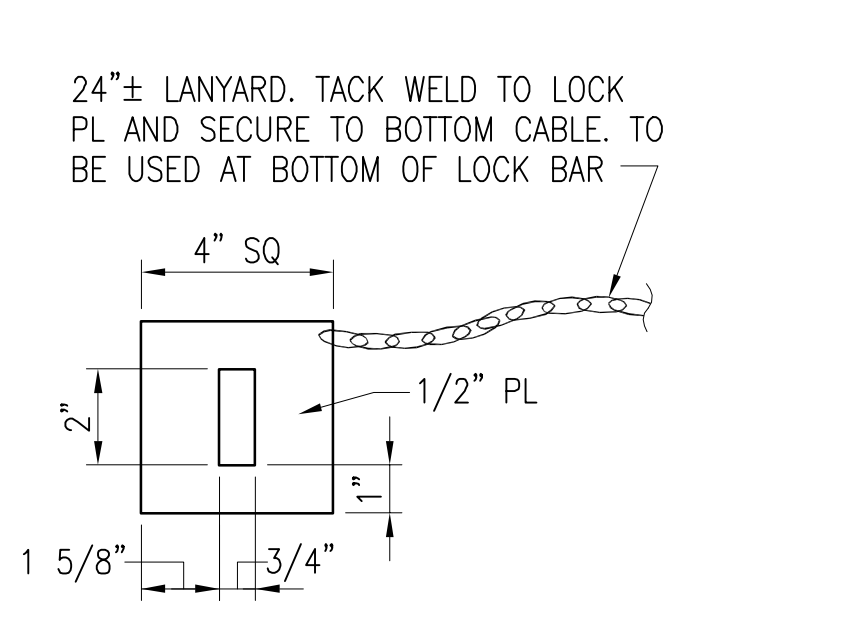
UFC-712 & UFC-722



**LOCKING BAR TAB PLATE DETAIL**

SCALE: 6" = 1'-0"

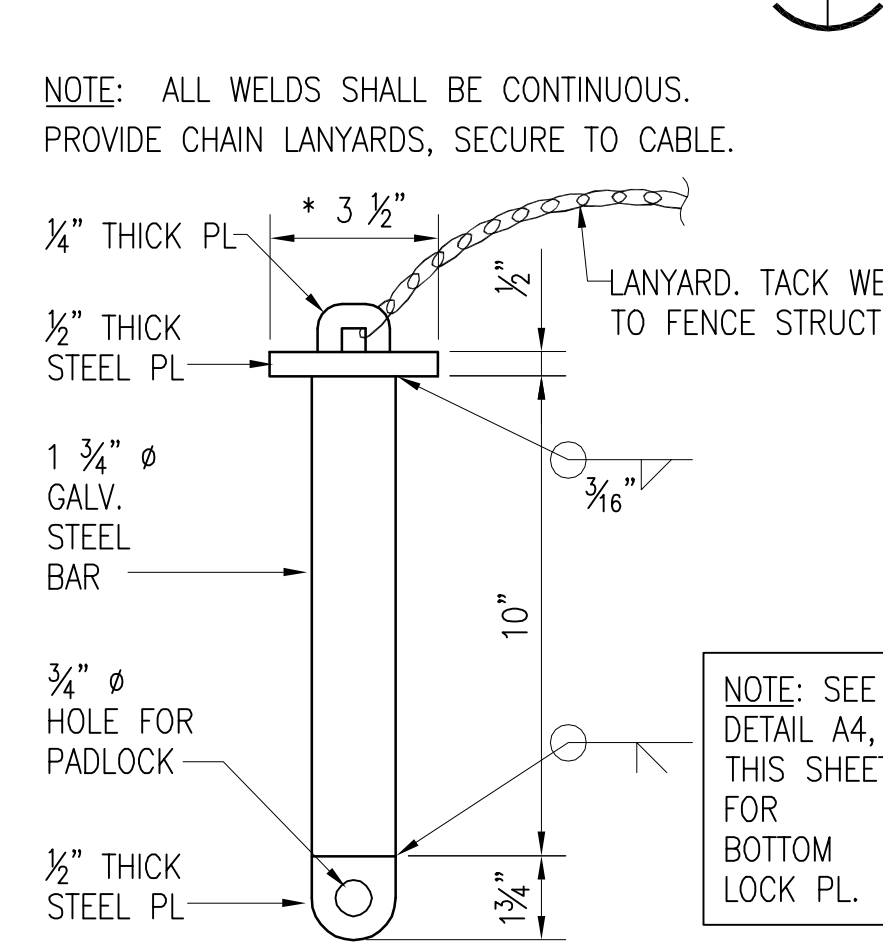
UFC-714



**LOCK PLATE**

SCALE: 3" = 1'-0"

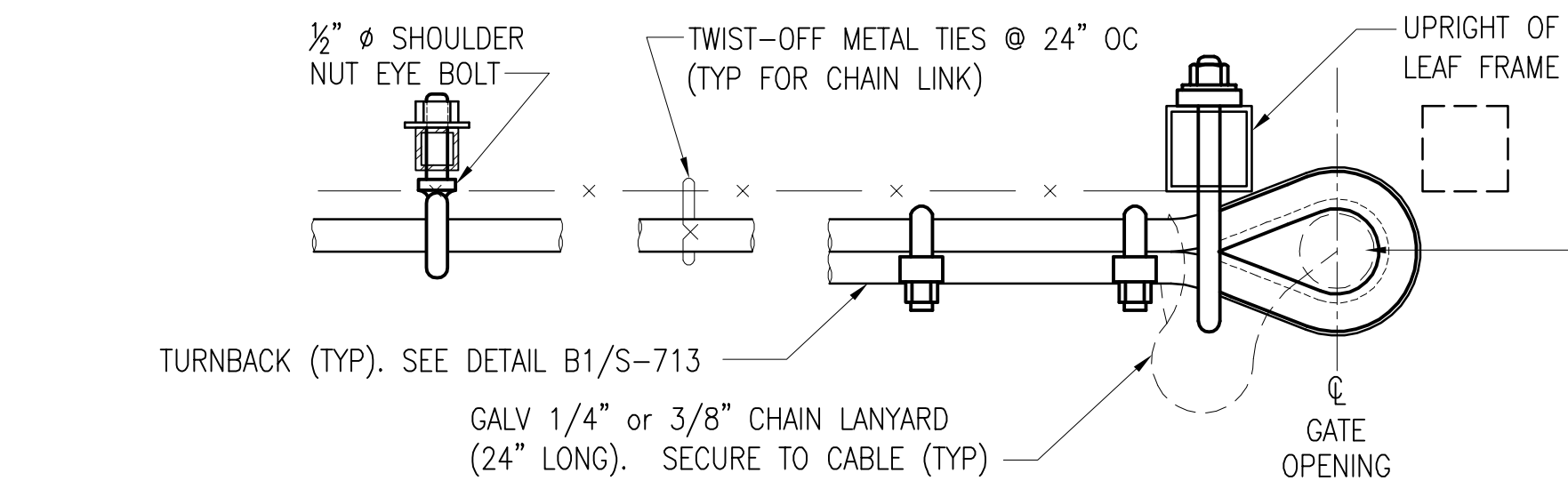
UFC-714



**LOCK BAR DETAIL**

SCALE: 3" = 1'-0"

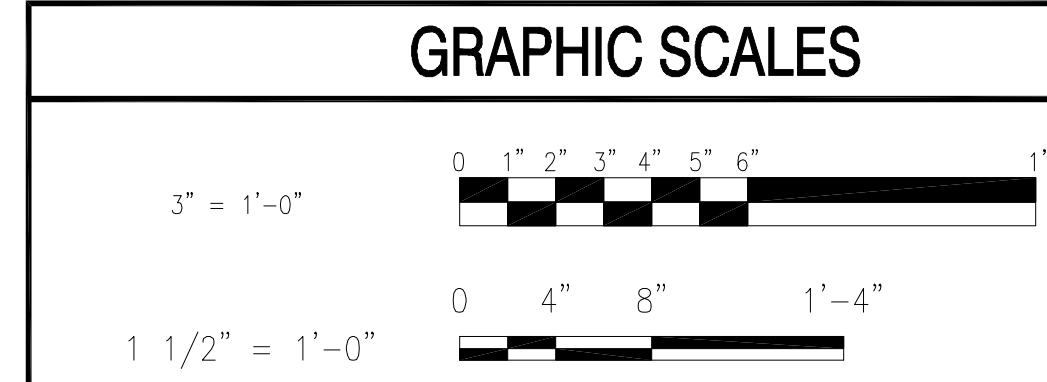
UFC-714



**SECTION**

SCALE: 3" = 1'-0"

UFC-712 & UFC-722



**GRAPHIC SCALES**

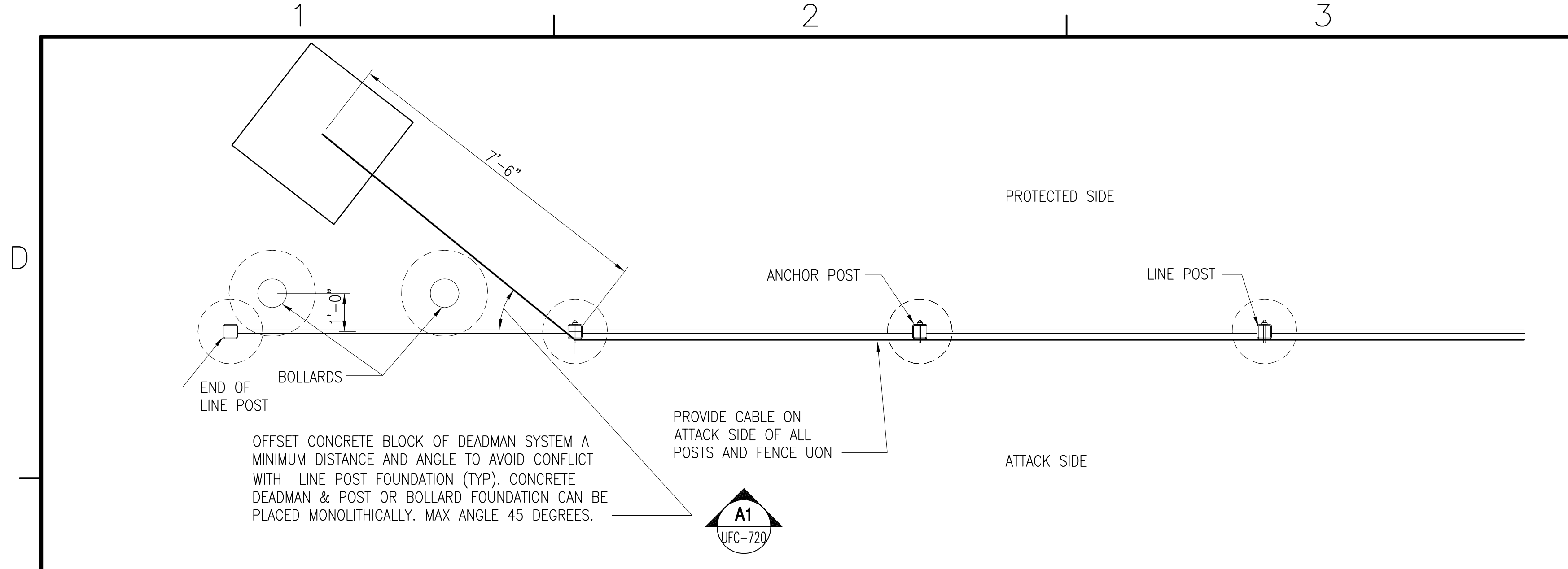
UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
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CABLE REINFORCING DETAILS (CONT'D)

UFC-714

DRAWING REVISION: 24 AUGUST 2007

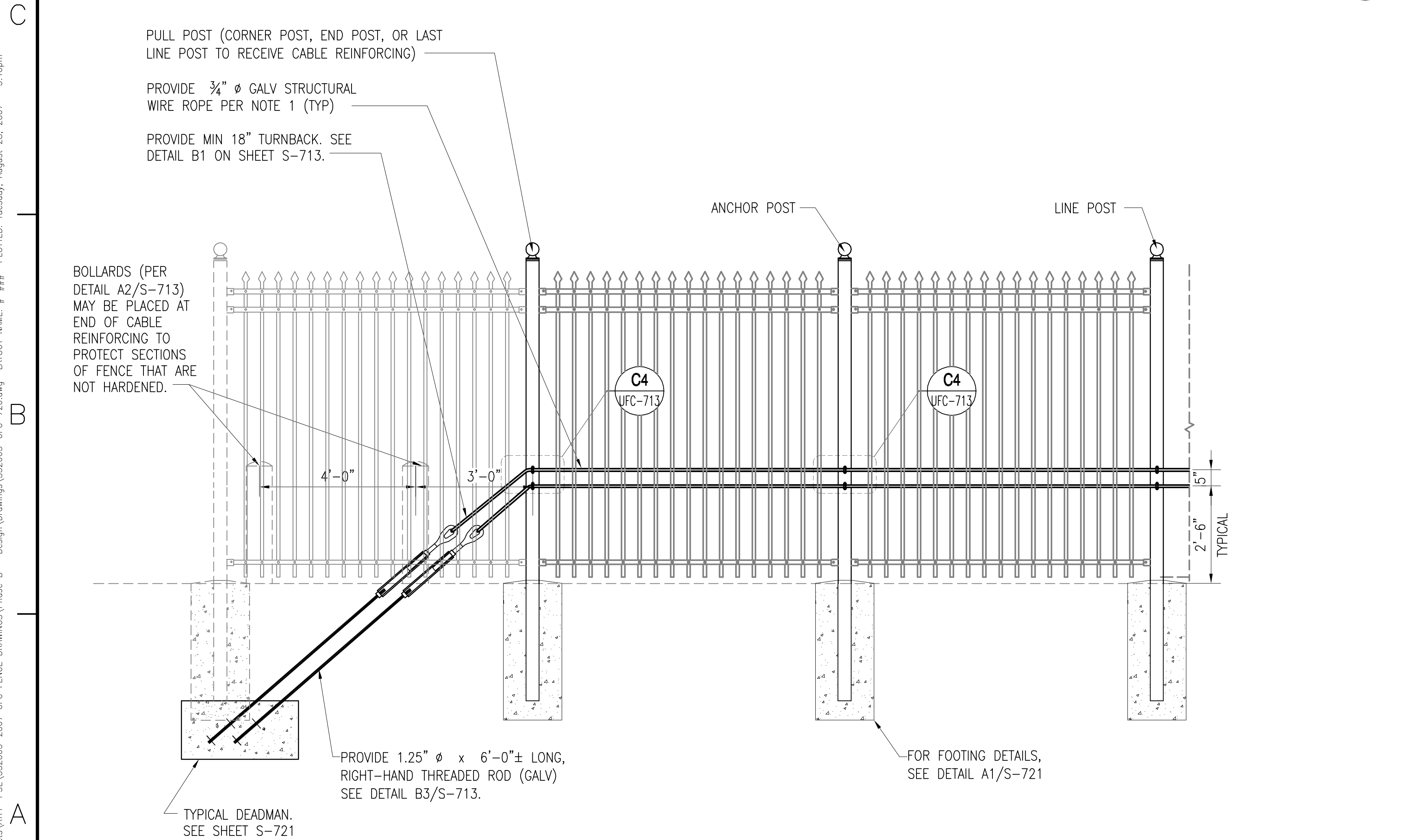
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**TYPICAL PLAN OF END POST DEADMAN AND LINE POST LAYOUT**

SCALE: 1/2" = 1'-0"

C1  
CIVIL DWGS UFC-720



**TYPICAL ELEVATION OF END POST DEADMAN AND LINE POST LAYOUT**

SCALE: 1/2" = 1'-0"

A1  
UFC-720 UFC-720

**LAYOUT OF REINFORCING**

DESIGNER OF RECORD TO LOCATE DEADMEN ON SITE PLANS, SATISFYING SPACING CRITERIA, OVERLAPS, AND FENCE CORNERS / TURNING POINTS. AT GATES IT IS DESIRABLE TO HAVE TRAFFIC ON EITHER SIDE OF A MEDIAN TO OPERATE AND PROTECT INDEPENDENTLY (NOT UTILIZING THE SAME DEADMAN SYSTEMS). THEREFORE DEADMEN SHOULD BE PLACED IN THE MEDIAN TO ANCHOR THE GATE REINFORCING FOR EACH SIDE OF THE ROAD. IF THERE IS NO PHYSICAL MEDIAN (MERELY PAINTED LINES), LIMITED ROOM, OR UTILITY CONFLICTS THAT DO NOT ALLOW FOR DEADMEN PLACEMENT BETWEEN THE GATES, ENSURE THAT THE CABLING FOR BOTH GATES ARE CONNECTED-- EITHER DIRECTLY OR VIA AN INTERMEDIATE CABLE WHICH CREATES AN INTEGRAL CABLE SYSTEM ACROSS THE ENTIRE GATE AREA.

**MODIFICATIONS TO TYPICAL DESIGN**

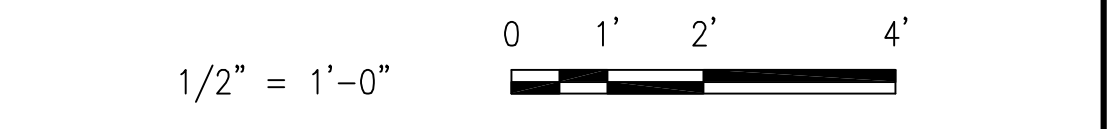
IF LARGER DESIGN THREATS OR CUSTOMER REQUESTS INDICATE A NEED FOR GREATER SECURITY, MORE 3/4" Ø CABLES CAN BE UTILIZED OR THE CABLES CAN BE UPGRADED TO 1" Ø. BOTH SCENARIOS REQUIRE THE DEADMAN (WHICH WILL NEED TO BE LARGER) TO BE DESIGNED BY A PROFESSIONAL ENGINEER TO SATISFY THE CRITERIA OUTLINED IN REINF NOTE 19 ON THIS SHEET. FOR BIDDING PURPOSES, ESTABLISH A UNIT COST FOR ADDITIONAL EXCAVATION AND NEW CONCRETE PER CUBIC FOOT.

IF 1" Ø CABLE IS USED, SPECIFICATIONS SHALL MATCH REINF NOTE 1 ON THIS SHEET, EXCEPT THE CABLE SHALL HAVE A MINIMUM BREAKING STRENGTH OF 70,000 POUNDS (35 TONS). OTHER COMPONENTS, SUCH AS EYEBOLTS, U-BOLTS, ROPE CLIPS, THIMBLES, AND OTHER ASSOCIATED HARDWARE SHALL BE SIZED ACCORDINGLY.

**REINFORCING NOTES**

1. REINFORCING CABLES SHALL BE U.S. DOMESTIC 3/4" Ø 6x19 CLASS WIRE ROPE, REGULAR LAY, EXTRA IMPROVED FLOW STEEL (EIP), INDEPENDENT WIRE ROPE CORE (IWRC), CLASS A CONFORMING TO ASTM A1023 AND GALVANIZED IN ACCORDANCE WITH ASTM A475, & HAVE A MINIMUM BREAKING STRENGTH OF 40,000 POUNDS (20 TONS). CABLES SHALL HAVE A BLACK VINYL COATING, BUT SHALL NOT BE IMPREGNATED.
2. CABLES SHALL BE CONTINUOUS FROM DEADMAN TO DEADMAN. NO SPLICES IN CABLE SHALL BE ALLOWED. CABLE BARRIER SHALL BE INSTALLED BETWEEN FENCE POST AND FENCE FABRIC AS PER PLANS. U-BOLTS SHALL BE INSTALLED PERPENDICULAR TO THE LAY OR THE STRANDS OF THE WIRE ROPE AND SHALL BE TIGHTENED AFTER SAG IN CABLE BARRIER HAS BEEN REMOVED. CONCRETE DEADMAN SPACING SHALL BE AT MAXIMUM 200' INTERVALS & TURNING POINTS (EXTERNAL CORNERS).
3. WIRE ROPE ENDS SHALL TERMINATE AROUND TURNBUCKLES, GATE POSTS OR EXTRA HEAVY-DUTY WIRE ROPE THIMBLES (AT GATES). THESE TERMINATIONS REQUIRE 18" MINIMUM OF ROPE FOR TURN BACK AND A MINIMUM OF (4)- CLIPS EACH (EQUAL SPACING).
4. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO ORDERING MATERIALS.
5. DEADMEN TO BE INSTALLED ON THE SECURED SIDE (INTERIOR) OF THE FENCE; WHILE CABLES SHOULD BE INSTALLED ON THE EXTERIOR SIDE OF POST.
6. PROVIDE NECESSARY SLACK IN CABLES (GATES ONLY) TO ALLOW FOR FULL SWING OF ALL GATE LEAVES.
7. OFFSET DEADMAN SYSTEMS FROM FENCELINE (PLAN VIEW) TO AVOID CONFLICT WITH EXISTING FENCE POSTS.
8. ALLOW EPOXY ANCHOR BOLTS (MIN 2 DAYS) & CONCRETE DEADMEN (MIN 7 DAYS) TO CURE, PRIOR TO APPLYING LOADS (INSTALLING TURNBUCKLES & STRAIGHTENING CABLES).
9. ALL WELDING SHALL BE DONE IN ACCORDANCE WITH AWS D1.1. ALL WELD MATERIAL SHALL BE E70XX ELECTRODES.
10. STRUCTURAL STEEL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE NINTH EDITION OF THE AISC "MANUAL OF STEEL CONSTRUCTION FOR ALLOWABLE STRESS DESIGN.
11. STRUCTURAL STEEL SHALL CONFORM TO ASTM A36 AND SHALL HAVE A MINIMUM YIELD STRESS OF 36000 PSI.
12. ALL STRUCTURAL STEEL MEMBERS AND HARDWARE USED IN CABLE ANCHORING SYSTEM SHALL BE HOT-DIPPED GALVANIZED. ANY AREAS WHERE COATING IS DAMAGED OR REMOVED SHALL BE COVERED WITH A ZINC RICH COMPOUND.
13. TURNBUCKLES SHALL BE 1/4"x18", TYPE I, GALVANIZED IN ACCORDANCE WITH ASTM F1145.
14. WIRE ROPE CLAMPS SHALL BE TYPE I, GALVANIZED, IN ACCORDANCE WITH FS FF-C-450.
15. ALL THREADED RODS, U-BOLTS, AND BOLTS SHALL CONFORM TO ASTM A307 AND SHALL BE INSTALLED WITH F844 WASHERS AND A563 NUTS. ENTIRE BOLT ASSEMBLY SHALL BE GALVANIZED. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
16. ZINC RICH COMPOUND FOR REPAIRS SHALL BE 95% METALLIC ZINC, BY WEIGHT IN DRIED FILM; CONFORMING TO FED SPEC DOD-P-21035A & MEETING MILITARY SPEC MIL-P-26915A. INSTALL AT LEAST TWO COATS, 4 MILS MIN TOTAL THICKNESS.
17. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ACI 318. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI. THE MINIMUM CONCRETE COVER SHALL BE 3", UNLESS OTHERWISE NOTED.
18. ALL ITEMS NOT NOTED AS "EXIST" OR "EXISTING" SHALL BE PROVIDED AND INSTALLED UNDER THE REQUIREMENTS OF THIS CONTRACT.
19. DESIGN CRITERIA:  
UFC 4-022-03 "SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES"  
  
NFESC UG-2031-SHR "USER'S GUIDE ON PROTECTION AGAINST VEHICLE BOMBS" (5/98)
20. IF CABLE REINFORCING GATES, PROVIDE EYEBOLTS TO SECURE CABLE TO GATE PICKETS @ 24" OC & U-BOLTS TO SECURE TO GATE UPRIGHTS. MODIFY AS NEEDED FOR OPERATION.

**GRAPHIC SCALES**

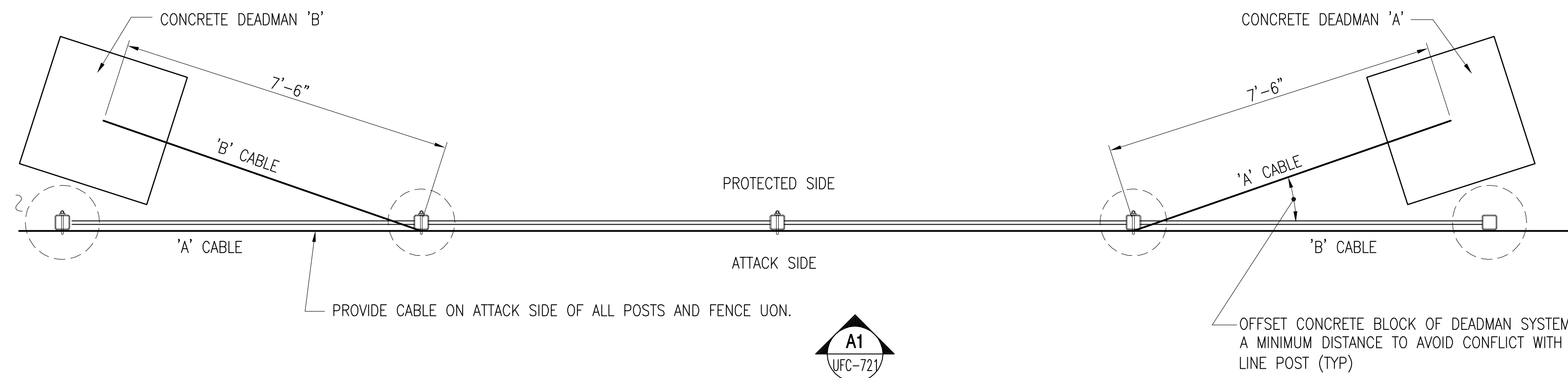


UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

TYPICAL CABLE REINFORCED ORNAMENTAL FENCE - END POST

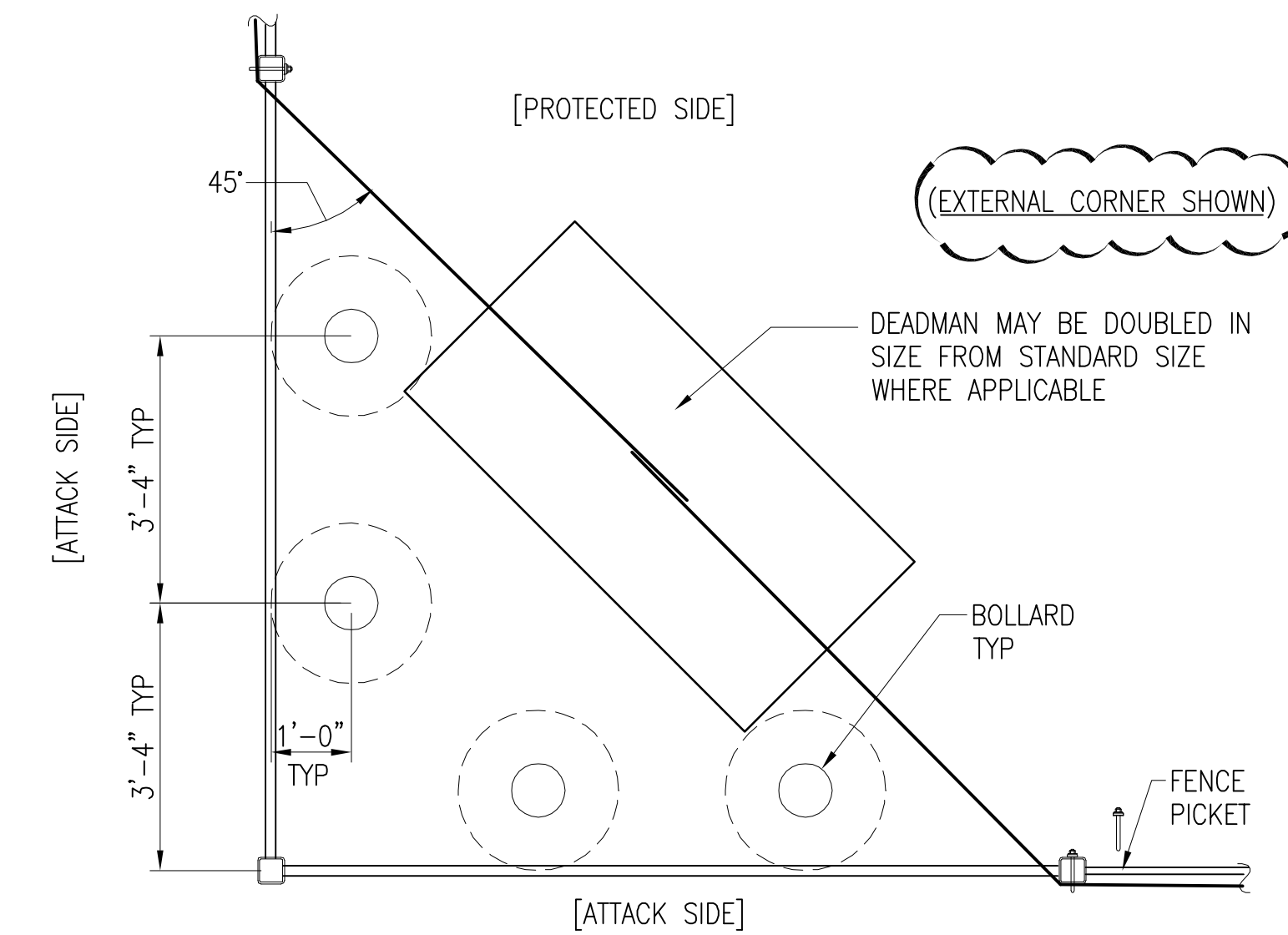
UFC-720

DRAWING REVISION: 24 AUGUST 2007



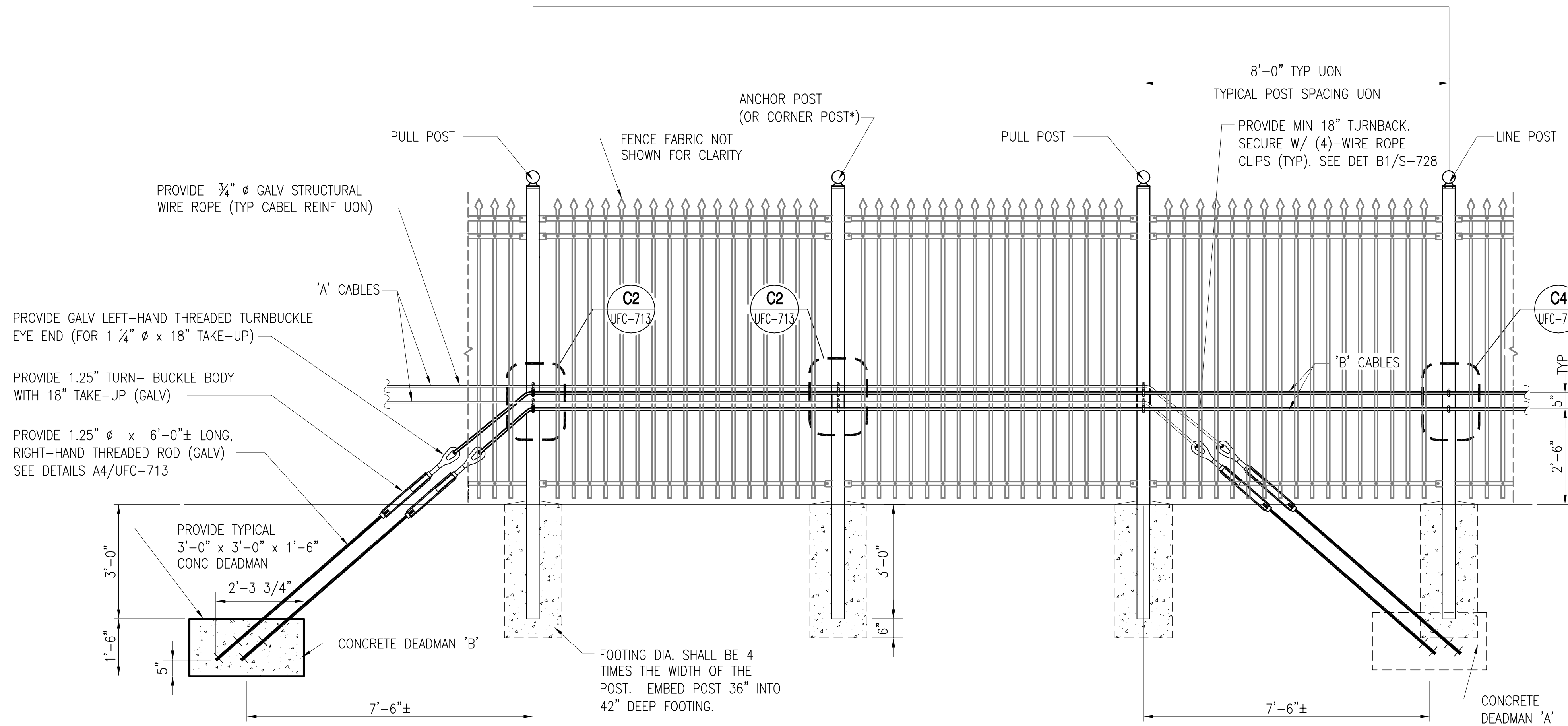
**TYPICAL PLAN OF DEADMAN AND LINE POST LAYOUT**

SCALE: 1/2" = 1'-0"



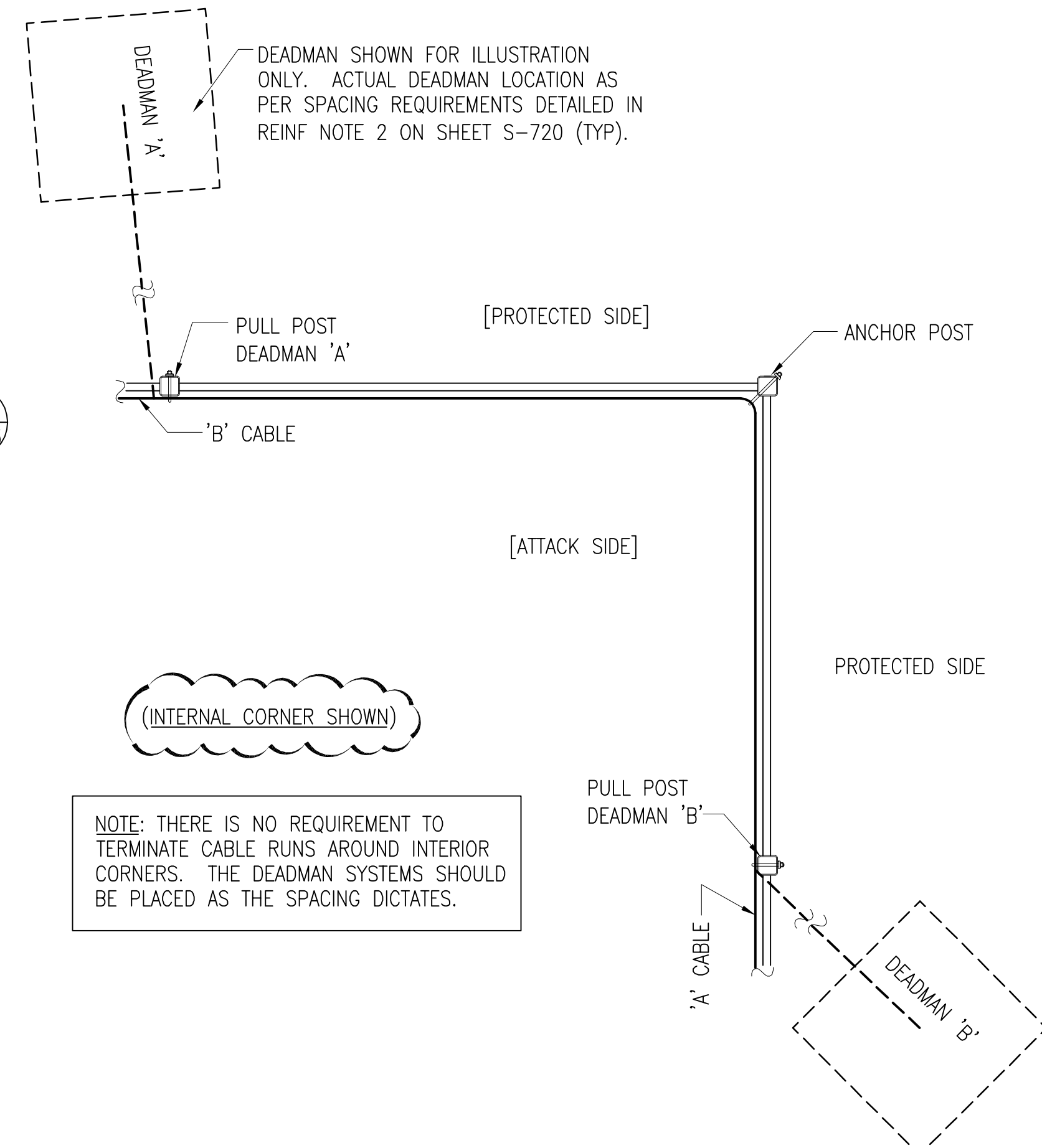
**TYPICAL PLAN OF TURNING POINT POST LAYOUT**

SCALE: 1/2" = 1'-0"



**TYPICAL ELEVATION OF DEADMAN AND LINE POST LAYOUT**

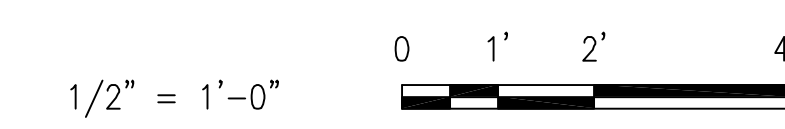
SCALE: 1/2" = 1'-0"



**TYPICAL PLAN OF TURNING POINT POST LAYOUT**

NOT TO SCALE

**GRAPHIC SCALES**



UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

TYPICAL CABLE REINFORCED ORNAMENTAL FENCE - DEADMAN AND LINE POST

UFC-721

FILE NAME: P:\Core Projects\ATP-FSE\562005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\562005-UFC-721.dwg LAYOUT NAME: ### PLOTTED: Tuesday, August 28, 2007 - 2:49pm

DRAWFORM REVISION: 24 AUGUST 2007

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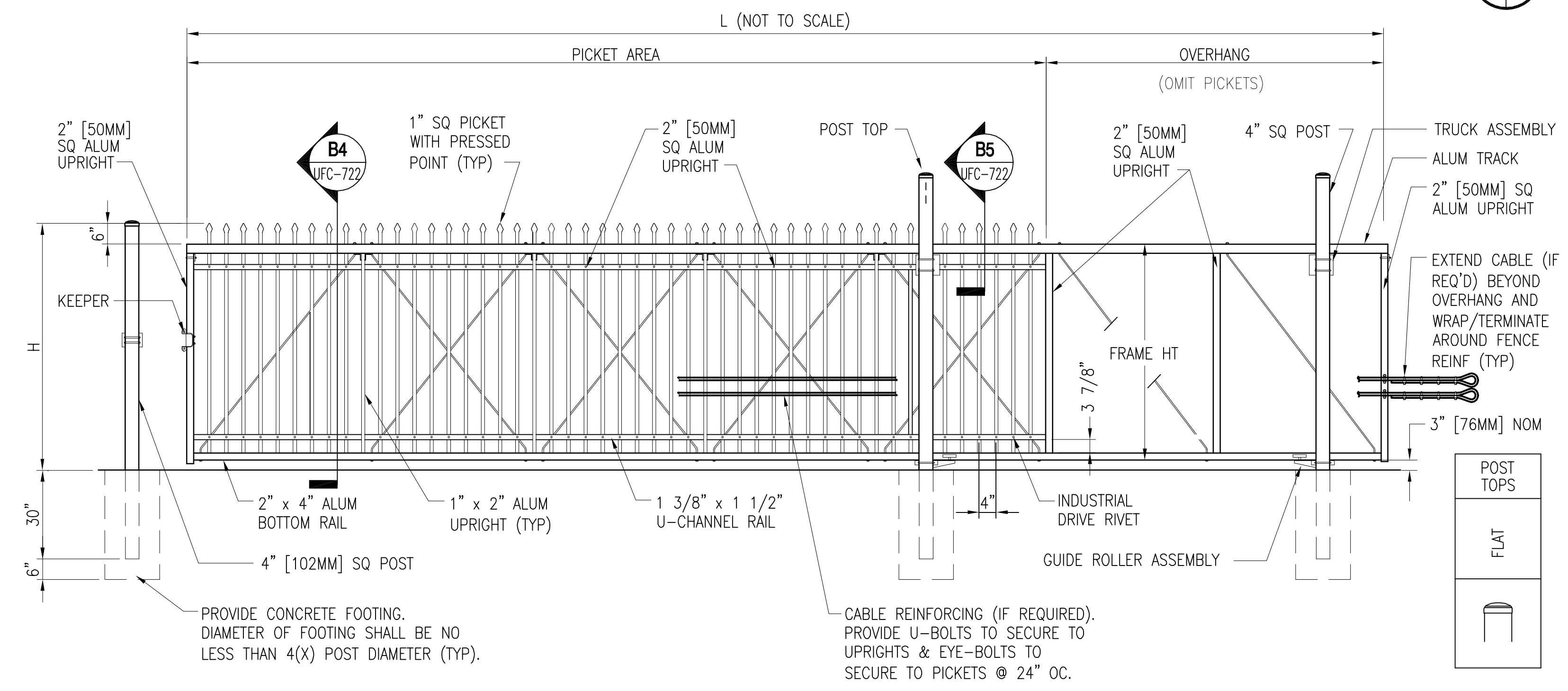
**GATE PLAN**

NOT TO SCALE

**D1**  
CIVIL DWGS UFC-722

BAYS	OPENING (F/F)	NOM HEIGHT (H)	LENGTH (L)	GATE POSTS (G)	BAYS / OVERHANG
5	30'-0" [9144MM]	8'-0" [2438MM]	42'-3" [12878MM]	12'-0" [3658MM]	5(Pickets) / 2(w/o)

\* NOTE: VERIFY SIZE OF OPENING WITH SITE PLANS. DIMENSIONS WILL VARY BASED ON OPENING. DIMENSIONS ABOVE PROVIDED FOR BASELINE PURPOSES.



**TYPICAL SINGLE CANTILEVERED SLIDING GATE ELEVATION- (5) BAYS SHOWN**

NOT TO SCALE

**B1**  
CIVIL DWGS UFC-722

**SECTION (TYP)**

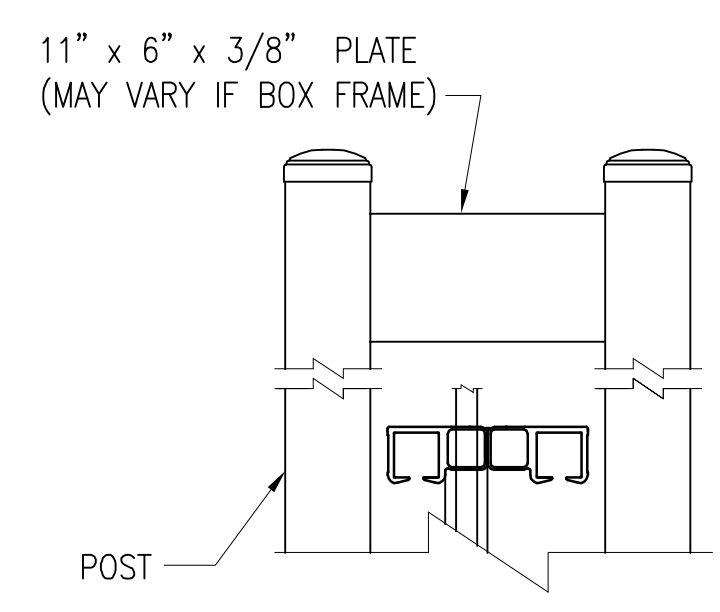
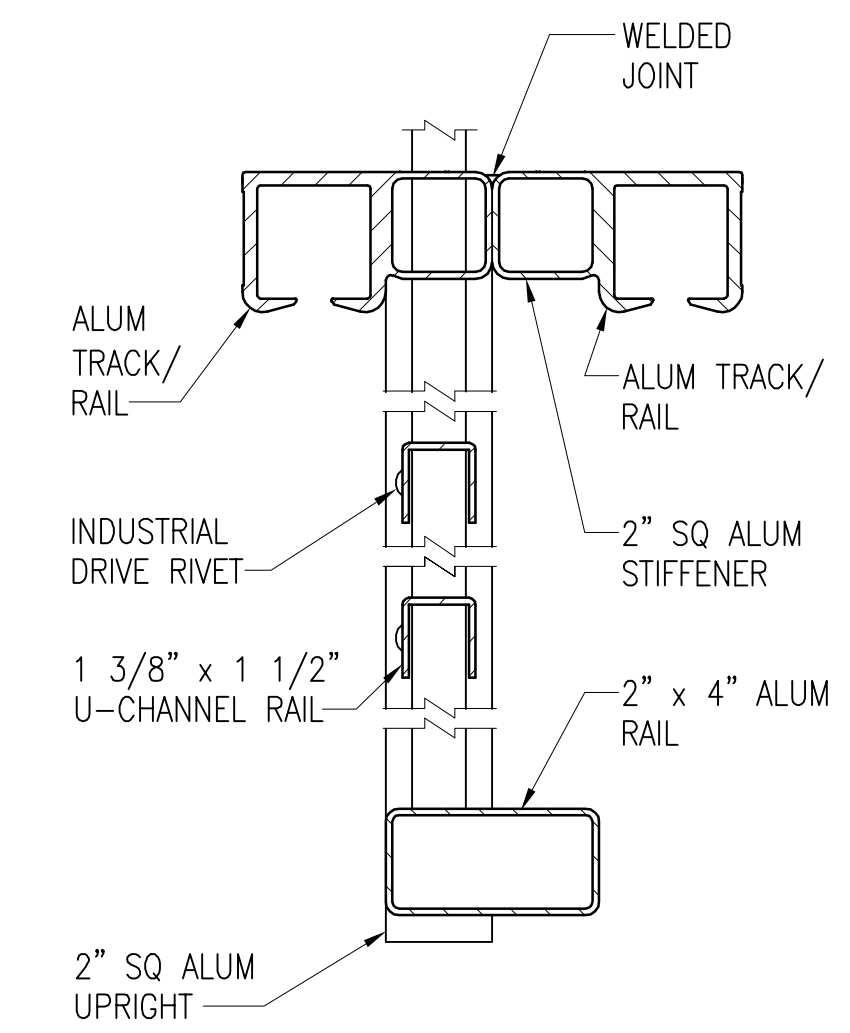
NOT TO SCALE

**B4**  
UFC-722 UFC-722

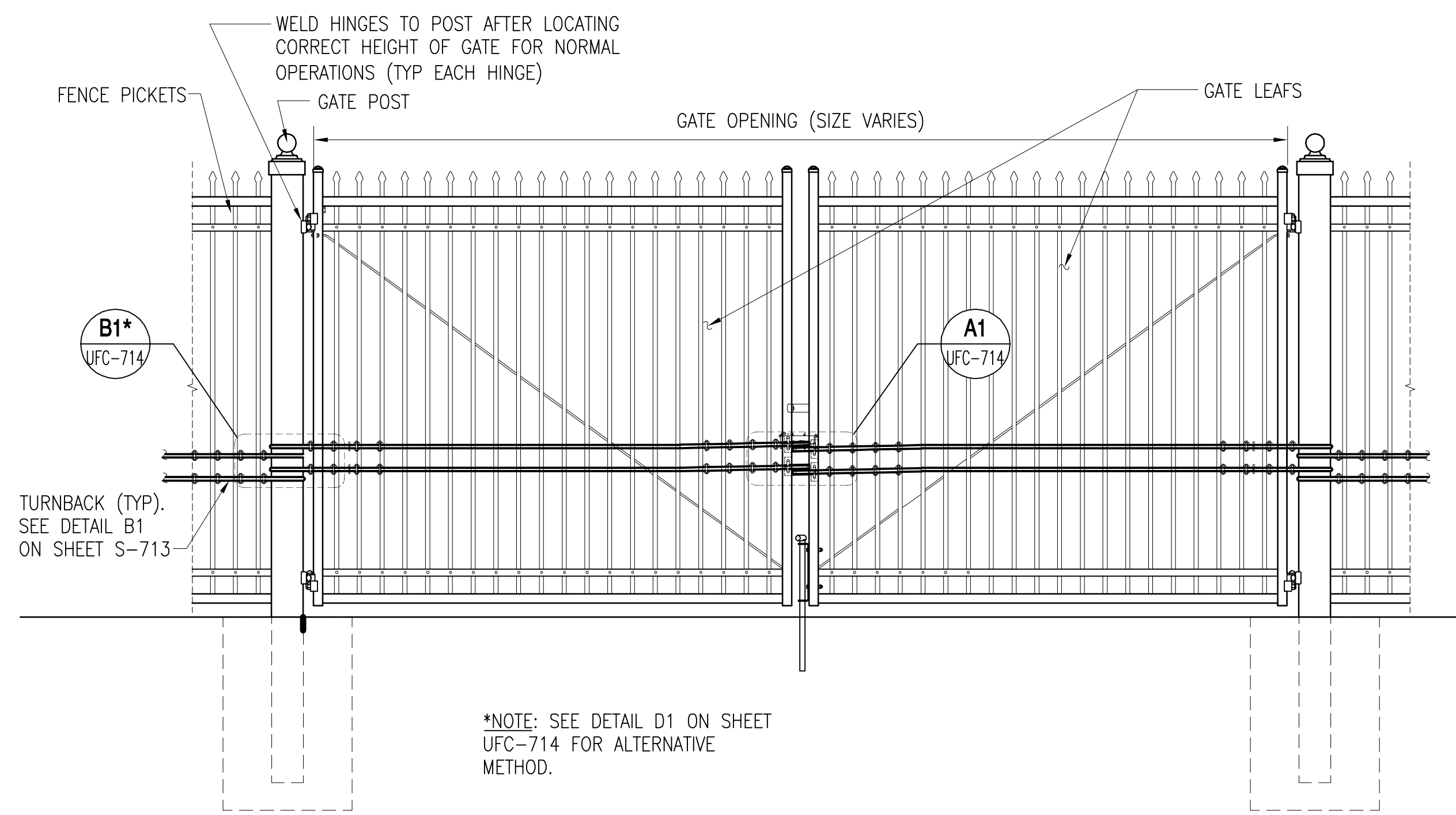
**SECTION (TYP)**

NOT TO SCALE

**B5**  
UFC-722 UFC-722



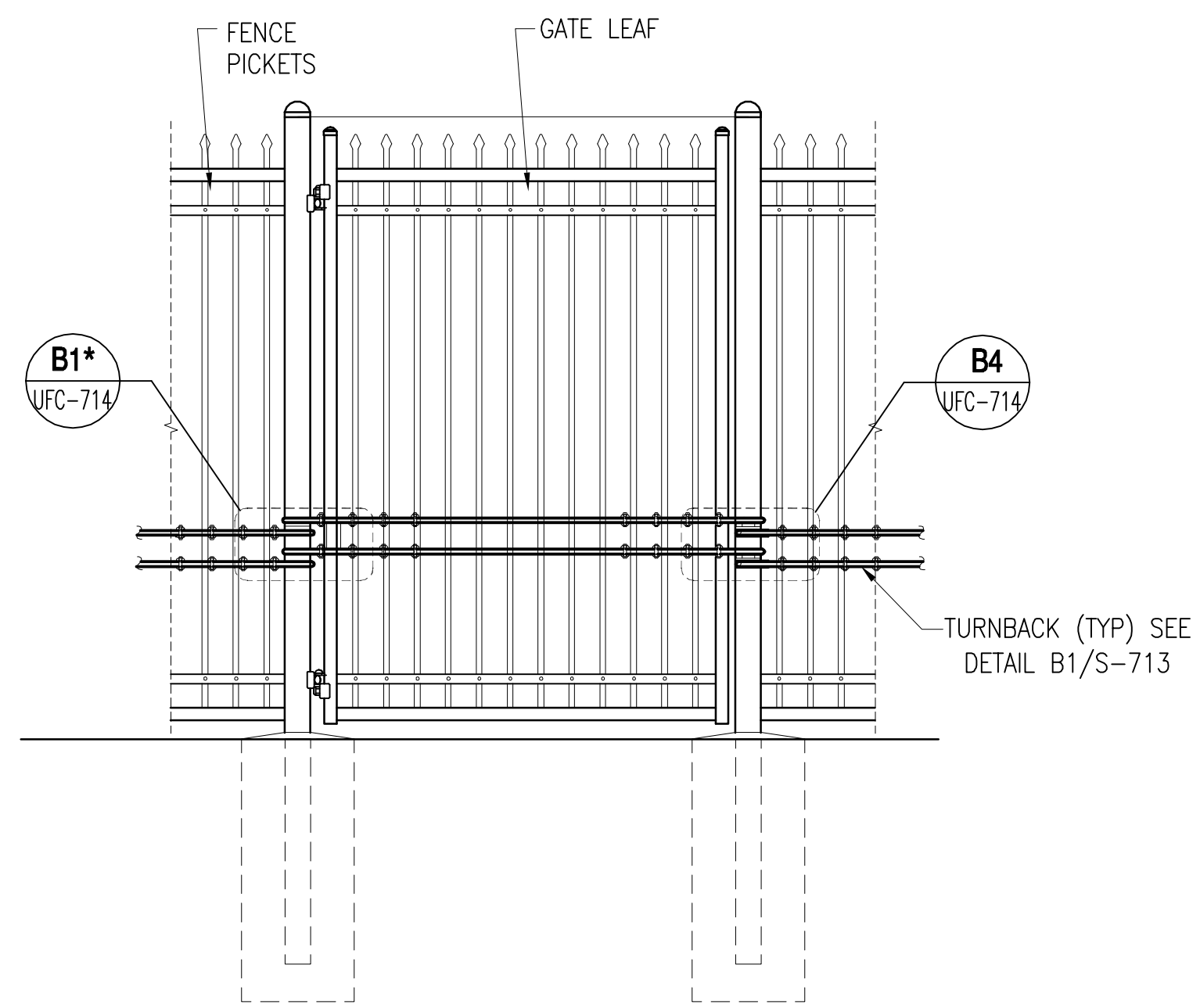
\*NOTE: SEE DETAIL D1 ON SHEET UFC-714 FOR ALTERNATIVE METHOD.



**ELEVATION - TYP CABLE REINFORCING DOUBLE FOR SWING GATE**

SCALE: 1/2" = 1'-0"

**A1**  
CIVIL DWGS UFC-722

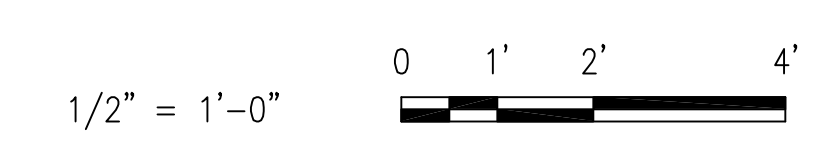


**ELEVATION - TYP CABLE REINFORCING SINGLE SWING GATE**

SCALE: 1/2" = 1'-0"

**A3**  
CIVIL DWGS UFC-722

**GRAPHIC SCALES**



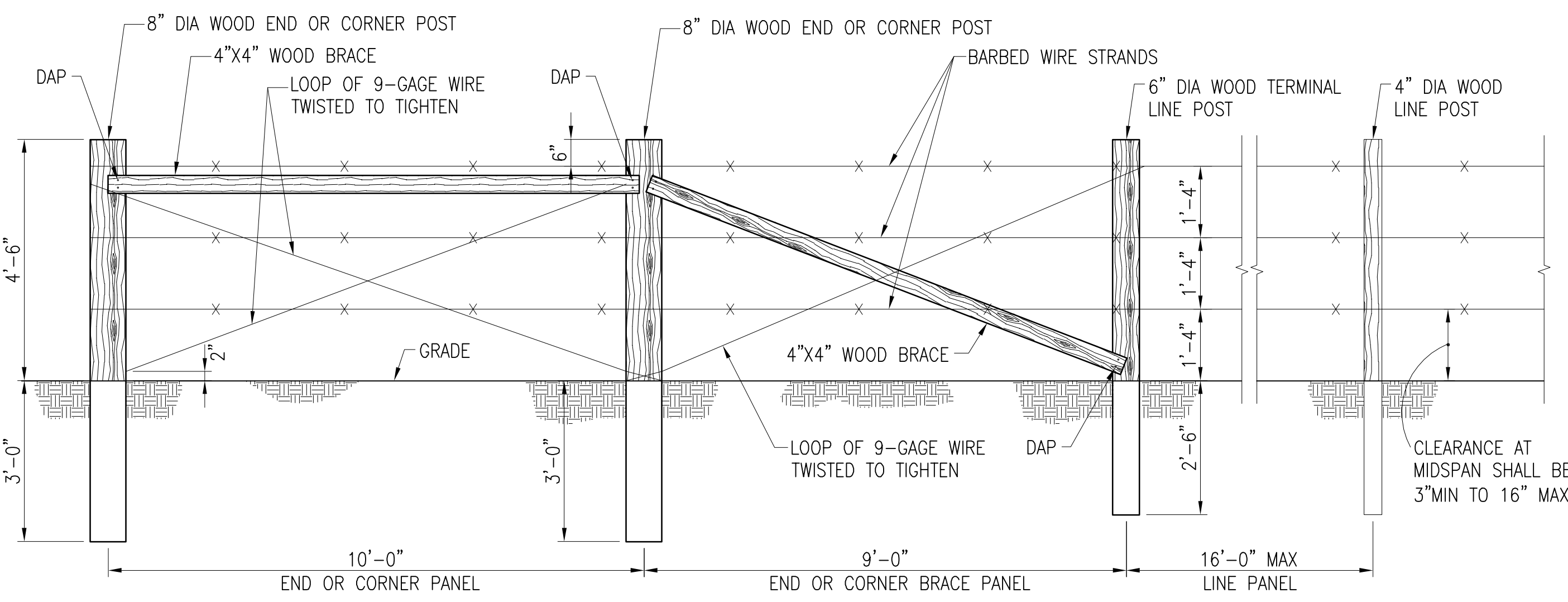
UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

ORNAMENTAL CANTILEVERED AND SWING GATES AND CABLING DETAILS

UFC-722

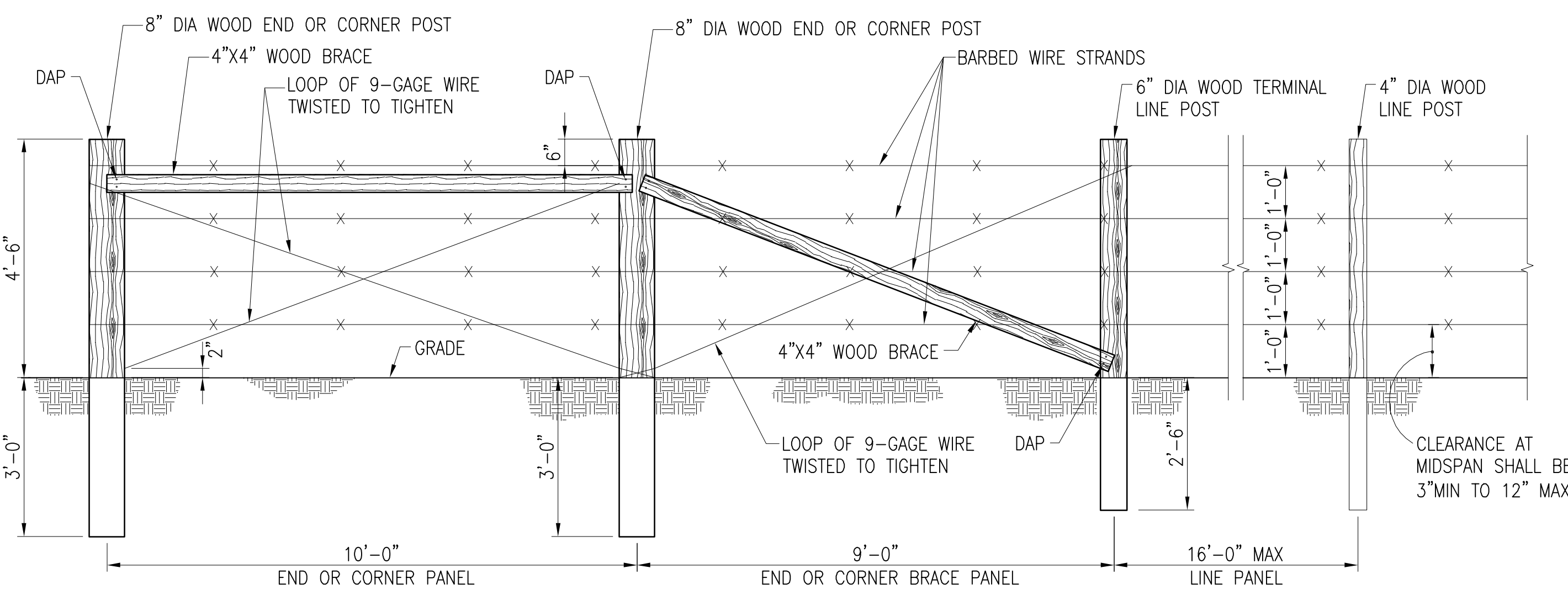
DRAWING REVISION: 24 AUGUST 2007

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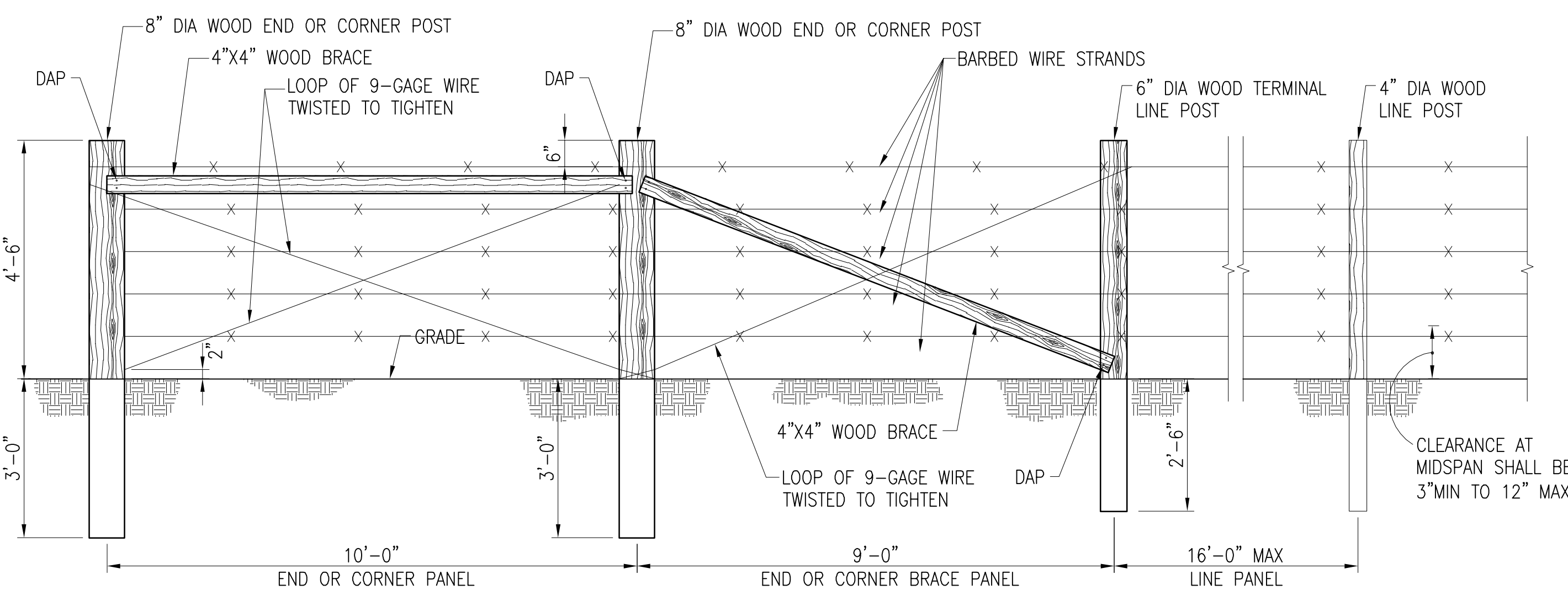
**TYPICAL 3 STRAND BARBED WIRE FENCE**

SCALE: 1/2" = 1'-0"



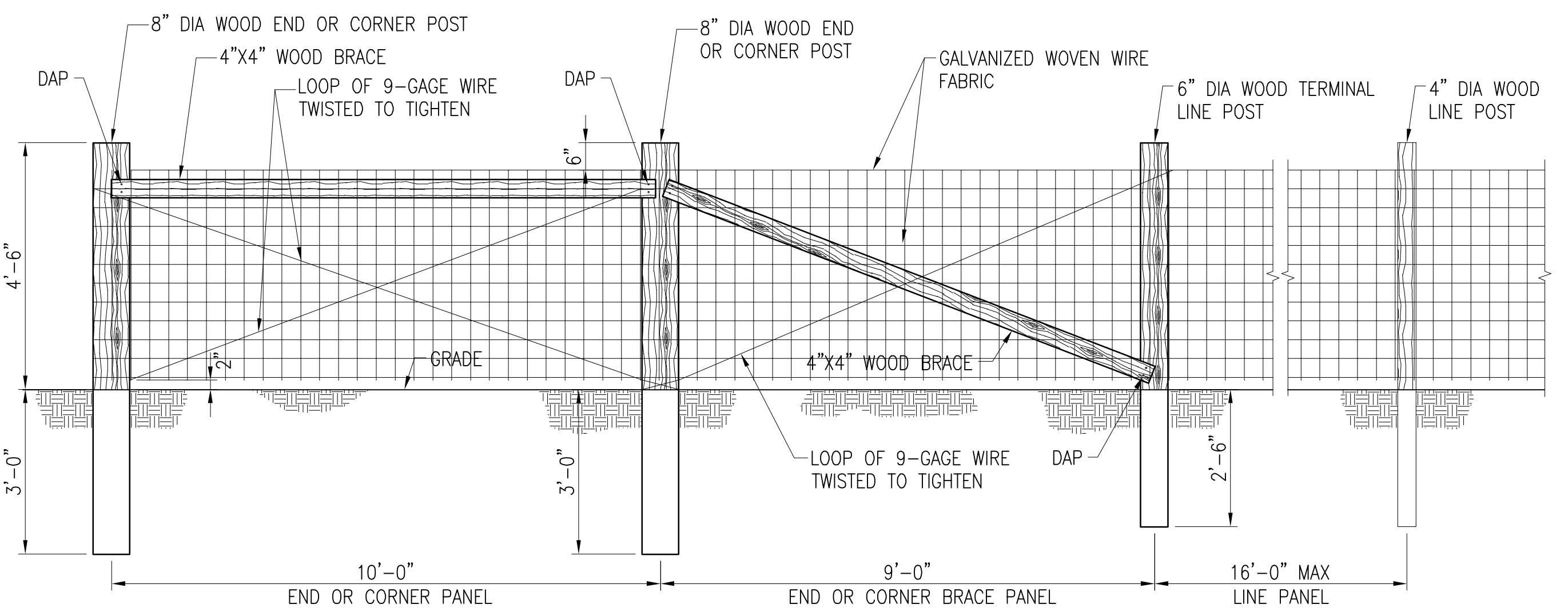
**TYPICAL 4 STRAND BARBED WIRE FENCE**

SCALE: 1/2" = 1'-0"



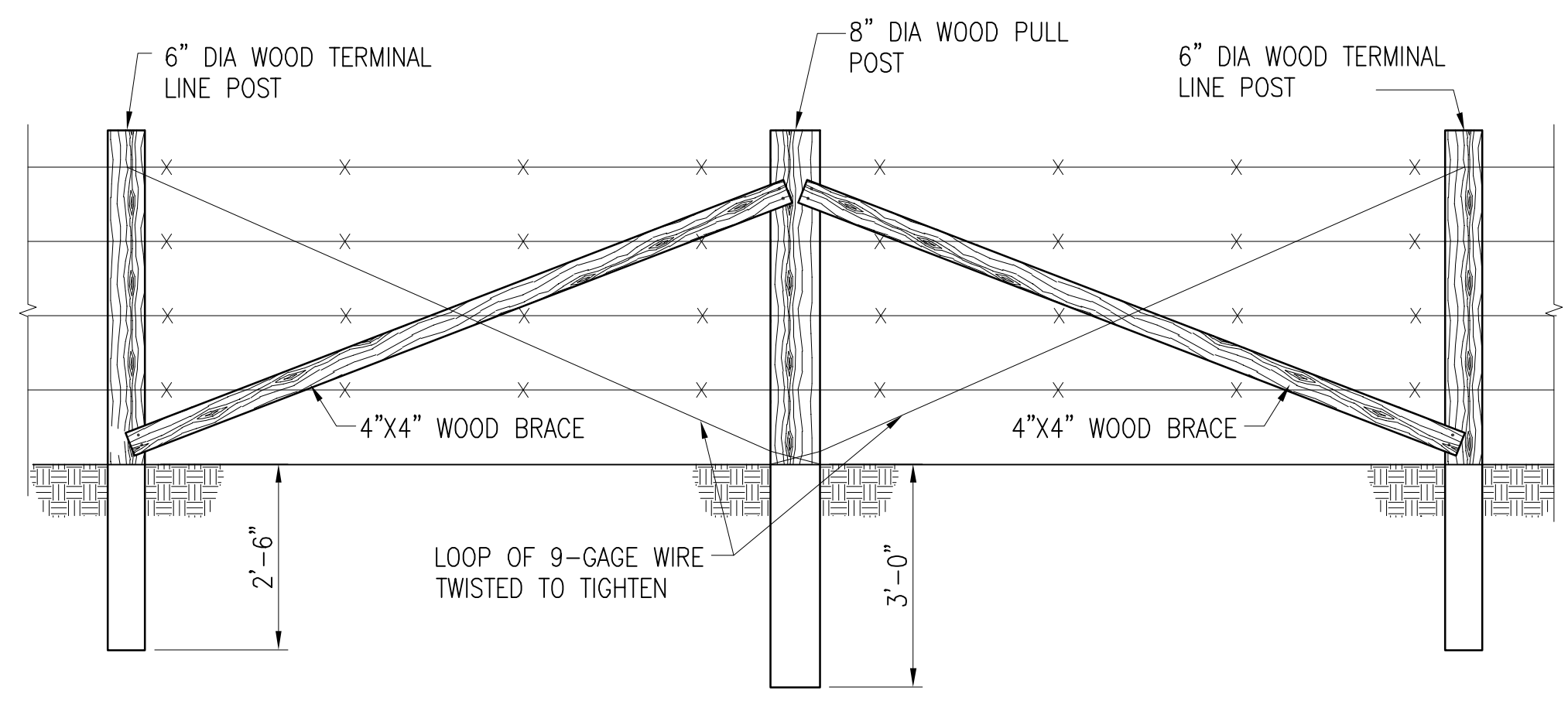
**TYPICAL 5 STRAND BARBED WIRE FENCE**

SCALE: 1/2" = 1'-0"



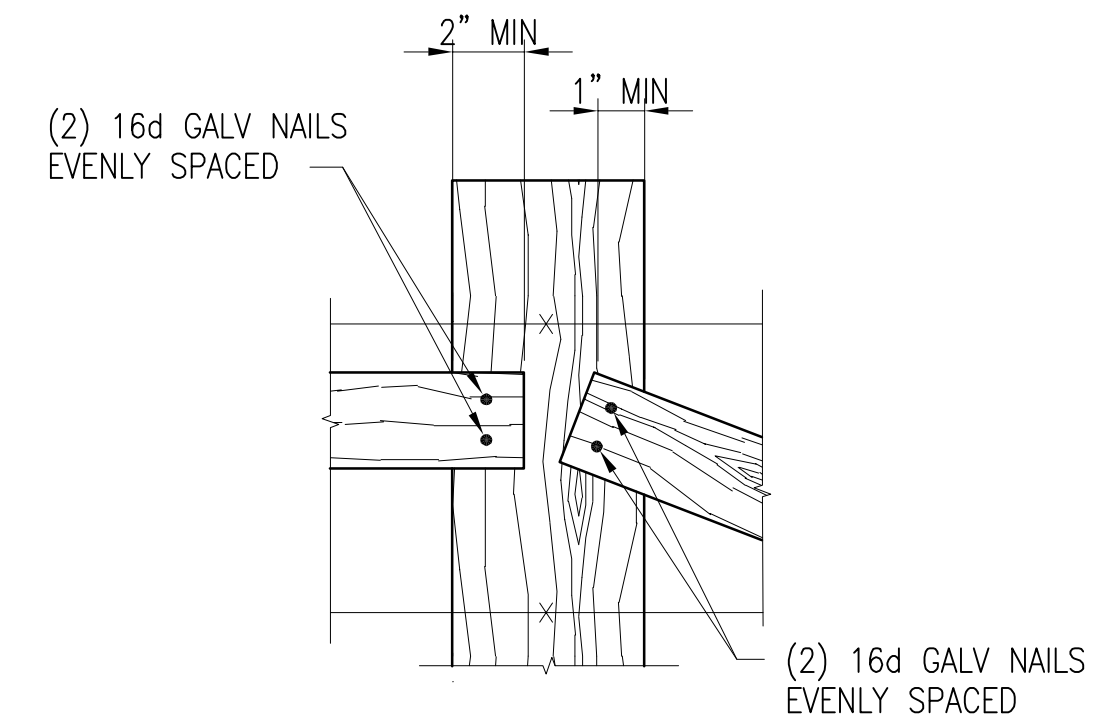
**TYPICAL LAYOUT - WOVEN WIRE FENCE**

SCALE: 1/2" = 1'-0"



**PULL POST BRACE PANEL DETAIL**

SCALE: 1/2" = 1'-0"



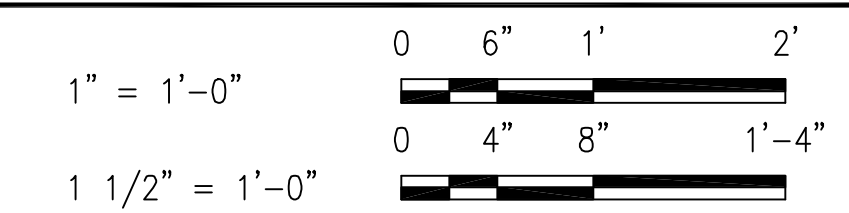
**DAP DETAIL**

SCALE: 1 1/2" = 1'-0"

**GENERAL NOTES**

1. THE SPACING OF END OR CORNER PANEL AND BRACE PANEL OF 10'-0" AND 9'-0" IS MAXIMUM. WHEN CORNER OR END PANEL CONFLICTS WITH GATE OR CATTLE GUARD BRACE PANEL OR TWO CORNER PANELS CONFLICT, BRACING AND SPACING OF POSTS SHALL BE ALTERED TO PROVIDE ADEQUATE BRACING AS REQUIRED.
2. THE GATE SHOWN IS TYPICAL. ANY STANDARD COMMERCIAL GATE THAT VARIETY ONLY IN NON-ESSENTIAL DETAILS SHALL BE ACCEPTABLE, SUBJECT TO APPROVAL.
3. LATCH AND PIN FOR PANEL GATE REQUIRED, BUT NOT SHOWN.

**GRAPHIC SCALES**

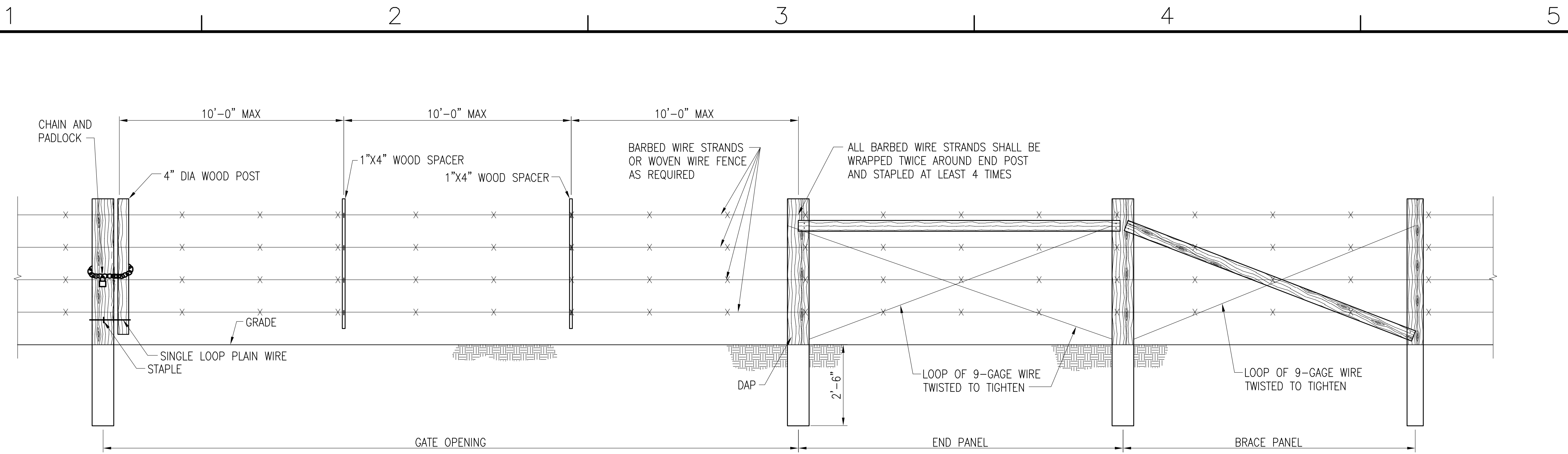


UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

FARM STYLE FENCES

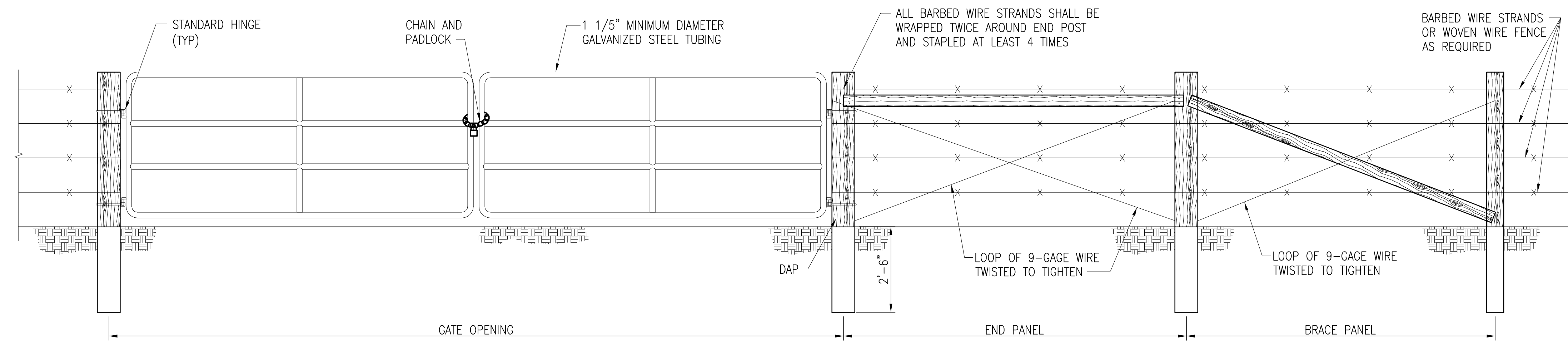
UFC-730

DRAWING REVISION: 24 AUGUST 2007



**TYPICAL BARBED WIRE DROP GATE ELEVATION**

SCALE: 1/2" = 1'-0"



**TYPICAL PANEL GATE ELEVATION**

SCALE: 1/2" = 1'-0"

**GRAPHIC SCALES**

1/2" = 1'-0"

0 1' 2' 4'

UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

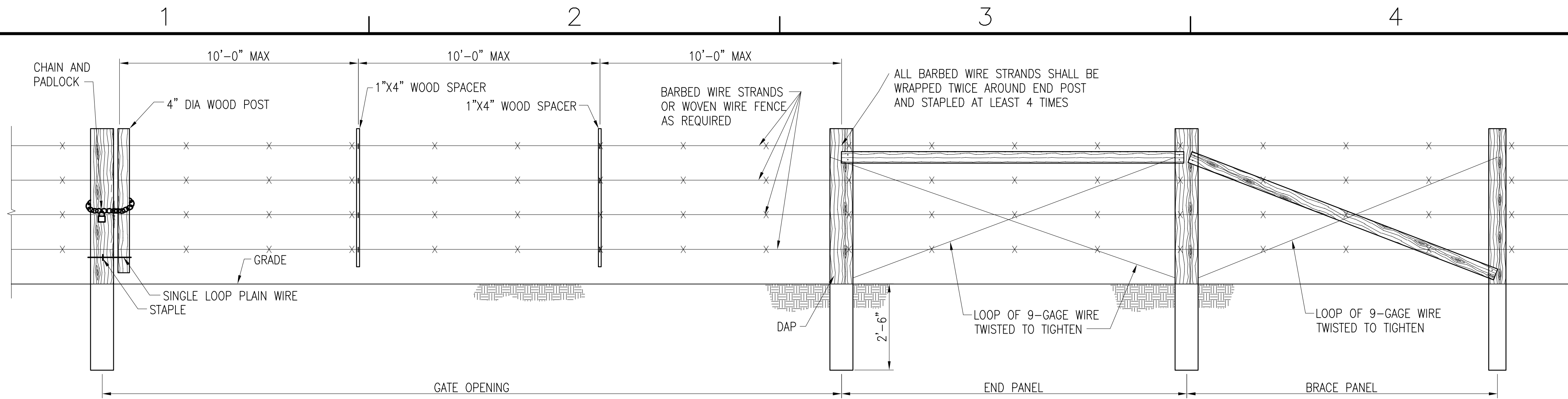
FARM STYLE GATES

UFC-731

FILE NAME: P:\Core Projects\ATP-FSE\552005-2007 UFC FENCE DRAWINGS\Phase B - Design\Drawings\552005-UFC-731.dwg LAYOUT NAME: S-702 PLOTTED: Tuesday, August 28, 2007 - 2:47pm

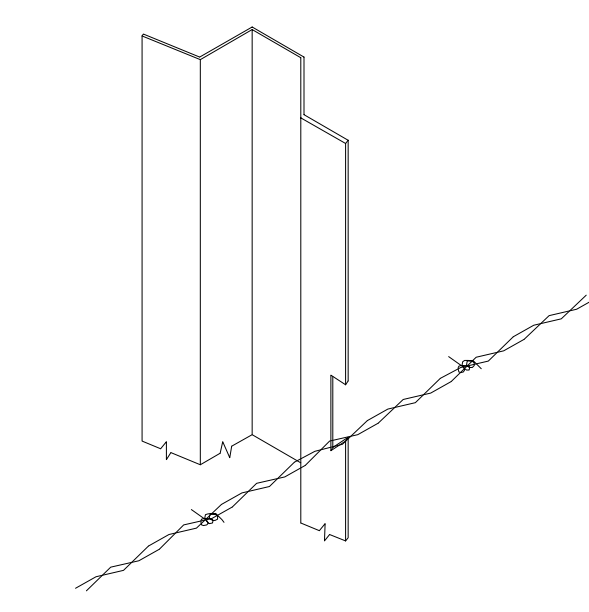
DRAWFORM REVISION: 24 AUGUST 2007

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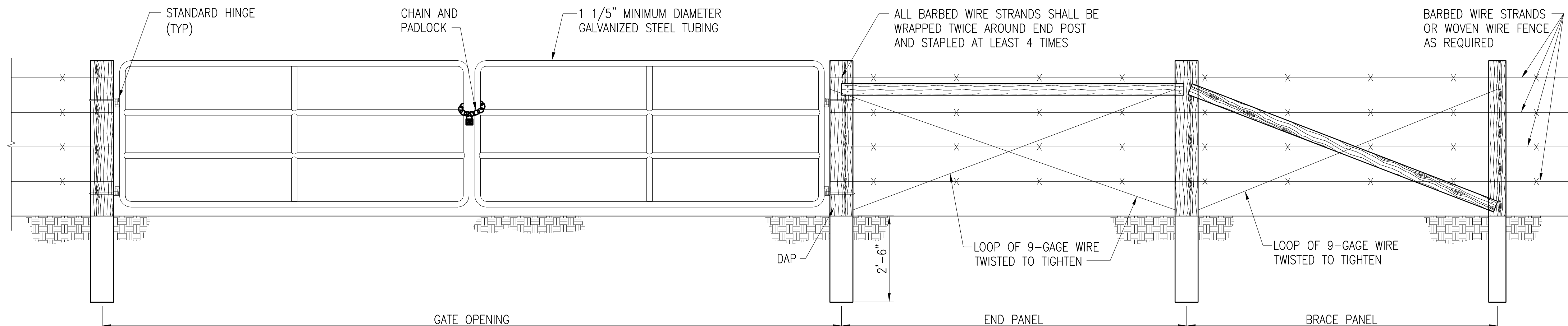
**TYPICAL BARBED WIRE DROP GATE ELEVATION**

SCALE: 1/2" = 1'-0"



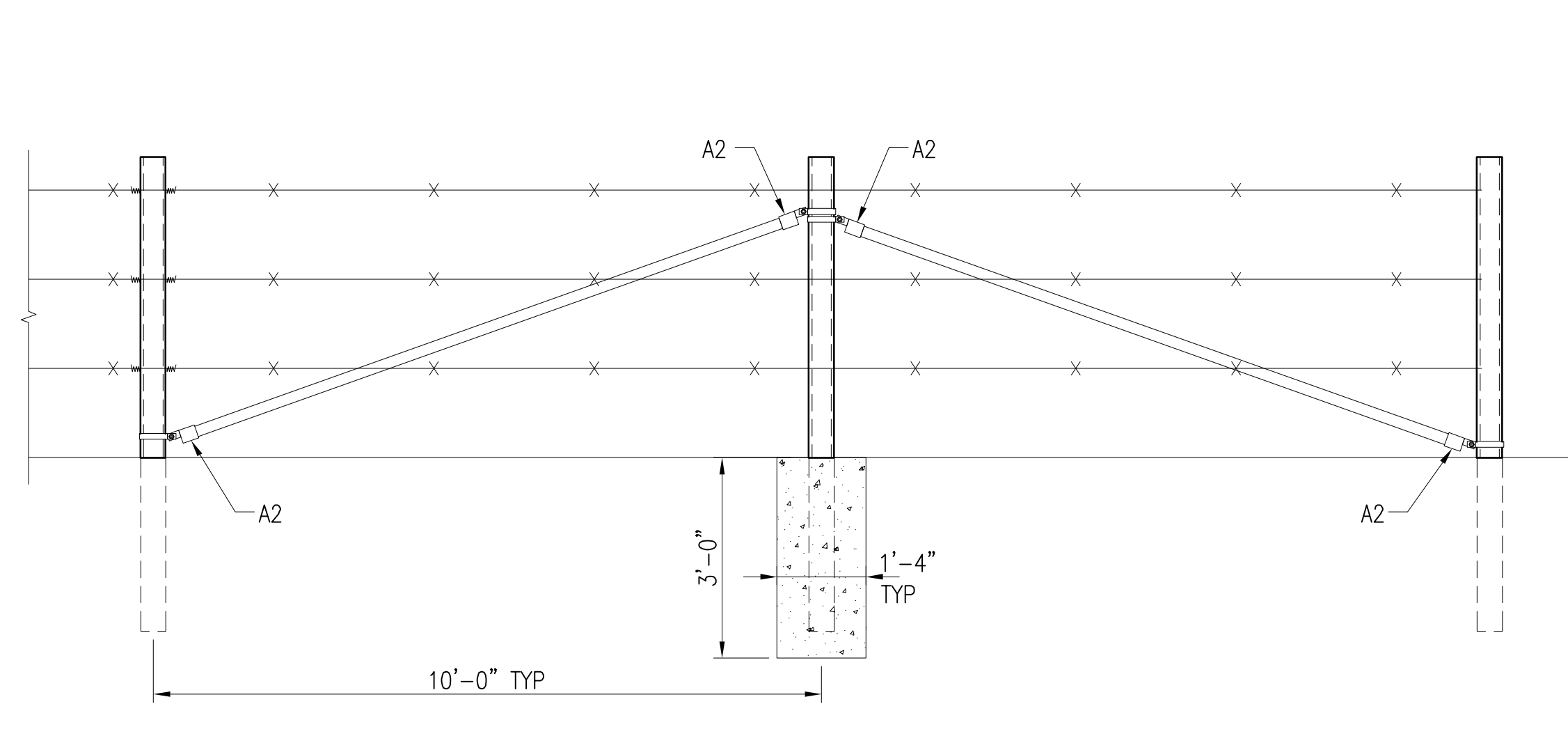
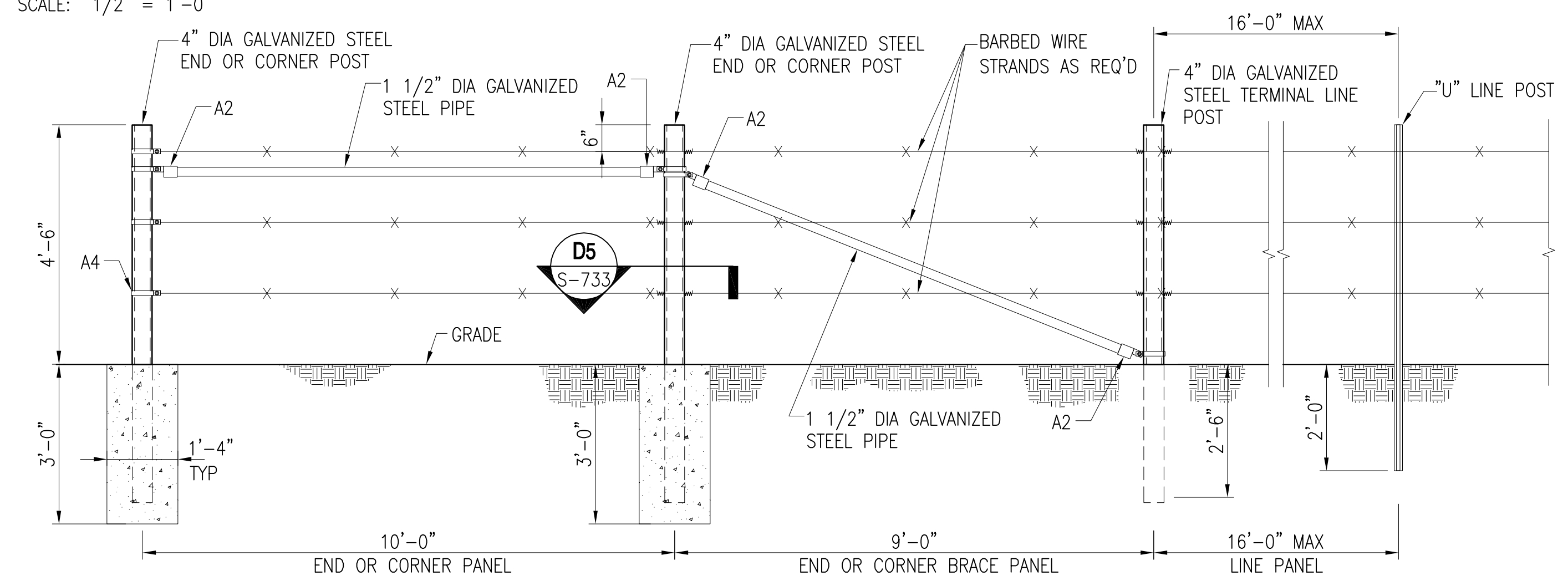
**"U" LINE POST**

NO SCALE



**TYPICAL PANEL GATE ELEVATION**

SCALE: 1/2" = 1'-0"

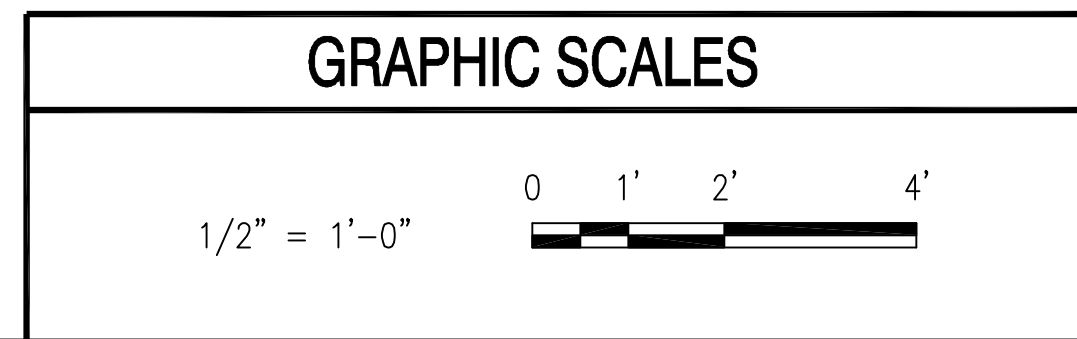


**TYPICAL 3 STRAND BARBED WIRE FENCE WITH STEEL POSTS (FOR OTHER STRAND CONFIGURATIONS SEE SHEET 730)**

SCALE: 1/2" = 1'-0"

**PULL POST PANEL - BARBED WIRE FENCE WITH STEEL POSTS**

SCALE: 1/2" = 1'-0"



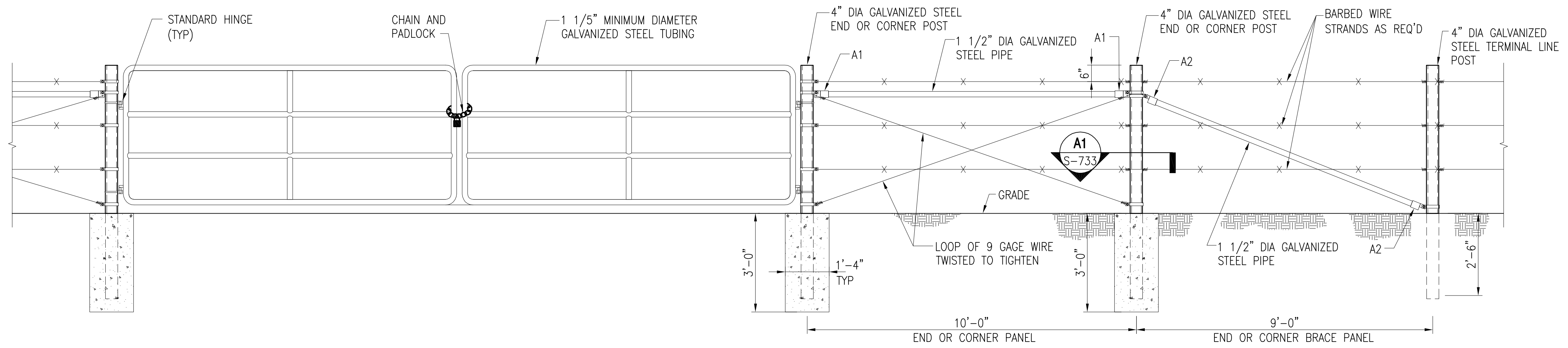
UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

FARM STYLE GATE AND FENCE DETAILS

UFC-732

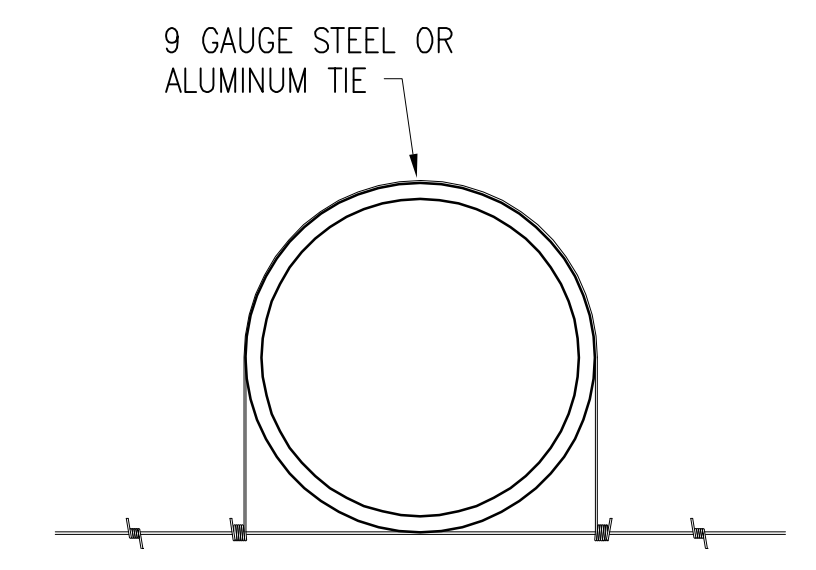
DRAWFORM REVISION: 24 AUGUST 2007

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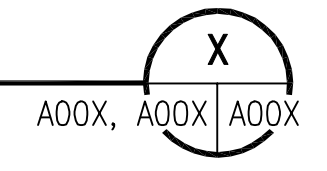
**TYPICAL 3 STRAND BARBED WIRE FENCE WITH STEEL POSTS (FOR OTHER STRAND CONFIGURATIONS SEE SHEET 730)**

SCALE: 1/2" = 1'-0"

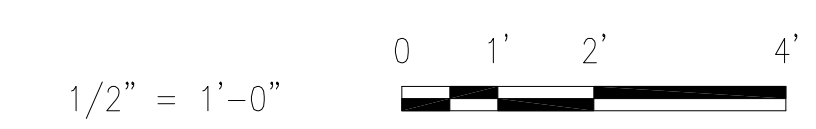


**SECTION**

SCALE: 1/2" = 1'-0"



**GRAPHIC SCALES**



UNIFIED FACILITIES CRITERIA 4-022-03 SECURITY ENGINEERING: FENCES, GATES AND GUARD FACILITIES  
DEFINITIVE DRAWINGS FOR SECURITY FENCING, GATES AND CABLING

FARM STYLE FENCES

UFC-733

DRAWING REVISION: 24 AUGUST 2007