# ARMY ACCESS CONTROL POINTS STANDARD DESIGN/CRITERIA

JANUARY 2009

Prepared By:

U.S. Army Corps of Engineers
Protective Design Center
Omaha District

**ARMY ACCESS CONTROL POINTS**
**STANDARD DESIGN/CRITERIA**
**INDEX**

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**DEPARTMENT OF THE ARMY**
**441 G. ST NW**
**U.S. ARMY CORPS OF ENGINEERS**
**WASHINGTON, D.C. 20314-1000**

APR 15 2009

CEMP-ZA

MEMORANDUM FOR RECORD

SUBJECT: Approval for the January 2009 Revision of the Army Access Control Points (ACPs) Standard Design/Criteria

1. The 2009 revised Access Control Points Standard Design Criteria (Encl 1) is approved. This 2009 version supersedes the 14 December 2004 document in its entirety.

2. The Army Standard for ACPs, approved by the Army Facility Standardization Committee also on 14 December 2004, remains in effect. No changes are required to the Army Standard for ACPs based on this revision of the Army ACPs Standard Design/Criteria.

3. Revisions in the ACP Standard Design/Criteria include:

   a. Incorporation of lessons learned.

   b. More detailed layouts and equipment information.

   c. Revised roadway geometry to improve traffic flow.

   d. Addition of alternative roadway layouts to improve threat detection.

   e. Revised floor plans and site plans to accommodate the future Automated Installation Entry (AIE) system.

4. We request the widest dissemination of the revised criteria. The USACE Center of Standardardization (COS) POC for ACPs is Brian Erickson, at 402-995-2394.

FOR THE COMMANDER:

3 Encl

JEFFREY J. DORKO
Major General, USA
Deputy Commanding General
for Military and International Operations

# ARMY ACCESS CONTROL POINTS (ACP)

# STANDARD DESIGN/CRITERIA

## 1 INTRODUCTION

### 1.1 DEFINITIVE DESIGN

This Standard Design/Criteria supersedes all versions for this facility type. It shall be used for construction of all new ACP projects and renovations to existing ACP projects. It is intended for use anywhere in the continental United States or overseas locations. The design procedures and drawings included in this Standard Design/Criteria provide flexibility to Army ACP designers in meeting the Army's baseline physical security requirements and the full range of Force Protection Conditions on Army Installations. This Standard Design/Criteria meets the Army Standard for Access Control Points approved by the Army Facilities Standardization Committee and the ACP Criteria established by the Office of the Provost Marshal General (OPMG), who is the Army's proponent for Access Control Points. It also meets Architectural and Engineering design criteria established by the Headquarters U.S. Army Corps of Engineers (HQUSACE). The Chief of Engineering and Construction Division at HQUSACE must approve all changes, deviations, or waivers to the Standard Design/Criteria.

### 1.2 ACP DEFINITION

An Access Control Point is a corridor at an Installation entrance through which all vehicles and pedestrians must pass when entering or exiting the Installation. The perimeter of the ACP consists of both passive and active barriers arranged to form a contiguous barrier to pedestrians and vehicles. ACP guards control the active barriers to deny or permit entry into the Installation.

### 1.3 ACP PERFORMANCE REQUIREMENTS

**ACP's shall be designed to prevent an unauthorized vehicle or pedestrian from entering the Installation, to ensure safety of innocent ACP users, and to maximize throughput of vehicular and pedestrian traffic.** In order to meet these diverse and sometimes conflicting requirements, Army ACP designers must consider local site constraints and then use creativity and innovation to develop design solutions that meet all of the ACP performance requirements. There are no cookie-cutter design solutions. Each design is unique. Designers must carefully consider all of the criteria and then select and design protective measures that will be most effective for the given site.

# 2 ACP DESIGN CRITERIA

## 2.1 THE ARMY STANDARD FOR ACPs

The Army Facilities Standardization Committee established the Army Standard for Access Control Points on 14 December 2004. The standard lists mandatory requirements for all Army ACPs. The standard is included in Appendix A. The Army Facilities Standardization Committee must approve changes, deviations, or waivers from this standard.

## 2.2 OFFICE OF PROVOST MARSHAL GENERAL (OMPG) DESIGN CRITERIA

OPMG, as the Army's proponent for Access Control Points, provided their criteria for ACP's in a document titled "ACP Criteria from OPMG" dated 19 November 2004, which was subsequently updated in July 2008 and approved by OPMG on 10 December 2008. The OPMG Criteria consist of mandatory requirements and non-mandatory recommendations. Mandatory requirements in the criteria are designated by the words "shall", "will", or "must", whereas non-mandatory recommendations are designated by the words "should", "can", or "may". The current OMPG Criteria have been made a part of this Standard Design/Criteria. The OPMG Criteria is included in Appendix B.

## 2.3 STANDARD DESIGN/CRITERIA DRAWINGS

The Protective Design Center (PDC) of the U.S. Army Corps of Engineers (USACE), as the Center of Standardization (COS) for Army Access Control Points, developed Standard Design/Criteria drawings for ACP's. These drawings incorporate the Army Standard for ACPs, the OPMG Criteria for ACPs, and other applicable criteria. They also provide mandatory requirements and recommendations to Army ACP designers and Installation Security Specialists for designing Army ACPs. The drawings have been made a part of this Standard Design/Criteria and are included in Appendix C.

## 2.4 OTHER CRITERIA

ACP designers are responsible to identify additional criteria such as applicable design codes, security (anti-terrorism), sustainability, energy conservation, environmental stewardship, and the Installation Design Guide for each ACP project developed from this Standard Design/Criteria at the time project design work is authorized.

# 3 DESIGN PROCEDURE

The Designer must evaluate the criteria in paragraph 2 above and select ACP features that detect possible threats and ACP features that will delay the threats for the delay times required in the criteria. Detection features include vehicle speed detectors, vehicle wrong-way detectors, vehicle presence detectors, and detection by security guards. Delay features for vehicles include straight roadways, curved roadways, and roadways with chicanes or turns. Based on the opportunities and constraints of the site, the designer must determine appropriate detection and delay features and perform calculations to assure that the selected features provide the delays required for each Threat Scenario listed in the criteria. The design engineer must prepare a Design Analysis including descriptions of selected ACP features, layouts of detection and delay features, and calculations verifying delay times. Step-by-step procedures along with examples are included in Appendix D.

# 4 CONTROL OF ACTIVE VEHICLE BARRIERS (AVBs)

Active vehicle barriers are an essential element in preventing unauthorized motorists from entering Army Installations. However, an active vehicle barrier capable of stopping large, moving vehicles can cause significant damage to vehicles and can cause injury or even death to vehicle occupants. Through Army policy and design criteria, ACP designs must include adequate safety features to ensure the safety of motorists entering and exiting the ACP. The active vehicle barrier controls are an essential element of the ACP safety features. Active vehicle barrier controls must provide sufficient information to ACP guards to help them decide when to deploy the barriers. Active vehicle barrier controls must also close the active barriers upon command of the guards in order to stop a threat vehicle. Finally, the active vehicle barrier controls must provide sufficient warning to non-threat vehicles to allow them to either clear the barrier or stop safely in front of it before it is closed.

## 4.1 SENSORS

Barrier controls include sensors that may be required to detect a vehicle going the wrong way in the ACP, a vehicle speeding through the ACP, and a vehicle’s presence at a specific location in the ACP. Sensor systems for over-speed, wrong-way, and vehicle presence shall utilize proven sensor technology and equipment.

### 4.1.1 Wrong Way Detection

Wrong way sensors, when required, are usually deployed in all outbound lanes at the ACP entrance and after each Turn-around from the inbound lanes. Wrong way detectors can utilize induction loops, video motion cameras, microwave, laser, or other appropriate sensor technology. Location of sensors is a function of the protective system design and the type(s) of sensors used.

### 4.1.2 Point Over-Speed Detection

Point over-speed sensors, when required, are used to detect speeding vehicles at calculated distances in front of the ACP Check Point. At each calculated distance, sensors must detect speeding vehicles in all inbound and, if required, all outbound lanes. Point over-speed detectors can utilize induction loops, video motion cameras, microwave, laser, or other appropriate sensor technology. Location of sensors is a function of the protective system design and the type(s) of sensors used.

### 4.1.3 Continuous Over-Speed Detection

Continuous over-speed sensors may be deployed in the Approach and Access Control Zones to defeat Threat Scenario #2 (see description of Threat Scenarios in Appendices B and D). Continuous over-speed detectors can utilize video motion cameras, forward/backward looking microwave or laser sensors, or other appropriate sensor technology. Induction loops and side fired microwave and laser sensors are not suitable for continuous over-speed detection. Location of sensors is a function of the protective system design and the type(s) of sensors used.

### 4.1.4 Vehicle Presence Detection

Vehicle Presence Detectors (VPDs) shall be deployed at all active vehicle barriers to detect a vehicle immediately in front of or behind the barrier. Detection of a vehicle traveling through the zone of these VPDs will suppress a barrier “close” command. VPDs shall also be deployed in the “Vehicle Presence Detection” safety system to detect vehicles that are stopped at a Stop Signal ahead of the barrier. VPDs can utilize induction loops, video motion cameras, microwave, break beam, or other appropriate sensor technology.

## 4.2 PROCUREMENT

The supplier of the active vehicle barriers at a given ACP shall be required to provide all barrier controls in accordance with UFGS 34 41 26.00 10 “Access Control Points Control System”. Controls shall include all required over-speed, wrong-way, and vehicle presence sensors; traffic warning signs and signals; traffic control signals near the barrier; gate arms at the barrier (when applicable); barrier control panels including switches and indicating lights; Annunciator panels for gate guards; and traffic controller units (TCUs) to control the barriers and the warning and traffic signals associated with the barriers.

## 4.3 INSTALLATION

The active vehicle barrier supplier shall be required to provide on-site direction to the installation contractor (if different than the supplier) during installation of all barrier control elements and connecting wiring per UFGS 34 41 26.00 10 “Access Control Points Control System”.

## 4.4 COMMISSIONING

The barrier supplier shall be required to conduct all barrier control system commissioning activities per UFGS 34 41 26.00 10 “Access Control Points Control System” including, training, performance verification testing, and endurance testing. The active vehicle barrier supplier shall be required to submit for approval complete schematics and logic diagrams of the barrier control system along with complete test procedures for all commissioning tests. Commissioning tests must verify barrier performance for all modes of operation including the full range of operation of all sensors utilized in the barrier control system.

# 5 COSTS

All ACPs are different depending on traffic volume, internal and external roadway configurations, and site opportunities and constraints. Appendix E includes a cost estimate of an ACP with specifically defined parameters. However, the costs of the various ACP components can be extracted from this estimate and applied to a wide variety of ACP configurations to obtain programming level costs.

# 6 OTHER DESIGN CONSIDERATIONS

## 6.1 PASSIVE BARRIERS

### 6.1.1 Stopping Capacity

The OPMG Criteria in Appendix B require that passive barriers along the ACP corridor be capable of stopping a 15,000 pound vehicle traveling at the maximum velocity and approach angle that it can attain before impacting the barrier. The capacity in kinetic energy (KE) of a passive barrier that is required to stop a vehicle with a mass of M impacting the barrier at an angle of θ° and traveling at a velocity of V is:

$$KE=\frac{1}{2}*M*(\sin(\theta)*V)^2$$

The sin(θ)*V term is the component of the threat vehicle's velocity that is perpendicular to the barrier. The capacity of a passive barrier that is required to stop a 15,000 pound threat vehicle impacting the barrier at 90° and traveling at 30 miles per hour (mph) is 451,000 foot-pounds (ft-lbs). The capacity of a passive barrier required to stop a 15,000 pound threat vehicle impacting the barrier at 25° and traveling at 30 mph is 80,540 ft-lbs, which is a significant reduction from the kinetic energy in the 90° impact case. Reducing the impact angle of the threat vehicle through ACP corridor design can significantly reduce the energy stopping requirement for passive barriers. See Appendix D for a procedure for determining approach angles, velocities, and resulting energy stopping requirements for passive barriers along ACP corridors.

### 6.1.2 Acceptable Passive Barriers

The vehicle stopping capability of a passive barrier can be determined through crash testing or by engineering analysis. The following are acceptable passive barriers for use at Army ACPs:

1. Included on the list of U.S. Department of State Certified Anti-Ram Vehicle Barriers,
2. Included on the list of DOD Certified Anti-Ram Vehicle Barriers maintained by the Protective Design Center, or
3. Verified by calculations performed and/or checked by a registered Professional Structural Engineer with experience in the design and application of passive barrier systems. Stamped and signed copies of the calculations shall be obtained and maintained on file by the barrier purchasing agency and by the using Army Installation.

## 6.2 ELECTRICAL LOADS

Electrical loads include Utility loads, Emergency Generator loads, and Uninterruptible Power Supply (UPS) loads. The OPMG Criteria in Appendix B describes requirements for the Emergency Generator and UPS loads. Drawing E1.02 in Appendix C shows an overall summary of all three types of loads for a typical large ACP. A detailed listing of the loads for a typical large ACP is included in Appendix F. Electrical loads for a specific ACP must be determined on a case by case basis.

## 6.3 BARRIER SAFETY SYSTEMS

As described in the OMPG Criteria in Appendix B, there are three active barrier safety systems that have been approved by the Surface Development and Distribution Command (SDDC) for use at Army ACPs. One of these safety systems must be used whenever an active vehicle barrier is installed at an Army ACP. These safety systems are:

### 6.3.1 Signs and Signals

This system employs warning signs and signals to alert non-threat vehicles of impending vehicle barrier deployment. Barrier deployment is delayed for four seconds from the time the guard initiates an Emergency Fast Operate (EFO) command to allow warning signals to sequence. See drawing C9.10 in Appendix C.

### 6.3.2 Vehicle Presence Detection

This system consists of a Stop Line in front of each barrier, a lane control type traffic signal at the Stop Line, and Vehicle Presence Detectors before the Stop Line and before and after each barrier. The traffic signal will normally indicate "red" requiring all motorists to stop at the Stop Line in front of the barrier. The VPD in front of the Stop Line will sense the vehicle's presence and change the lane control signal from "red" to "green" allowing the motorist to proceed over the barrier. If a guard initiates an Emergency Fast Operate command when the signal is "red" **and** there are no vehicles detected on the VPDs ahead of or behind the barrier, the barrier will close immediately thus eliminating the four second delay required in the Signs and Signals Safety System described above. This system is shown on drawings C3.17, 18, and 19 in Appendix C. Also, see Appendix G and drawings E1.03, E1.05, and E1.06 in Appendix C for information on logic control of the sensors, lane control signals, and barriers.

### 6.3.3 Normally Closed Operation

This safety system requires that two sets of barriers be installed to create an "entrapment area" in each inbound and outbound lane. One of the two barriers in each entrapment area must be closed. This system can be utilized when real estate for the ACP is limited. The distance between the two sets of barriers must be large enough to accommodate the largest vehicle served by the ACP, or it could be made larger to provide space for platooning multiple vehicles. Drawing C3.08 in Appendix C shows this safety system with the minimum space between barrier sets, and drawing C3.16 in Appendix C shows this safety system for a platooning operation.

# APPENDIX A

## THE ARMY STANDARD
## FOR
## ACCESS CONTROL POINTS

**APPENDIX A**
**THE ARMY STANDARD FOR ACPs**
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**DEPARTMENT OF THE ARMY**
**ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT**
**600 ARMY PENTAGON**
**WASHINGTON DC 20310-0600**

DAIM-ZA

DEC 14 2004

MEMORANDUM FOR RECORD

SUBJECT: The Army Standard for Access Control Points

1. The Army Standard for Access Control Points is approved for implementation. This Standard establishes mandatory features for Army Access Control Points (ACPs). It applies to all active Army installations and reserve components prime installations. Only the Army Facilities Standardization Committee has the authority to approve exceptions to this Standard. Waivers from the Army Standard must be approved through the installation management chain of command in accordance with AR 415-15.

2. The Army Standard for Access Control Points is mandatory for operations and maintenance projects starting FY2006 and beyond. For programming purposes requiring the use of Military Construction, Army/Army Reserve/National Guard appropriations, all projects from FY2008 and after must apply the Army Standard.

3. The proponent of this Standard is the Army Facilities Standardization Committee. Supplementation of this Standard is prohibited without prior approval from the Committee. The Army Standard for Access Control Points will be periodically reviewed and as needed, updated. The Army Standard for ACPs will be posted to the Army Installation Design Standards. Recommended changes with supporting rationale should be sent through the chain of command directly to the Assistant Chief of Staff for Installation Management, ATTN: Access Control Points Facilities Design Team (DAIM-MD), 600 Army Pentagon, Washington, DC 20310-0600.

JAMES A. CHEATHAM
Major General, USA
Acting Director for Military Programs
Army Facilities Standardization Committee
30 Nov 2004
(Date)

for RONALD L. JOHNSON
Major General, USA
Director, Installation Management Agency
Army Facilities Standardization Committee
12/14/04
(Date)

LARRY J. LUST
Major General, GS
Assistant Chief of Staff for Installation Management
Chairman, Army Facilities Standardization Committee
13/12/04
(Date)

# <u>THE ARMY STANDARD</u>

# For Access Control Points (ACPs)

# December 2004

# The Army Standard for Access Control Points – December 2004



The Assistant Chief of Staff for Installation Management, HQDA (Preparing Agent)

The United States Army Corps of Engineers

The Installation Management Agency

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

| Change No. | Date | Location |
|---|---|---|
| | | |
| | | |
| | | |

**This Army Standard supersedes the HQDA memorandum, 26 February 2004, subject: Interim Army Standards for Canopies at Army Installation Access Control Points**

## FORWARD

This printing publishes the Army Standard for Access Control Points (ACPs). The Army Facilities Standard process is explained in AR 415-15. This Army Standard establishes mandatory features for Army ACPs. It applies to all active Army installations and reserve components prime installations.

The proponent of this Standard is the Army Facilities Standardization Committee. Supplementation of this Standard is prohibited without prior approval from the Committee. Technical advice concerning the Army Standard is the responsibility of the Center of Standardization – the United States Army Corps of Engineers Omaha District. Users are invited to contact the Center of Standardization for document interpretation.

The Army Standard for Access Control Points is mandatory for operations and maintenance projects starting FY2006 and beyond. For programming purposes requiring the use of Military Construction, Army/Army Reserve/National Guard appropriations, all projects from FY2008 and after must apply the Army Standard.

Only the Army Facilities Standardization Committee has the authority to approve exceptions to this standard. Waivers from the Army Standard must be approved through the installation management chain of command in accordance with AR 415-15.

The Army Standard for Access Control Points will be periodically reviewed and as needed, updated, and made available to users as part of the Army's responsibility for providing technical criteria for military construction. The Army Standard for ACPs will be posted to the Army Installation Design Standards. Recommended changes with supporting rationale should be sent through the chain of command directly to the Assistant Chief of Staff for Installation Management, ATTN: Access Control Points Facilities Design Team (DAIM-MD), 600 Army Pentagon, Washington, DC 20310-0600.

# The Army Standard for Access Control Points – December 2004

## 1 INTRODUCTION

1-1 **PURPOSE AND SCOPE.** This document provides standards for Army access control points (ACPs). The Army Facilities Standardization Committee (AFSC) under the Department of the Army Facilities Standardization Program publishes the Army Standard. The AFSC is composed of the Headquarters, Department of the Army, Assistant Chief of Staff for Installation Management (ACSIM); The Director for Military Programs, Headquarters, US Army Corps of Engineers (USACE); and the Director, Installation Management Agency (IMA). Publication of the Army Standard for Access Control Points is by electronic media on the Internet at the ACSIM Installation Design Standards website.

1-2 **APPLICABILITY.** This Army Standard applies to all Army active installations and reserve components prime installations where government or contractors plan for, construct, and maintain Army access control points.

1-3 **REFERENCES.** Appendix A.

## 2 REQUIREMENTS

2-1 **ACP FUNCTION CLASSIFICATION.** Army physical security policy requires all Army installations to restrict access. Access Control Points are the physical assets along with manpower and operational procedures that commanders employ to control access to Army installations. Army ACPs shall be categorized as follows:

**Table 2-1 ACP Use Classifications**

| Use Classification | Operational Hours | Preferred Operation |
|---|---|---|
| Primary | 24/7 Open continuously | Vehicle registration/visitor pass capacity. Could also be designated as truck and delivery gate. |
| Secondary | Less than 24/7 with regular operating hours | Regular operations, visitors with authorization. Could also be designated as truck and delivery gate. |
| Limited Use | Only opened for special purposes or special events | Tactical vehicles, HAZMAT, special events. |
| Pedestrian | Varies | Personnel only. Could be located near installation housing areas, near schools, or as part of a Primary or Secondary ACP. |

2-2 **PRIMARY AND SECONDARY ACP REQUIREMENTS.** The following requirements apply to all Primary and Secondary ACPs except as noted:

2-2.1 **Performance Standard.** ACPs must be designed to defeat the vehicle and pedestrian threats prescribed in the ACP Criteria from the Office of the Provost Marshal General (Appendix B in the Standard Designs for ACPs), and to ensure safety of motorists, pedestrians, and guards.

2-2.2 **ACP Corridor.** ACPs must have both passive and active vehicle barriers forming a contiguous perimeter around the ACP.

2-2.2.1 **Passive Barriers.** Passive barriers must be capable of preventing penetration of a threat vehicle.

2-2.2.2 **Active Vehicle Barriers.** Active vehicle barriers, controlled by ACP guards, must be utilized in each inbound and outbound lane to permit or deny vehicle access.

2-2.2.3 **Active Vehicle Barrier Safety.** An active vehicle barrier safety regime must be utilized that conforms to one of the Surface Deployment and Distribution Command – Transportation and Engineering Agency (SDDC-TEA) approved safety protocols.

2-2.3 **Control.** ACPs must have zones established to control the flow of vehicular and pedestrian traffic in order to detect, assess, and respond to prescribed threats.

2-2.4 **Entry Gate.** ACPs must have an entry gate capable of securing the ACP. The entry gate must provide the same level of protection as the adjoining perimeter, and should appear to resemble the adjoining perimeter fence and / or barriers

2-2.5 **Identity Check Area.** ACPs must have an identity check area within the access control zone where guards or automated equipment verify pedestrians, vehicles, and vehicular occupants identifications; perform limited searches; and validate authorizations to enter the installation. The identity check area must include:

2-2.5.1 **Identity Check Area Canopy.** Identity check area must be covered with a canopy over all inbound lanes.

2-2.5.2 **Entry Lanes.** ACPs must have at least two lanes in the identity check area.

2-2.5.3 **Traffic Islands.** ACPs must have raised, curbed islands to separate all inbound lanes in the identity check area.

2-2.5.4 **Guard Booths.** ACPs must have a guard booth building for each lane of incoming traffic for use by guards performing vehicle/passenger identity checks.

2-2.5.5 **Lighting.** Identity check area must provide adequate lighting for visual inspection of identification cards and documents.

2-2.6 **Turn-around Lanes.** ACPs must have at least two turn-around lanes, one before and one immediately after the identity check or vehicle search area.

2-2.7 **Gatehouse.** ACPs must have a gatehouse with the primary controls for the final active vehicle barriers. The gatehouse must be sized to accommodate ACP guards and their activities.

2-2.8 **Search Area.** ACPs must have a covered area separated from and easily accessible to the identity check area and obscured from casual observation from the identity check area. The size of the search area must be determined from a traffic engineering study. However, for search areas that allow trucks, the area must be sized to accommodate a minimum of one WB-62 tractor-trailer. For areas that do not allow trucks, the search area must be sized to accommodate a minimum of two passenger-sized vehicles.

2-2.8.1 **Search Area Building.** Search areas must have an adjacent or nearby building to shelter vehicle occupants from inclement weather. The building will facilitate guards' observation of vehicle occupants.

2-2.8.2 **Consolidated Search Area Building.** For ACPs with both truck and passenger search areas, one consolidated search area building is sufficient if the search areas are near each other.

2-2.9 **Overwatch Position.** ACPs must have a strategically located area suitable for an overwatch position that includes controls for the final active vehicle barriers.

2-2.10 **Visitors Control Center (VCC).** Installations must have a building for processing visitors. The building must be sized for the effective throughput of the expected number of visitors.

2-3 **LIMITED USE ACPs.** The following requirement applies to all Limited Use ACPs:
2-3.1 **Performance Standard.** Limited Use ACPs shall provide means to defeat the vehicle and pedestrian threats prescribed in the ACP Criteria from the Office of the Provost Marshal General (Appendix B in the Standard Designs for ACPs), and to ensure safety of motorists, pedestrians, and guards. Portable facilities including passive and active barriers, guard booths, and lights shall be used and configured to meet the requirements of limited use.

2-3.2 **Control.** Limited Use ACPs must have zones established to control the flow of vehicular and pedestrian traffic in order to detect, assess, and respond to prescribed threats.

2-3.3 **Entry Gate.** Limited Use ACPs must have an entry gate capable of securing the ACP. The entry gate must provide the same level of protection as the adjoining perimeter, and should appear to resemble the adjoining perimeter fence and / or barriers.

2-3.4 **Identity Check Area.** Limited Use ACPs must have an identity check area where guards can verify pedestrians, vehicles, and vehicular occupants identifications; perform limited searches; and validate authorizations to enter the installation. The identity check area shall be configured to accept portable facilities to include passive and active barriers, guard booths, and lights.

2-3.5 **Turn-around Lanes.** Limited Use ACPs shall provide means for turn-around of vehicles. Where operational procedures are not adequate for control, a turn-around lane is required and shall be located before the identity check area.

2-4 **PEDESTRIAN ACPs.** The following requirements apply to all Pedestrian ACPs.

2-4.1 **Performance Standard.** Pedestrian ACP's must be designed to defeat the pedestrian threats prescribed in the ACP Criteria from the Office of the Provost Marshal General (Appendix B in the Standard Design for ACPs), and to ensure the safety of pedestrians and guards.

2-4.2 **Pedestrian Corridor.** Pedestrian ACPs must have both passive and active barriers forming a contiguous perimeter around the ACP.

2-4.2.1 **Passive Barriers.** Passive barriers must be capable of preventing easy circumvention or penetration by a pedestrian.

2-4.2.2 **Active Pedestrian Barriers.** Pedestrian ACPs must include active pedestrian barriers controlled by the ACP guards to permit or deny pedestrian access.

2-4.3 **Control.** ACP must have zones established to control the flow of pedestrian traffic in order to detect, assess, and respond to prescribed threats.

2-4.4 **Entry Gate.** Pedestrian ACPs must have an entry gate at the ACP entrance capable of closing off the ACP. The entry gate must provide equivalent security and equivalent appearance as the adjoining perimeter fence/barrier. If the active pedestrian barrier is located at the installation perimeter, a separate entry gate is not required.

2-4.5 **Identity Check Area.** Pedestrian ACPs must have an identity check area within the access control zone where guards or automated equipment verify pedestrians' identifications, perform limited searches, and validate authorizations to enter the installation. The identity check area must include:

2-4.5.1 **Guard Booths.** Pedestrian ACPs must have a guard booth for use by guards performing pedestrian identity checks.

2-4.5.2 **Lighting.** Identity check area must provide adequate lighting for visual inspection of identification documents.

## APPENDIX A

## REFERENCES

### GOVERNMENT PUBLICATIONS:

| | |
|---|---|
| **1. Department of Defense** | |
| Defense*Link* Publications Internet site http://www.defenselink.mil/pubs/ | DoD Directive 5200.8, Security of DoD Installations and Resources |
| | DoD 5200.8-R, DoD Physical Security Program |
| | DoD Instruction 2000.16, DoD Antiterrorism Standards |
| Unified Facilities Criteria (UFC) Index http://65.204.17.188//report/doc_ufc.html | Unified Facilities Criteria (UFC) 4-012-01, Security Engineering: Entry Control Facilities / Access Control Points. |
| **2. Department of the Army** | |
| Army Electronic Publications Internet site http://www.army.mil/usapa/ | AR 190-13, The Army Physical Security Program |
| | AR 415-15, Army Military construction Program Development and Execution |
| Army IDS web site http://www.mantech-mec.com/army_ids | Army Installation Design Standards |
| | Army Standard Design for ACPs |
| | HQDA memorandum, Interim Army Standards for Canopies at Army Installation Access Control Points |
| SDDC-TEA web site http://www.tea.army.mil/cdrom/readmes/allsections.htm#gates | Surface Deployment and distribution Command-Transportation and Engineering Agency publication, Traffic Engineering for Better Gates |
| **3. Department of Transportation** | |
| Federal Highway Administration web site http://mutcd.fhwa.dot.gov | Manual on Uniform Traffic Control Devices and Standard Highway Signs |

# APPENDIX B

# ACP CRITERIA FROM OPMG

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# DEPARTMENT OF THE ARMY

OFFICE OF THE PROVOST MARSHAL GENERAL
2800 ARMY PENTAGON
WASHINGTON, DC 20310-2800

REPLY TO
ATTENTION OF

DAPM-MPP-PS

DEC 10 2008

MEMORANDUM THRU ARMY CHIEF OF STAFF FOR INSTALLATION MANAGEMENT (ACSIM), 600 ARMY PENTAGON, WASHINGTON, DC 20310-0600

FOR UNITED STATES ARMY CORPS OF ENGINEERS, PROTECTIVE DESIGN CENTER (CENWO-ED-S), 1616 CAPITOL AVENUE, SUITE 9000, OMAHA, NE 68102-4901

SUBJECT: Review of Proposed Changes to Access Control Point (ACP) Physical Security Criteria from the Office of the Provost Marshal General (OPMG), November 2004

1. References:

a. Army Regulation 420-1, Army Facilities Management, February 2008.

b. The Army Standard for ACPs, December 2004.

2. The OPMG has reviewed and concurs with the United States Army Corps of Engineers (USACE) Protective Design Center (PDC) recommended changes to the November 2004 ACP Physical Security Criteria from the OPMG (Encl).

3. Request OPMG review and concur prior to any future supplementation or modification of the physical security requirements contained within the standard.

4. I sincerely appreciate the professional efforts of the USACE PDC working hand-in-hand with the OPMG staff; reevaluating and incorporating the necessary physical criteria into the Army Standard for ACPs to ensure our Soldiers, civilians and family members living and working on Army installations remain safe.

5. My point of contact for this action is Mr. Richard Patrick, COMM (703) 614-2597.

Encl

RODNEY L. JOHNSON
Brigadier General, USA
Provost Marshal General

A. The following four types of ACP shall be considered when designing an ACP:
   1. Primary - operates 24 hours per day 7 days a week – 24/7.
   2. Secondary - operates during regular hours but less than 24/7.
   3. Limited Use - open only for special purposes or special events.
   4. Pedestrian - is designated for pedestrians and bicyclers only.

B. ACP Functions. ACPs shall be designed for the following functions:
   1. Vehicle Screening. All vehicles shall be screened for authorization to enter the installation.
   2. Personnel Identification Validation. The identification of all personnel entering the installation shall be verified along with their authorization to enter the installation.
   3. Personnel and vehicles shall be checked and/or searched per prevailing Force Protection Conditions and local procedures.

C. Traffic Engineering Study. A traffic engineering study shall be conducted prior to the modification of an existing ACP; prior to the implementation of active vehicle barriers and automated technologies; and prior to the design of a new ACP. The traffic engineering study shall include scaled CADD drawings with bar scales and north arrows. Traffic engineering studies are subject to the review and approval of the Surface Deployment and Distribution Command – Transportation Engineering Agency (SDDCTEA) as well as the Army Corps of Engineers' Protective Design Center (PDC). The traffic engineering study shall consist of the following:
   1. Perform an assessment of compliance of existing/proposed facilities with Unified Facilities Criteria (UFC) 4-022-01, Security Engineering: Entry Control Facilities/ Access Control Points; Department of the Army, Army Access Control Points Standard Design/Criteria; and SDDCTEA Pamphlet 55-15, Traffic and Safety Engineering for Better Entry Control Facilities.
   2. Conduct a safety review and evaluate available crash data to identify improvements required to mitigate guard, pedestrian, and driver safety concerns.
   3. Calculate existing and future lane requirements (per SDDCTEA Pamphlet 55-15, Traffic and Safety Engineering for Better Entry Control Facilities) with consideration of growth (BRAC, Grow the Army, etc), as well as single or tandem lane processing and automation (AIE, etc.).
   4. Utilize the ACP/ ECF SMART Decision Evaluator© (or other methods to accomplish the same results) to evaluate the existing, short-term and long-term impact of security, manpower, automation, and roads and traffic.
   5. Identify short-term recommendations.
   6. Identify long-term recommendations.
   7. Calculate threat requirements including AVB strategy per Department of the Army, Army Access Control Points Standard Design/Criteria.
   8. Identify traffic control requirements per SDDCTEA Pamphlet 55-15, Traffic and Safety Engineering for Better Entry Control Facilities.
   9. Consider conducting a comprehensive review of overall ACP needs (number of ACPs, optimum ACP locations, total lanes, roadway infrastructure requirements, origins/destinations) on the entire installation if improvements for multiple ACPs are being considered or if an existing ACP cannot be upgraded to meet requirements without technically infeasible infrastructure modifications.

D. Siting. The ACP should be sited at a distance inside the installation to facilitate the queuing of vehicles without creating an off-post traffic problem, but spatially separated from inhabited buildings.

E. Traffic Types. ACPs shall be capable of handling one or more of the following traffic types: trucks up to WB62, visitor POVs, DOD personnel POVs, official Army vehicles, pedestrians, and bicycles.

F. Operation.
   1. To minimize problems associated with mixing of traffic types, a separate ACP should be identified as a Commercial Vehicle Only ACP.
   2. ACPs that must handle both commercial and passenger vehicles should provide separate commercial vehicle and passenger vehicle ID Check areas and separate search areas.
   3. ACPs that handle pedestrian traffic and vehicular traffic shall keep these traffic types physically separate.

G. Future Enhancements. Designers shall consider future technology enhancements and possible expansion of the ACP. Automated systems to validate the identity of incoming personnel and vehicles are anticipated for use at Primary, Secondary, and Pedestrian ACPs. Designers shall provide spare conduits for communications, power, and computer upgrades.

H. Coordination.
   1. Before designing an ACP, the designer shall coordinate with state and local authorities concerning impacts to public roadways, signage, and other requirements.
   2. Designers should coordinate with the Surface Deployment and Distribution Command (SDDC) for assistance on issues involving public highways.
   3. For OCONUS Installations, the designer should coordinate with the host nation government agencies or their appropriate Status of Forces Agreement (SOFA) subcommittee.

I. The following requirements apply to Primary and Secondary ACPs except as noted: (Note, additional requirements for pedestrian access at Primary and Secondary ACPs are listed below in paragraph K below.)

   1. Performance Requirement. ACP's shall be designed to defeat all threats described below, to ensure safety of innocent users, and to maximize throughput.
   2. ACP Layout.
      a. Corridor. The Access Control Point shall consist of a corridor at the installation boundary through which all vehicles and pedestrians must pass when entering or exiting the installation.
      b. The perimeter of the ACP, except at its entrance, shall include both passive and active vehicle barriers arranged to form a contiguous barrier to vehicles. Active vehicle barriers, that can be opened and closed, shall be deployed at the end of the ACP (i.e., at the entrance to the Installation).
      c. ACP guards will control the active vehicle barriers to deny or permit entry into the Installation.
      d. Zones. The ACP corridor shall be divided into an Approach Zone, an Access Control Zone, and a Response Zone.
         1) The Approach Zone shall run from the ACP entrance to the beginning of the Access Control Zone. It shall provide an area for incoming vehicles to be sorted and queued for ID authentication.
         2) The Access Control Zone shall run between the Approach and Response Zones. Vehicle and occupant ID checks shall be performed within this zone at a covered ID Check Area or a covered Search Area.

3) The Response Zone shall run from the end of the Access Control Zone to the entrance to the Installation/Cantonment Area and includes the final active vehicle barriers.

3. Design Objective. The primary objective of the ACP design shall be to prevent an unauthorized vehicle or pedestrian from entering the installation. The ACP design shall include construction features supporting the effective and efficient use of equipment, manpower, and procedures to accomplish this primary objective.

4. Design Strategy. The overall design strategy to meet the objective above for vehicle threats shall be to detect the threat vehicle as early in its attack as possible and to delay it a sufficient amount of time to allow ACP guards time to deploy the active vehicle barriers before the threat vehicle can enter the Installation.

5. Design Criteria.
   a. Vehicle Threat Scenarios. ACPs shall be designed to defeat the following four minimum vehicle threat scenarios. Additional vehicle threat scenarios may be considered if supported by a local threat assessment.
      1) Vehicle Threat Scenario #1. Threat vehicle enters the ACP in the inbound or outbound lane(s) at the maximum speed attainable at the ACP entrance and then immediately accelerates at its maximum acceleration rate through the ACP. Army policy sets the maximum acceleration rate of a threat vehicle at 11.3 f/s/s.
      2) Vehicle Threat Scenario #2. Threat vehicle enters the ACP in the inbound or outbound lane(s) at or under the posted ACP Speed Limit and then, later at some point further in the Approach Zone, accelerates at its maximum acceleration rate through the rest of the ACP.
      3) Vehicle Threat Scenario #3. Threat vehicle attempts to covertly enter the ACP, but is detected and denied entry by guards at the ID Check Area. Vehicle driver then defies guards and accelerates through the rest of the ACP at the vehicle's maximum acceleration rate.
      4) Vehicle Threat Scenario #4. Similar to Threat Scenario 3 above, except the driver of the denied vehicle drives toward the Turn-around or Search Area at the ACP Speed Limit (25mph) as if complying with guard instructions, but then fails to turn and instead accelerates at its maximum acceleration rate through the rest of the ACP.
   b. Delay Time. Once a threat vehicle is detected, the ACP design shall delay it a sufficient time to allow ACP security guards time to deploy the active barriers before the threat vehicle reaches the entrance to the Installation. Delay time begins at the instant the attack is detected either by sensors or by security guards. The delay shall include the following:
      1) Guard reaction time shall be no less than 3 seconds for Threat Scenarios #1 through #3 and 1 second for Threat Scenario #4,
      2) Barrier traffic signal sequence time shall be no less than 4 seconds (unless other ACP features provide an equivalent amount of safety for innocent vehicles).
      3) Barrier operating time should not be more than 2 seconds.
      4) The ACP design, therefore, shall provide a minimum of 9 seconds delay for Threat Scenarios #1 through #3 and 7 seconds delay for Threat Scenario #4.

6. Entry Gate. The ACP entrance shall include a entry gate to close off the ACP at the installation perimeter. The entry gate shall provide the same level of security and same aesthetics as the adjoining perimeter barrier/fence.

7. ID Check Area. ACPs shall have an ID Check Area within the Access Control Zone where guards or automated means perform vehicle and passenger ID checks, grant vehicles authorization to enter the installation, or direct vehicles to other areas of the ACP.

8. ID Check Area Canopy. The ID Check Area shall be covered with a canopy over all inbound lanes to provide some protection from the weather for ID Check Area guards. The canopy shall meet the following requirements:
   a. The canopy shall consist of a roof structure supported by columns.
   b. Architectural treatment must reflect the architectural themes on the Installation and must also be consistent with architectural treatment of other facilities in the ACP, especially the gatehouse.
   c. Canopy columns shall be sized to preclude the requirement for cross bracing below the roofline.
   d. Columns shall be sized and located so as not to obstruct guard lines of site.
   e. Roof underside shall be capable of supporting lighting fixtures and security equipment (e.g., CCTV cameras) anywhere on the underside of the roof and shall be treated with a reflective surface to help achieve required lighting levels and CCTV camera coverage.
   f. Vertical clearance must be a minimum of 15 feet unless a large number of over height vehicles is expected, then 17 feet. Canopies at Truck/Commercial Vehicle only ACPs must have a minimum clearance of 17 feet.
   g. Width shall be sufficient to cover all inbound lanes and all current and known future requirements for guard booths and the ID Check Area footprint.
   h. Length shall be sufficient to cover single or tandem vehicle processing stations. New ACPs and existing ACPs with peak hourly demands greater than 300 vehicles per hour require tandem processing stations on each traffic island.

9. Entry Lanes.
   a. The number of inbound and outbound lanes shall be determined from the Traffic Engineering Study.
   b. ACPs shall have a minimum of 2 lanes in the ID Check Area.

10. Primary Traffic Islands. ACPs shall have raised, curbed islands to separate all inbound lanes in the ID Check Area.

11. Secondary Traffic Islands.
   a. ACPs may also have raised, curbed islands at the end of the Approach Zone for installing over speed detectors or optional over height detectors.
   b. When used, secondary islands should be the same width as primary islands.

12. Turn-around Lanes.
   a. ACPs shall have at least two Turn-around Lanes, one before and one immediately after the ID Check Area.
   b. If secondary islands are used, a Turn-around should be included between the secondary and primary islands.

13. Gatehouse. ACPs shall have a Gatehouse sized to accommodate ID Check Area guards and their activities. For new construction, the Gatehouse building shall be located on a raised island immediately after the last Turn-around to give the Gatehouse guard clear views of operations in the ID Check Area, of vehicles directed to the last Turn-around, and of vehicles entering and exiting the Search Area. At ACPs with existing Gatehouses, the Gatehouse building may be located within the ID Check Area. All Gatehouses shall have the following:
    a. Construction to provide a minimum ballistics protection of UL 752 (latest edition) Level 3 with a higher level of protection authorized if warranted by a local threat assessment.
    b. Heating and/or Air Conditioning appropriate for the geographic location,
    c. Water Cooler.
    d. Unisex Latrine with sink.
    e. Interior storage for cleaning materials and special equipment.
    f. Exterior storage for traffic cones, signs, etc.
    g. Heavy-duty exterior power outlets sufficient to run temporary floodlights, etc.
    h. Interior power outlets sufficient for radio chargers, computers, etc.
    i. Active vehicle barrier control console with enunciator, computer workstation, and communications equipment including LAN, telephone, and Internet connections.
    j. Sufficient counter space for report writing and storage of reference material.
    k. Sufficient parking to facilitate security vehicle stationing and shift changes.
    l. Passive barriers to provide crash protection from inbound and (if located on center island) outbound vehicles.
    m. Windows to provide 180 degree field of view toward incoming traffic and mirrors or other visual aids to complete the field of view.
    n. Electrical/communications room at least 10’ by 10’.

14. Guard Booths. ACPs shall have a Guard Booth building for each lane of incoming traffic (except for the lane with a Gatehouse) for use by guards performing vehicle/passenger ID checks. Guard Booths shall be located on the primary, raised traffic islands or between raised traffic island sections in the ID Check Area. Guard Booths shall also have:
    a. Construction that provides a minimum ballistics protection of UL 752 (latest edition) Level 3 with a higher level of protection authorized if warranted by a local threat assessment.
    b. Heating and/or Air Conditioning appropriate for the geographic location.
    c. Exterior power outlet sufficient to power hand-held searchlights, bug zappers etc.
    d. Interior power outlet sufficient for radio chargers, computers, etc.
    e. Active vehicle barrier control console with enunciator, computer workstation, and communications equipment including Local Area Network (LAN), telephone, and Internet connections.
    f. Anti-fatigue floor mat.
    g. Sufficient counter space for report writing and storage of reference material.
    h. Passive barriers to provide crash protection from vehicles.
    i. Windows to provide 360-degree field of view.

15. Passenger Vehicle Search Area. ACPs will have a Passenger Vehicle Search Area:
    a. Covered with a canopy.
    b. Easily assessable from the ID Check Area.
    c. Shielded from casual observation from the ID Check Area.
    d. Sized to accommodate the search of a minimum of 2 passenger vehicles.

16. Truck Search Area.  ACPs that allow truck traffic will have a Truck Search Area:
    a. Separate from the Passenger Vehicle Search Area.
    b. Covered with a canopy (unless prohibited by the cargo search equipment system in use).
    c. Obscured from casual observation.
    d. Sized to accommodate the search of one WB-62 tractor-trailer and the search equipment to be used, e.g., Mobil Vehicle Inspection System (MVIS).
    e. If there is only one Search Area for both trucks and passenger vehicles, the Search Area shall be easily assessable from the ID Check Area.

17. Search Offices. The ACP shall include a Search Office building located adjacent to both the Passenger Vehicle and Truck Search Areas to support Search Area guards and their activities. If Truck and Passenger Vehicle Search Areas are far apart, provide a Search Office for each.  The size of the Search Office building shall be based on the volume of traffic expected through the ACP.   As a minimum, the Search Office shall provide shelter for vehicle occupants during searches and storage of Search Area equipment.  For ACPs with significant traffic volumes, each Search Area building will have:
    a. Heating and Air Conditioning appropriate for the geographic location.
    b. Water cooler.
    c. Unisex Latrine with sink.
    d. Internal storage for security equipment, supplies, and spare parts.
    e. External storage for traffic control devices, vehicle inspection equipment, etc.
    f. Locker storage for weapons, personal gear, and pre-positioning of protective equipment.
    g. Break room for 4 security personnel with refrigerator, microwave, water cooler, and sink.
    h. Space and power for Computer servers for future automated systems.
    i. Interior power outlets sufficient for radio chargers, computers, etc.
    j. Control console with enunciator controls for gate arms, aids to search guards (e.g., CCTV monitors), and communications equipment including LAN and Internet connections.
    k. Secure and Non-secure areas for vehicle drivers and passengers separated by a space suitable for a walk-through metal detector and x-ray package scanner if used.
    l. Space for a future Computer Kiosk for self-registration of drivers/passengers located in the non-secure area.
    m. One or two (depending on anticipated requirement) truck driver/passenger processing stations each with sufficient workspace for a computer, ID Badge making machine, and camera for taking ID Photos.
    n. Requirements for support of package and personnel screening devices, such as x-ray machines and magnetometers, if used.

18. Overwatch Position.  ACPs shall have a strategically placed Overwatch Position located near the final active vehicle barriers but within sight of the ID Check Area. The Overwatch Position shall include a permanent facility or a paved pad to accommodate a security force vehicle or temporary facility during increased FPCONS.  The position shall be equipped with controls for the active vehicle barriers.
    a. Permanent Building. If a permanent building is provided, it shall provide a fighting position for one guard and shall include the following:

1) Construction to provide a minimum ballistics protection of UL 752 (latest edition) Level 3 with a higher level of protection authorized if warranted by a local threat assessment.
2) Heating and/or Air Conditioning appropriate for the geographic location.
3) Interior power outlet sufficient for radio chargers, computers, etc.
4) Active vehicle barrier control console with enunciator, computer workstation, and communications equipment including Local Area Network (LAN), telephone, and Internet connections.
5) Windows to provide 360-degree field of view.

b. Paved Pad. If the Overwatch position is established as a paved pad for a temporary facility, a lockable junction box shall be imbedded in the pad with quick connections to communications, power, and barrier controls.

19. Passive Barriers. Passive vehicle barriers shall be capable of stopping a 15,000-pound vehicle traveling at the maximum speed and approach angle it can attain immediately prior to impacting the barrier. Where possible, the roadway shall be designed to limit the maximum approach angle to no more than 25 degrees. However, for other points on the perimeter, e.g., opposite to a Turn-around, the maximum approach angle could be as high as 90 degrees. Barriers at these points shall be sized accordingly.

20. Active Barriers.

a. Number. Active barriers shall be installed in all inbound and outbound lanes at the end of the Response Zone.

b. Vehicle Crash Resistance Capability. Active vehicle barriers shall be capable of stopping a 15,000-pound vehicle traveling at the maximum speed it can attain before impacting the barrier, but in no case shall the speed be less than 30 mph. The maximum vehicle speed must be determined by an evaluation of the threat vehicle speed and acceleration characteristics and the design of the roadway approaching the barrier. The allowable length of vehicle penetration beyond the barrier shall be determined by a local vulnerability assessment of buildings and facilities adjacent to the barrier that would be subjected to the detonation of the threat vehicle explosive charge. Active barriers shall have both an impact condition rating (weight of vehicle and impact speed) and a penetration rating (distance vehicle penetrates past the barrier). Active barriers shall have an impact condition rating for a 15,000-pound vehicle impacting the barrier at the speed determined above (but no less than 30 miles per hour) and a penetration rating equal to or greater than the allowable length of vehicle load penetration determined above. A larger vehicle weight may be used if warranted by a local threat/vulnerability assessment.

c. Certification/Rating. Active vehicle barriers shall be:
1) Included on the list of U.S. Department of State Certified Anti-Ram Vehicle Barriers, or
2) Included on the list of DOD Certified Anti-Ram Vehicle Barriers maintained by the Protective Design Center.

Both the DOS and DOD certified anti-ram vehicle barrier lists are available on the PDC website https://pdc.usace.army.mil/library/BarrierCertification.

d. Operating Modes: Active vehicle barriers shall be capable of either or both of the following modes of operation:
1) Normally Open Mode. In the Normally Open mode, the barrier is open to normal traffic flow. Security guards will close the barriers only when they detect a threat vehicle. The design of the ACP for this mode of operation

shall provide a sufficient delay after the threat vehicle is detected to allow the guards to close the barrier before the threat vehicle reaches it.

2) Normally Closed Mode. In the Normally Closed mode, the barrier is closed to normal traffic flow. Security guards will open it for each authorized vehicle and then immediately close it once that vehicle has passed over the barrier. This mode of operation adds time to process vehicles and creates additional wear and tear on the barriers. However, it significantly reduces the real estate required for the ACP by eliminating the requirement to delay the threat vehicle.

e. Emergency Fast Operating Time. Active vehicle barriers deployed in the Normally Open operating mode shall have an Emergency Fast Operating (EFO) control capability. The EFO control shall be capable of closing the barrier in two (2) seconds or less when actuated.

f. Barrier Safety. Active vehicle barrier safety features shall ensure safety of innocent (non-threat) vehicles using the ACP in the event that the barrier is activated. One of the following Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA) approved safety regimes shall be implemented:

1) Option 1 – Signs and Signals Safety System. Active barriers shall be deployed in the Normally Open mode. ACP guards will activate all barriers simultaneously when a threat vehicle is detected. A traffic signal(s) shall be installed at the active vehicle barriers. During normal operation, the traffic signal shall indicate solid green or flashing yellow. When the guards initiate the barrier EFO command, the traffic signal shall change to solid yellow for a minimum of 3 seconds and then change to red. After a minimum of another 1 second, the barrier "close" circuit shall then be energized. The total delay of 4 seconds will give innocent vehicles approaching the barrier time to either clear the barrier or stop safely in front of it.

2) Option 2 – Presence Detection Safety System. Active barriers shall be deployed in the Normally Open mode. ACP guards will activate all barriers simultaneously with the EFO command when a threat vehicle is detected. A traffic signal and stop line shall be installed in front of each active barrier. Vehicle presence detectors (VPDs) shall also be installed ahead of the stop line, between the stop line and the active barrier, and behind the active barrier. The traffic signal shall normally be red, requiring all vehicles to stop at the stop line. When the VPDs ahead of the stop line sense a vehicle for more than 1 second, the traffic signal shall change to green allowing the vehicle to proceed over the barrier. If the barrier EFO command is activated while a vehicle is in the zone of one of the VPDs between the stop line and the barrier or the VPDs behind the barrier, the barrier "close" circuit for that barrier shall be suppressed until the vehicle clears the zone. The other barriers shall not be affected and shall close instantaneously, unless a vehicle is also in their presence detector's zone. This safety system will allow the elimination of the 4-second safety time delay described in Option 1 above. This safety system also requires passive barriers between all lanes (both inbound and outbound), which shall extend from the VPD's in front each barrier to the VPD's behind each barrier to prevent the threat vehicle from changing lanes from a closed barrier to an open barrier.

3) Option 3 – Barrier Normally Closed Safety System. Active barriers shall be deployed in the Normally Closed mode. One set of Active Vehicle Barriers shall be installed in each inbound and outbound lane. Each set of barriers shall consist of an initial and final barrier separated by a selected

distance to form an entrapment area. Either the initial barrier or final barrier shall always be closed. Initial and final barriers are alternately opened and closed by guards to admit one or more authorized vehicles into the entrapment area and then to release them into the Installation (or vice-versa). VPDs immediately ahead of and behind each barrier shall suppress barrier closure until both VPDs are clear. Since there is always a closed barrier in the path of a threat vehicle, features to delay the threat vehicle are not required.

4) Other systems approved by SDDCTEA that provide an equivalent level of safety.

g. Barrier Controls – Signs and Signals Safety System and Presence Detection Safety System.

1) Only guards in the Gatehouse, Guard Booths, Overwatch Position, and possibly the Search Area shall have emergency fast operate (EFO) control of the active barriers. An EFO button shall be provided on a barrier Master Control Panel located in the Gatehouse. An EFO button shall also be located on a Control Panel in each Guard Booth, the Overwatch Position, and the Search Area (if required). Actuation of any EFO button shall close all active barriers in all inbound and outbound lanes.

2) The barrier Master Control Panel, each Guard Booth Control Panel, and the Search Area Control Panel (if required) shall include an enunciator providing audible and visual indication of alarms including over speed and wrong way alarms.

3) Switches and indicating lights shall be provided on the barrier Master Control Panel to allow the Gatehouse guard to enable or disable the individual EFO buttons in the Guard Booths, Overwatch Position, and Search Area (if required).

4) Indicating lights shall be provided on the Guard Booth, Overwatch Position, and Search Area (if required) control panels showing whether the EFO switch on the control panel is enabled or disabled. A separate indicating light on these control panels shall also indicate if the EFO has been actuated. Indicating lights may also be provided on these control panels that indicate the OPEN and CLOSE positions of each barrier.

5) The Master Control Panel shall include a key operated LOCAL-EFO-TEST mode selector switch, OPEN and CLOSE control switches, and OPEN and CLOSE status indication for each barrier. The mode selector switch will allow the lead ACP guard to switch to LOCAL mode (open and normal close control only at the barrier), TEST mode (open and normal close control only from the Master Control Panel), and EFO mode (emergency fast closure control from any of the EFO switches).

6) The Master Control Panel shall also include a key operated EFO RESET switch to reset EFO after it has been initiated.

7) Under normal operations, keys for each barrier’s mode selector switch and the EFO Reset switch shall be removed from the switches and controlled by the lead ACP guard.

h. Barrier Controls – Barrier Normally Closed Safety System.

1) Guards shall control barriers from either the Gatehouse or Guard Booths.

2) A Gatehouse Master Control Panel shall be located in the Gatehouse and shall include the following:

   1. Key operated LOCAL-AUTO-MANUAL mode selector switch for each barrier set (initial and final barriers).
   2. FILL and RELEASE control switches for each barrier set for operation in the AUTO mode.

3. OPEN and CLOSE switches for each individual barrier for operation in the MANUAL mode.
4. OPEN and CLOSE status indicating lights for each individual barrier.

3) A Guard Booth Control Panel shall be provided for each Guard Booth and shall include the following:
    1. FILL and RELEASE control switches for each barrier set for operation in the AUTO mode.
    2. OPEN and CLOSE status indicating lights for each individual barrier.
4) Strict key control must be maintained to prevent ACP guards from operating barriers in the LOCAL or MANUAL modes unless supervised by the head of the ACP guards.

21. Visitors Control Center (VCC). For ACPs that handle visitors, the ACP shall have a Visitors Control Center building for processing visitors wishing to enter the installation. The VCC should be sized for effective through put of the number of expected visitors considering that a single processor can process 12-20 visitors per hour. The Visitors Control function for ACPs with minimal visitors can be performed from a Guard Booth; a separate VCC building is not required. The VCC should include the following:
    a. Waiting Area.
    b. Parking.
    c. Service Counter.
    d. Self-registering kiosks.
    e. Administration Office.
    f. Break Room.
    g. Water cooler.
    h. Restrooms.

22. Lighting. ACP lighting will meet the following criteria:
    a. Approach and Response Zones and Search Area Parking and Roadways – 3 Foot Candles (FC) average with average to minimum ratio not to exceed 4:1.
    b. Access Control Zone and Search Areas – 5 FC average with average to minimum ratio not to exceed 3:1. In the location where ID checks or searches are made, illumination shall be 10 FC or twice the illumination in the immediate surrounding area (whichever is greater). The vertical illumination shall be at least 25% of the horizontal illumination.
    c. Lighting at the ID Check and Search Areas shall have a color rendition index (CRI) of not less than 65. All other light sources shall have a CRI of not less than 50.

23. Surveillance. ACPs will have a CCTV system with the following:
    a. Overwatch Cameras. CCTV cameras shall over watch the Approach Zone, ID Check Area, Search Area, and Active Vehicle Barrier areas.
    b. ID Check Area. CCTV cameras shall be positioned to view driver, ID Check guard, and the vehicle in the ID check lane.
    c. Search Areas. CCTV cameras shall be positioned to view drivers, Search guards, and the vehicle being searched.
    d. Rear License Plates. Conduit shall be installed in the islands at the ID Check Area and Search Areas to accommodate future cameras to view rear license plates.
    e. Monitors. Monitors for CCTV shall be at the Gatehouse and the Central Security Monitoring Station.

f. Digital Video Recording. The CCTV system shall include digital video recording for all ACP video cameras. The video recording shall operate 24 hours per day, 7 days a week and shall retain all imagery for a minimum of 7 days.

24. Communications. Guards at the Gatehouse, Guard Booths, Search Areas, Overwatch Position, and Visitors Control Center shall have a minimum of 2 means of communications with each other and with the Central Security Monitoring Station.

25. Information Access. ACPs shall have computers capable of accessing and displaying pertinent law enforcement information and Installation access data.

26. Electronic Security.
    a. Duress Alarms. Guards at the ID Check Area, Search Areas, Overwatch Position, and VCC will have duress alarm capability that will annunciate at both the Gatehouse and the Central Security Monitoring Station.
    b. Intrusion Detection. The entry doors to the Gatehouse, Guard Booths, Overwatch Building, Search Office, and Visitors Control Center shall be equipped with Balanced Magnetic Switches (BMS) for intrusion detection.

    c. Tamper Switches.
        1) Electronic control cabinets for communications, security, and barrier controls shall be equipped with tamper switches.
        2) The junction box at the Overwatch Position pad (if provided) shall be equipped with a tamper switch.

27. Back-up Power. The ACP will have a back-up emergency generator or equivalent with the following:
    a. Automatic start-up within 10 seconds after the normal source of electrical power fails.
    b. Sufficient on-site fuel to maintain full-load operation for a minimum of 12 hours.
    c. Status monitored at Gatehouse including alarms for loss of normal power, emergency generator malfunction, and low fuel.
    d. The following loads shall be on Back-up Power:
        1) Interior lighting for the Gatehouse, Guard Booths, Overwatch position, and Inspection Offices.
        2) Canopy lighting in the ID Check Area and the Search Areas.
        3) External lighting in the Access Control Area.
        4) External lighting in the Search Areas.
        5) Approach Zone and Response Zone lighting within 100 feet of the Access Control Zone.
        6) External lighting 150 feet on both sides of the final vehicle barriers.
        7) Uninterruptible Power Supplies (UPS).

28. Uninterruptible Power Supply (UPS). The ACP shall have one or more Uninterruptible Power Supplies to power critical security and safety loads. The UPS(S) shall be sized to carry its required load(s) for a minimum of 10 minutes when the normal source of electrical power fails. The following loads shall be on UPS:
    a. Primary communications system
    b. Duress alarm system.
    c. Computers.

d. CCTV systems.
e. Intrusion Detection Systems (IDS).
f. Lighting:
    1) One luminaire for each ID Check Lane located near the guard position.
    2) One luminaire for each CCTV camera required at the Active Vehicle Barrier.
g. Access Control Equipment including:
    1) Active vehicle barrier controls,
    2) Active barrier activation system for one complete operation cycle (open to close and close to open).
    3) Traffic arms.
    4) Traffic sensors (wrong way, over speed, and presence detectors).
    5) Traffic signals and warning lights.

29. Traffic Control Devices.
    a. ACPs shall utilize traffic control devices including signs, markings, signals, and traffic arms to direct traffic, to provide information, and to safeguard both drivers and guards.
    b. Traffic control devices shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), the National Standard IAW Title 23 U.S. Code, and applicable State and Host-Nation laws.
    c. The Surface Deployment and Distribution Command, Transportation Engineering Agency (SDDCTEA) is available to assist in defining traffic control requirements when standards are not available.
    d. An Overheight Vehicle Detection and Warning System should be deployed ahead of the ID Check Area to detect and warn drivers of Overheight vehicles before proceeding to the canopy.

30. Automation: Personnel identification systems for automated access control shall be compatible with approved DOD identification credentials.

J. The following requirements apply to Limited Use ACPs:
    1. Entry Gate. The ACP entrance shall include an entry gate to close off the ACP at the Installation perimeter.
    2. The entry gate shall provide the same level of security and same aesthetics as the adjoining perimeter barrier/fence.

K. The following requirements apply to Pedestrian ACPs. These requirements apply to Pedestrian ACPs that stand-alone or Pedestrian ACP facilities that are a part of a Primary or Secondary ACP. The term pedestrian used here includes both pedestrian and bicycle traffic.

    1. Performance Standard. Pedestrian ACPs shall be designed to prevent unauthorized entry, to ensure safety, and to maximize throughput of pedestrians.
    2. Design Criteria. Pedestrian Threat Scenarios. ACPs shall be designed to defeat the following two minimum pedestrian threat scenarios. Additional threat scenarios may be considered if supported by a local threat assessment:
        a. Pedestrian Threat Scenario #1. Pedestrian attempts to forcibly enter the Installation by breaching or circumventing ACP barriers using limited hand tools.
        b. Pedestrian Threat Scenario #2. Pedestrian attempts to covertly enter the Installation by using false credentials.

3. Entry Gate. Pedestrian ACPs will have an Entry Gate at the ACP entrance capable of closing off the ACP. The Entry Gate shall provide equivalent security and equivalent aesthetics as the adjoining perimeter fence/barrier.

4. Guard Booths. Pedestrian ACPs will have one or more Guard Booth buildings for use by guards performing pedestrian ID checks. Guard Booths will have the following:
   a. Construction that provides a minimum ballistics protection of UL 752 (latest edition) Level 3 with a higher level of protection authorized if warranted by a local threat assessment.
   b. Heating and/or Air Conditioning appropriate for the geographic location.
   c. Exterior power outlet sufficient to power hand-held searchlights, bug zappers, etc.
   d. Interior power outlets sufficient for radio chargers, computers, etc.,
   e. Anti-fatigue floor mat.
   f. Sufficient counter space for report writing and storage of reference material.
   g. Windows to provide a 360-degree field of view.

5. Perimeter Barriers. Pedestrian ACPs shall have passive barriers along each side of the ACP corridor capable of preventing easy penetration by a pedestrian. These barriers must tie into the Entry Gate at the ACP entrance as well as the Active Pedestrian Barrier(s) to form a contiguous personnel barrier from the ACP entrance through the Active Pedestrian Barrier(s).

6. Active Pedestrian Barriers. Pedestrian ACPs shall include active pedestrian barriers (e.g., turnstiles, portals, etc.) controlled by the ACP guards to regulate pedestrian traffic.

7. Communications.
   a. ACP guards shall have a minimum of two means to communicate with each other and with guards at the Gatehouse (if the pedestrian access is part of a Primary or Secondary ACP) or guards at the Central Security Monitoring Station (if the Pedestrian ACP is Stand-alone).
   b. ACP guards will have wireless duress alarms that annunciate at the Gatehouse (if the pedestrian access is part of a Primary or Secondary ACP) or the Central Security Monitoring Station if the Pedestrian ACP is Stand-alone).

8. Lighting. Lighting in the Pedestrian ACP shall maintain a minimum of 2-foot candles illumination.

9. Surveillance Equipment. Pedestrian ACPs shall be equipped with a Closed Circuit Television (CCTV) system with the following requirements:
   a. Overwatch Cameras. CCTV cameras shall over watch the approach to the Guard Booth from the Entry Gate to the area around the active pedestrian barrier including the Guard Booth.
   b. Monitors. Monitors for CCTV shall be at the Pedestrian Guard Booth. Monitors shall also be at the Gatehouse if the Pedestrian ACP is part of a Primary or Secondary ACP or at the Central Security Monitoring Station if the Pedestrian ACP is stand-alone.
   c. Digital Video Recording. The CCTV system shall include digital video recording for all ACP cameras. The video recording shall operate 24 hours per day, 7 days a week and shall retain all imagery for a minimum of 7 days.

10. Information Access. Pedestrian ACPs shall have a computer capable of accessing and displaying pertinent law enforcement information and Installation access data.

11. Signs. Pedestrian ACPs shall include signs to direct pedestrians, provide security information, and provide adequate safeguards to both guards and pedestrians.

# APPENDIX C

# DRAWINGS

U.S ARMY ENGINEER DISTRICT, OMAHA

# DEPARTMENT OF THE ARMY
# FACILITIES STANDARDIZATION PROGRAM

## STANDARD DESIGN/ CRITERIA
## APPENDIX C

# ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

JANUARY 2009

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
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| DESIGNED BY: X.X.X. | DATE: NOV 2007 |
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U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

COVER SHEET

SHEET REFERENCE NUMBER
G1.01
SHEET 1 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## SHEET INDEX

| REFERENCE NO. | SHEET NO. | TITLE |
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| G1.01 | 1 | COVER SHEET |
| G2.01 | 2 | SHEET INDEX |
| C0.01 | 3 | GENERAL NOTES |
| C3.01 | 4 | SITE PLAN - PRIMARY ACP WITH VCC AND COMMERCIAL VEHICLE ACCESS |
| C3.02 | 5 | SITE PLAN - PRIMARY/SECONDARY ACP WITH VCC |
| C3.03 | 6 | SITE PLAN - PRIMARY/SECONDARY ACP WITHOUT VCC |
| C3.04 | 7 | SITE PLAN - LIMITED USE ACP |
| C3.05 | 8 | SITE PLAN - COMMERCIAL VEHICLE ACP - BARRIER NORMALLY CLOSED (DEPLOYED) OPERATION |
| C3.06 | 9 | SITE PLAN - COMMERCIAL VEHICLE ACP - BARRIER NORMALLY OPEN OPERATION |
| C3.07 | 10 | SITE PLAN - RESTRICTED REAL ESTATE ACP WITH VCC AND COMMERCIAL VEHICLE ACCESS |
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STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
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U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SHEET INDEX

SHEET REFERENCE NUMBER
G2.01
SHEET 2 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## REFERENCE CRITERIA

1. DEPARTMENT OF ARMY FACILITIES STANDARDIZATION PROGRAM, ARCHITECTURAL AND ENGINEERING DESIGN CRITERIA, ENGINEERING REGULATION ER 1110-1-113 (LATEST EDITION)
2. FEDERAL HIGHWAY ADMINISTRATION (FHWA), MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), LATEST EDITION.
3. FHWA, STANDARD HIGHWAY SIGNS, LATEST EDITION.
4. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO), A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (GREENBOOK), LATEST EDITION
5. AASHTO, ROADSIDE DESIGN GUIDE, LATEST EDITION
6. TRANSPORTATION RESEARCH BOARD (TRB), HIGHWAY CAPACITY MANUAL, LATEST EDITION
7. DEPARTMENT OF DEFENSE, UNIFIED FACILITIES CRITERIA (UFC) ON ENTRY CONTROL FACILITIES/ACCESS CONTROL POINTS: UFC 4-022-01
8. INSTITUTE OF TRANSPORTATION ENGINEERS (ITE), TRAFFIC ENGINEERING HANDBOOK, 1999
9. NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 350, RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES
10. SURFACE DEPLOYMENT AND DISTRIBUTION COMMAND-TRANSPORTATION ENGINEERING AGENCY (SDDC-TEA), TRAFFIC AND SAFETY ENGINEERING FOR BETTER ENTRY CONTROL FACILITIES: SDDCTEA PAMPHLET 55-15.

## STANDARDS

ARMY INSTALLATION DESIGN STANDARDS (IDS) MAY 2004 - THE PURPOSE OF THESE STANDARDS, AND THIS STANDARD DESIGN PACKAGE, IS TO PROVIDE COMMON FACILITY AND INFRASTRUCTURE STANDARDS FOR ALL ARMY INSTALLATIONS. THE ARMY IDS PROVIDE COMPREHENSIVE STANDARDS IN THE FOLLOWING AREAS THAT THIS STANDARD DESIGN, WHEN IMPLEMENTED, SHALL COMPLY WITH:

SITE PLANNING DESIGN STANDARDS
BUILDING DESIGN STANDARDS
CIRCULATION DESIGN STANDARDS
LANDSCAPE DESIGN STANDARDS
SITE ELEMENTS DESIGN STANDARDS
FORCE PROTECTION DESIGN STANDARDS

1. UNIFIED FACILITIES CRITERIA (UFC) 4-010-01, MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS.
2. NFPA 70, 72, 101, AND 780.
3. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), NATIONAL FIRE CODES (NFC).
4. ETL 1110-3-491 - SUSTAINABLE DESIGN AND DEVELOPMENT FOR MILITARY FACILITIES, 1 MAY 2001.

## ELECTRONIC SECURITY

1. UNIFIED FACILITIES CRITERIA (UFC) 4-020-04FA ELECTRONIC SECURITY SYSTEMS: SECURITY ENGINEERING
2. UNIFIED FACILITIES GUIDE SPECS (UFGS) 28 20 01.00 10 ELECTRONIC SECURITY SYSTEMS
3. UNIFIED FACILITIES GUIDE SPECS (UFGS) UFGS 28 23 23.00 10 CLOSED CURCUIT TELEVISION SYSTEMS

## ELECTRICAL DESIGN REQUIREMENTS

1. ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA), GUIDELINE FOR SECURITY LIGHTING FOR PEOPLE PROPERTY AND PUBLIC SPACES, 2003 G-1-03
2. TECHNICAL MANUAL (TM) 5-811-1/AIR FORCE AFJMAN32-1080, ELECTRICAL POWER SUPPLY AND DISTRIBUTION
3. TECHNICAL INSTRUCTIONS (TI) 811-16, LIGHTING DESIGN
4. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 70, 72, 101, AND 780
5. ANSI C2 NATIONAL ELECTRIC SAFETY CODE, LATEST EDITION
6. UNIFIED FACILITIES CRITERIA (UFC) 3-501-03N, ELECTRICAL ENGINEERING PRELIMINARY DESIGN CONSIDERATIONS

## MECHANICAL DESIGN REQUIREMENTS

1. TI 800-01, TECHNICAL INSTRUCTIONS, DESIGN CRITERIA, 20 JULY 1998 (CHG. 28-30 JULY 2004)
2. AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS (ASHRAE) MANUALS
3. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), NATIONAL FIRE CODES (NFC)
4. ENGINEERING TECHNICAL LETTER (ETL) 1110-3-491 - SUSTAINABLE DESIGN AND DEVELOPMENT FOR MILITARY FACILITIES, 1 MAY 2001
5. UFC 3-410-01FA DATED 15 MAY 2003, DESIGN: HEATING, VENTILATING AND AIR CONDITIONING
6. UFC 3-410-02A DATED 15 MAY 2003, DESIGN: HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS

## PLUMBING DESIGN REQUIREMENTS

1. NATIONAL STANDARD PLUMBING CODE (NAPHCC) AND ASHRAE TECHNICAL MANUALS

## CIVIL ENGINEERING

1. UNIFIED FACILITIES CRITERIA (UFC) 3-210-06A, SITE PLANNING AND DESIGN, 16 JANUARY 2004
2. UNIFIED FACILITIES CRITERIA (UFC) 3-230-17FA, DRAINAGE FOR AREAS OTHER THAN AIRFIELDS, 16 JANUARY 2004
3. UNIFIED FACILITIES CRITERIA (UFC) 3-250-18FA, GENERAL PROVISIONS AND GEOMETRIC DESIGN FOR ROADS, STREETS, WALKS, AND OPEN STORAGE AREAS, 16 JANUARY 2004
4. UNIFIED FACILITIES CRITERIA (UFC) 3-250-01FA, PAVEMENT DESIGN FOR ROADS, STREETS, WALKS, AND OPEN STORAGE AREAS, 16 JANUARY 2004

## ARCHITECTURAL

1. ADA- AMERICANS W/DISABILITIES ACT.
2. UFAS- UNIFORM FEDERAL ACCESSIBILITY STANDARDS.
3. IDG- INSTALLATION DESIGN GUIDES.
4. MSPA 80- STANDARDS FOR FIRE DOORS AND FIRE WINDOWS.
5. LEED VERSION 2.2- UNITED STATES GREEN BUILDING COUNCIL, LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN RATING SYSTEM.

## STRUCTURAL

1. FOR A STRUCTURAL REFERENCE, AND AS A GENERAL REFERENCE USE UFC 1-200-02 "DESIGN: GENERAL BUILDING REQUIREMENTS"
2. TI 809-04, TECHNICAL INSTRUCTIONS - SEISMIC DESIGN FOR BUILDINGS, 13 DECEMBER 1998
3. TI 809-04, TECHNICAL INSTRUCTIONS - STRUCTURAL DESIGN CRITERIA FOR BUILDINGS, 01 SEPTEMBER 1999

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
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U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

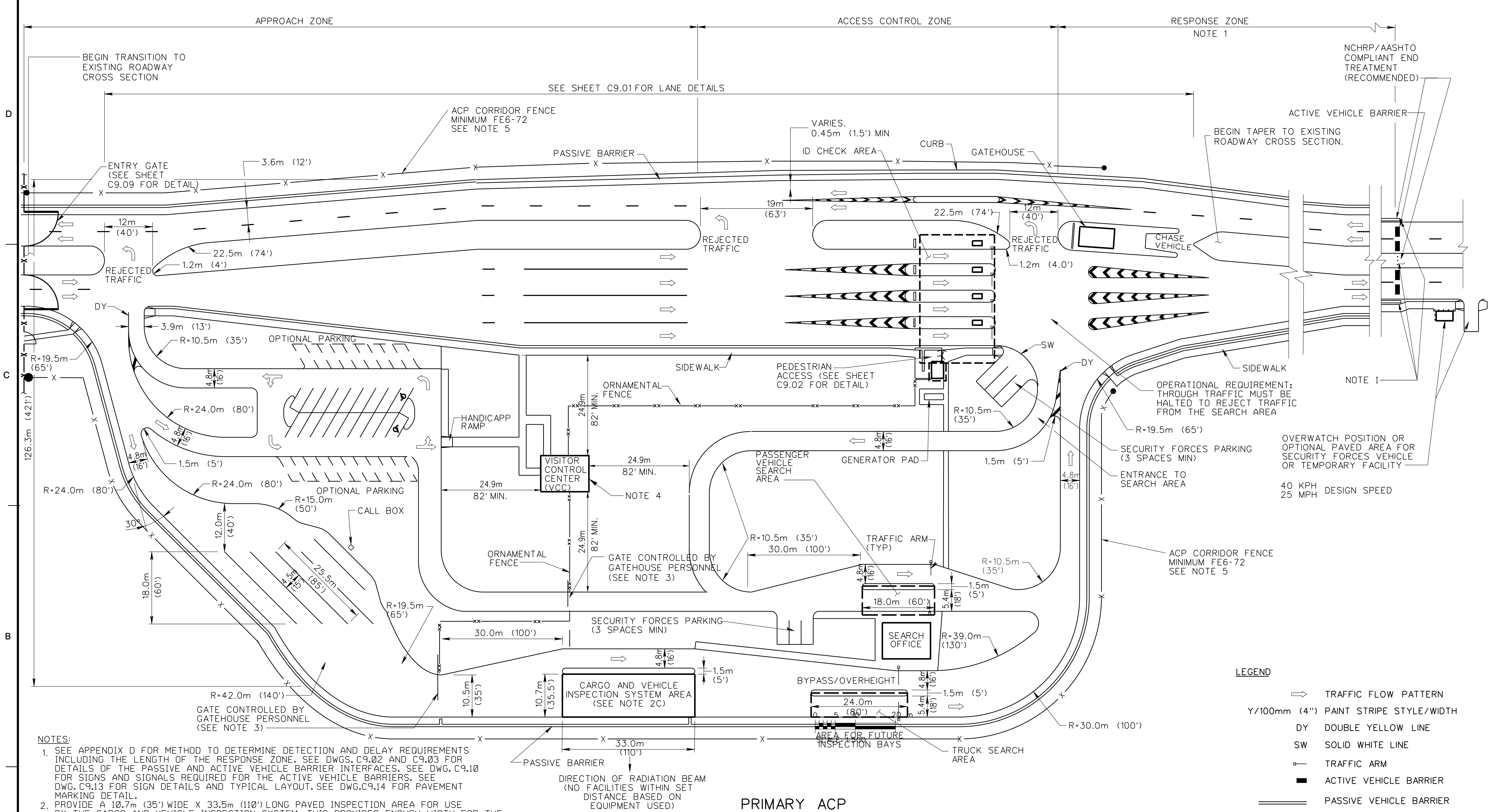
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

GENERAL NOTES

SHEET REFERENCE NUMBER C0.01



$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$




# PRIMARY ACP WITH VCC AND COMMERCIAL VEHICLE

NOT TO SCALE

NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAIL.
2. PROVIDE A 10.7m (35') WIDE X 33.5m (110') LONG PAVED INSPECTION AREA FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM. THIS PROVIDES ENOUGH WIDTH FOR THE INSPECTION SYSTEM AND THE LANE OF TRAVEL FOR THE VEHICLES TO BE INSPECTED. THE LENGTH IS SUFFICIENT TO ALLOW THE INSPECTION SYSTEM TO SCAN A LARGE STATIONARY VEHICLE AND MANEUVER.
   A. TO INCREASE THROUGHPUT A LONGER INSPECTION LANE CAN BE PROVIDED FOR OPERATION OF THE CARGO AND VEHICLE INSPECTION SYSTEM THAT SCANS STATIONARY VEHICLES. THIS WILL ALLOW THE SYSTEM TO SCAN SEVERAL VEHICLES AT ONE TIME.
   B. PROVIDE NO CANOPY OVER THE INSPECTION AREA PLANNED OR DEDICATED FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM UNLESS THE CLEAR HEIGHT IS A MINIMUM OF 6.7m (22').
   C. SITE ALL PERMANENT FACILITIES SUCH THAT THEY ARE NOT IN THE DIRECTION OF TRAVEL OF THE RADIATION BEAM UNLESS THE DISTANCE BETWEEN THE INSPECTION VEHICLE AND THE FACILITY IS AT LEAST 90.0m (300'). THE INTENT IS TO ENSURE THAT THE 100mR/YEAR RADIATION DOSE LIMIT IS NOT EXCEEDED FOR PERSONNEL WHO MAY BE IN THE DIRECTION OF TRAVEL OF THE RADIATION. THIS DISTANCE CAN BE REDUCED TO 23.0m (75.5') IF A 305mm (12") WIDE X 2.4m (8') HIGH (MIN) CONCRETE SHIELDING WALL IS PROVIDED BETWEEN THE RADIATION SOURCE AND ANY FACILITY OF CONCERN. THE DETERMINATION OF EXCLUSION ZONES SHOULD ALSO CONSIDER OBLIQUE SCAN ANGLES, WHICH SOME INSPECTION SYSTEMS CAN EMPLOY. REFER TO ACTUAL EQUIPMENT TO BE USED FOR SPECIFIC EXCLUSION ZONE REQUIREMENTS.
   D. ADD CONDUIT FOR ELECTRICAL POWER AND PROVIDE SUFFICIENT ELECTRICAL POWER CAPACITY FOR POSSIBLE ADDITION OF A FIXED VEHICLE INSPECTION SYSTEM.
3. SLIDING GATES TO CLOSE SEARCH AREA DURING NON-MANNED HOURS.
4. IF 11 OR MORE PEOPLE INHABIT THE VCC ON A ROUTINE BASIS, THAN THE VCC IS AN INHABITED BUILDING WITHIN AN UNCONTROLLED PERIMETER. PER DOD MINIMUM ANTI-TERRORISM STANDARDS FOR BUILDINGS (UFC 4-010-01), REQUIRED STANDOFF DISTANCE FROM ROADS AND PARKING AREAS IS 25m (82') FOR CONVENTIONAL CONSTRUCTION.
5. THE ACP CORRIDOR FENCE MAY BE INCORPORATED INTO CERTAIN TYPES OF PASSIVE BARRIERS, e.g., CABLE BARRIER SYSTEMS (SEE DRAWING C9.08). IF FENCE IS NOT INCORPORATED INTO THE PASSIVE BARRIER, LOCATE FENCE A SUFFICIENT DISTANCE FROM THE PASSIVE BARRIER SUCH THAT THE AREA BETWEEN THE PASSIVE BARRIER AND FENCE CAN BE MAINTAINED AND THE PASSIVE BARRIER CANNOT BE USED TO AIDE A FENCE CLIMBER. THE AREA BETWEEN FENCE AND PASSIVE BARRIER IS A CLEAR ZONE AND MUST BE FREE OF OBSTRUCTIONS AND PLANTINGS OVER 4 INCHES TALL.

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|
| | | | |

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

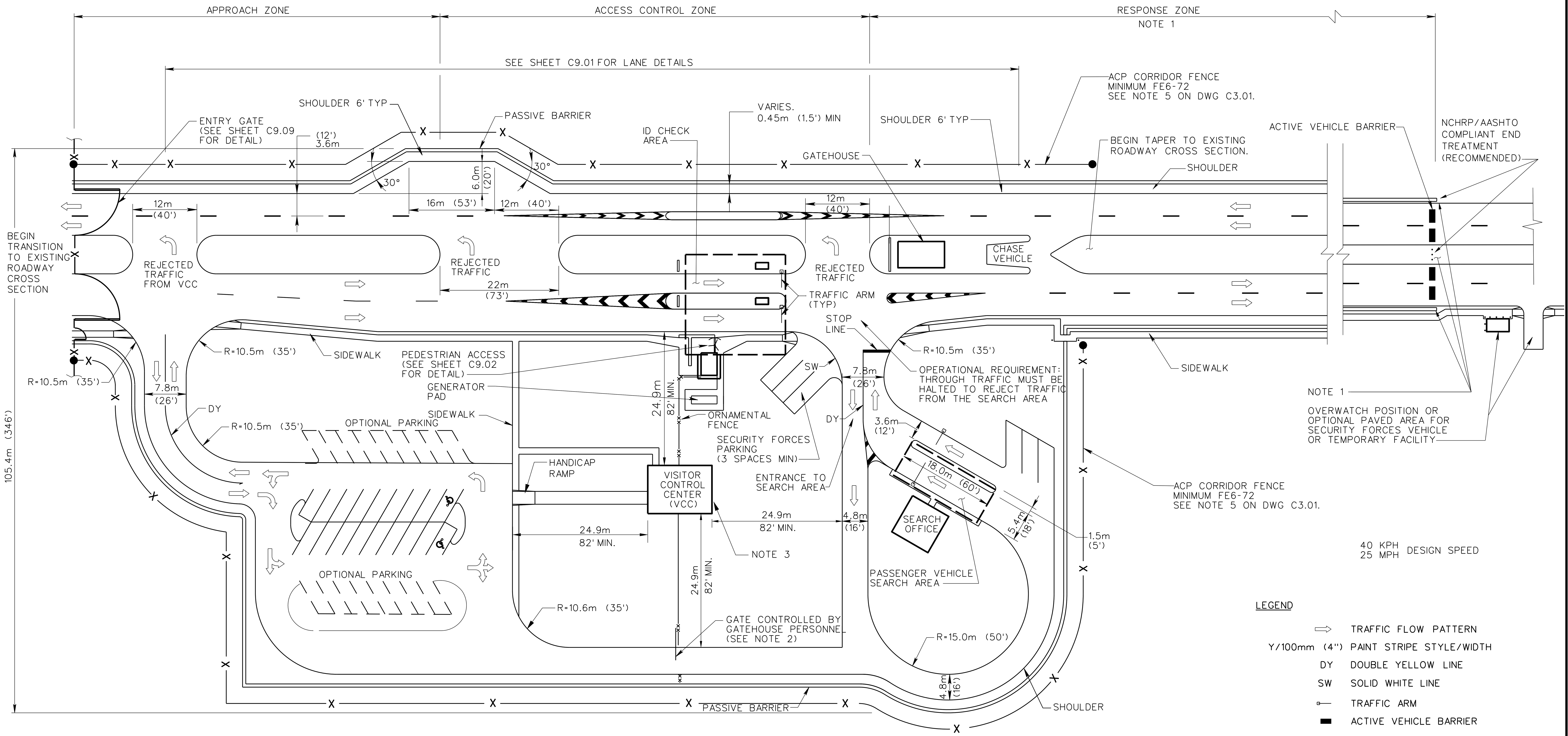
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN PRIMARY ACP WITH VCC AND COMMERCIAL VEHICLE ACCESS

SHEET REFERENCE NUMBER C3.01



$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$




## LEGEND

| | |
|---|---|
| ⇨ | TRAFFIC FLOW PATTERN |
| Y/100mm (4") | PAINT STRIPE STYLE/WIDTH |
| DY | DOUBLE YELLOW LINE |
| SW | SOLID WHITE LINE |
| | TRAFFIC ARM |
| | ACTIVE VEHICLE BARRIER |
| | PASSIVE VEHICLE BARRIER |
| ——xx—— | ORNAMENTAL FENCE |
| ——x—— | FENCE |
| · · · · · | BOLLARDS |
| | CANOPY |
| | BARRIER WALL |
| | DOUBLE FACE GUARD RAIL |
| | SINGLE FACE GUARD RAIL |
| | GUARD BOOTH |
| | GENERATOR PAD W/SIDEWALK |
| | CURB RAMP |

## PRIMARY/SECONDARY ACP WITH VCC

(NOT FOR COMMERCIAL VEHICLES)
NOT TO SCALE

NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG.C9.14 FOR PAVEMENT MARKING DETAIL.
2. SILIDING GATE TO CLOSE SEARCH AREA DURING NON-MANNED HOURS.
3. IF 11 OR MORE PEOPLE INHABIT THE VCC ON A ROUTINE BASIS, THEN THE VCC IS AN INHABITED BUILDING WITHIN AN UNCONTROLLED PERIMETER. PER DOD MINIMUM ANTI-TERRORISM STANDARDS FOR BUILDINGS (UFC 40010-01), REQUIRED STANDOFF DISTANCE FROM ROADS AND PARKING AREAS IS 25m (82') FOR CONVENTIONAL CONSTRUCTION.

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

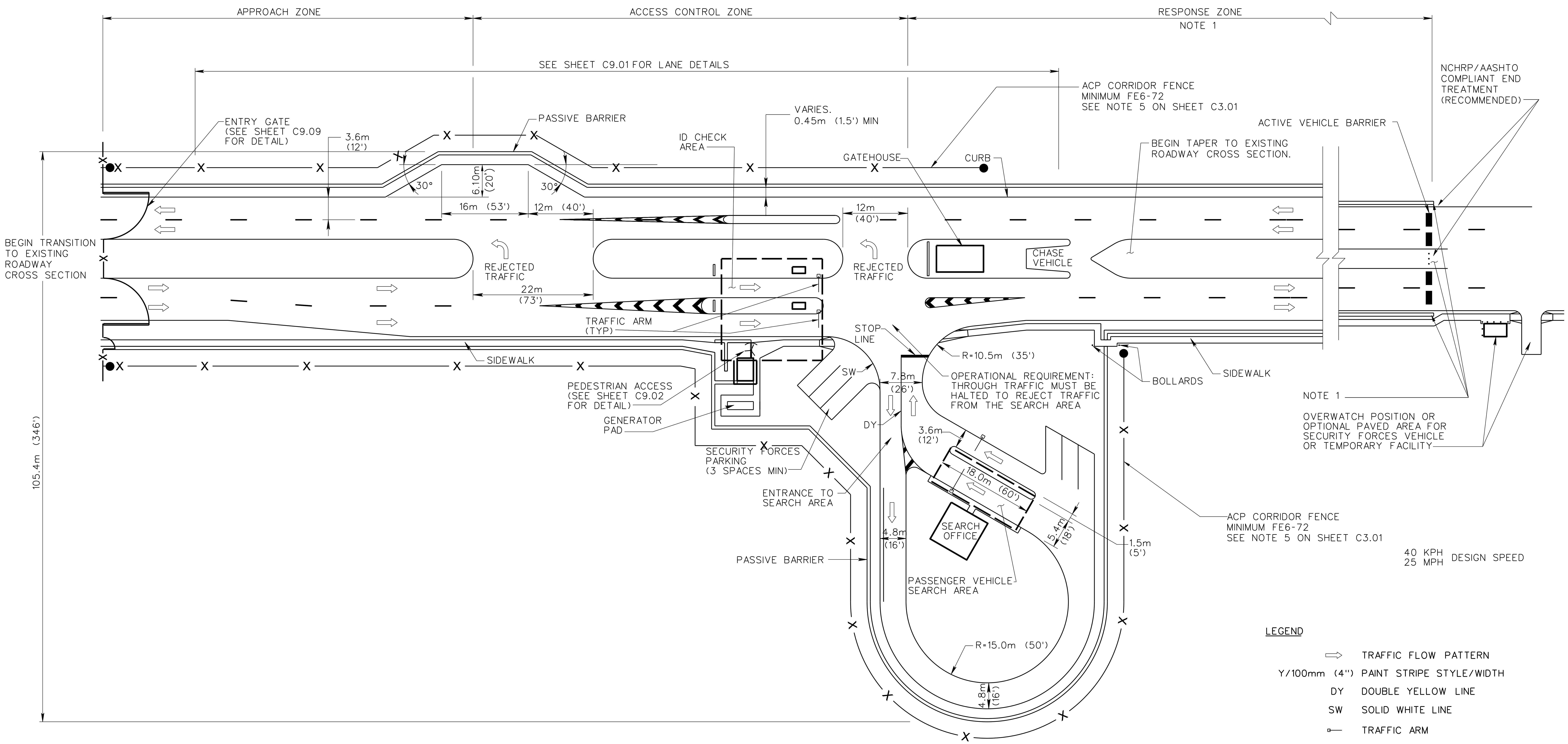
DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | PLOT SCALE: 1:1 | SIZE: ANSI D | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
PRIMARY/SECONDARY ACP WITH VCC

SHEET
REFERENCE
NUMBER
C3.02




NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG.C9.14 FOR PAVEMENT MARKING DETAIL.

## PRIMARY/SECONDARY ACP WITHOUT VCC

(NOT FOR COMMERCIAL VEHICLES)

0 5 10 20 m

SCALE: 1:400

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W912HN-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

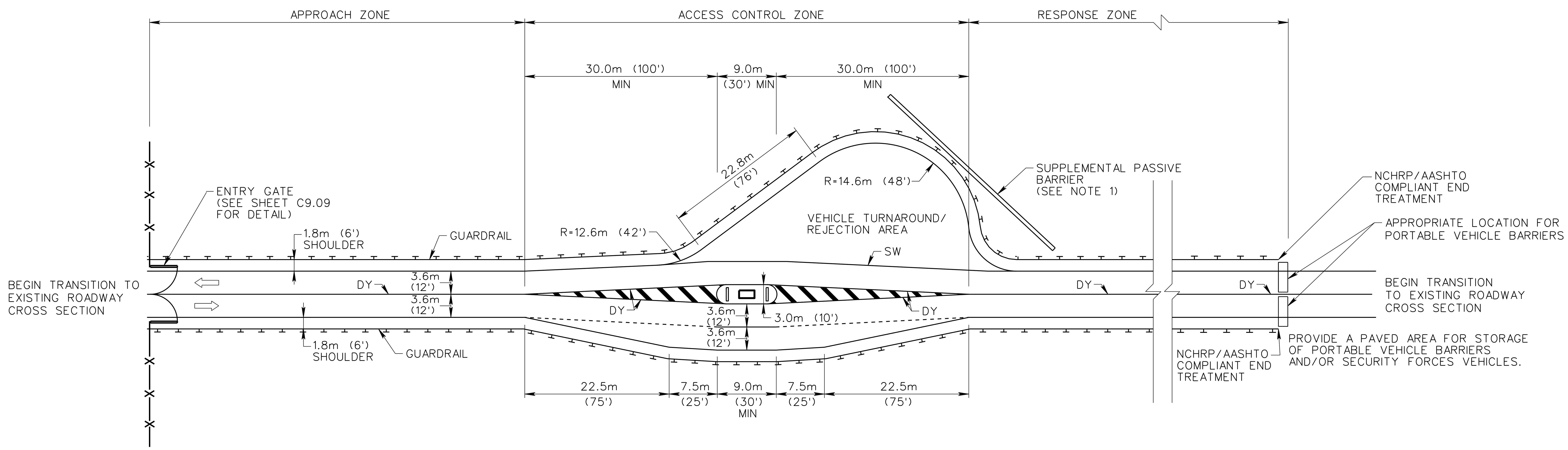
U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
PRIMARY/SECONDARY ACP WITHOUT VCC

SHEET REFERENCE NUMBER
C3.03
SHEET 6 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## LIMITED USE ACP

NOT TO SCALE

NOTES:

1. SUPPLEMENTAL BARRIERS REQUIRED TO STOP VEHICLES APPROACHING AT GREATER THAN 25 DEGREES.

LEGEND

| | |
|---|---|
| ⇨ | TRAFFIC FLOW PATTERN |
| Y/100mm (4") | PAINT STRIPE STYLE/WIDTH |
| DY | DOUBLE YELLOW LINE |
| SW | SOLID WHITE LINE |
| | TRAFFIC ARM |
| | ACTIVE VEHICLE BARRIER |
| | PASSIVE VEHICLE BARRIER |
| | ORNAMENTAL FENCE |
| | FENCE |
| | BOLLARDS |
| | CANOPY |
| | BARRIER WALL |
| | DOUBLE FACE GUARD RAIL |
| | SINGLE FACE GUARD RAIL |
| | GUARD BOOTH |
| | GENERATOR PAD W/SIDEWALK |
| | CURB RAMP |

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X. | DATE: NOV 2007 | DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | CATEGORY CODE: X | SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

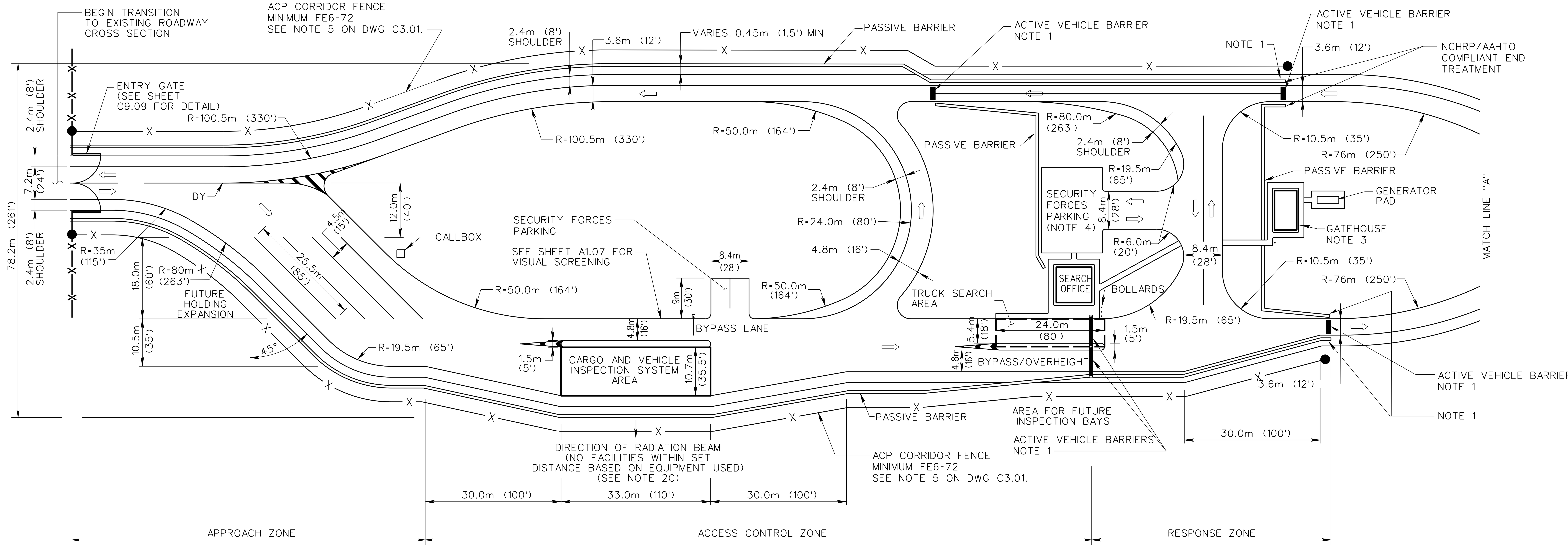
FACILITIES STANDARDIZATION PROGRAM ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN LIMITED USE ACP

SHEET REFERENCE NUMBER C3.04

SHEET 7 OF 60

$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$




40 KPH
25 MPH DESIGN SPEED

NOTES:

1. SEE DWG. C3.08 FOR SIGNALIZATION DETAIL AT ACTIVE VEHICLE BARRIER. SEE DWGS C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG C9.14 FOR PAVEMENT MARKING DETAILS.

2. PROVIDE A 10.7m (35') WIDE X 33.5m (110') LONG PAVED INSPECTION AREA FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM. THIS PROVIDES ENOUGH WIDTH FOR THE INSPECTION SYSTEM AND THE LANE OF TRAVEL FOR THE VEHICLES TO BE INSPECTED. THE LENGTH IS SUFFICIENT TO ALLOW THE INSPECTION SYSTEM TO SCAN A LARGE STATIONARY VEHICLE AND MANEUVER.

   A. TO INCREASE THROUGHPUT A LONGER INSPECTION LANE CAN BE PROVIDED FOR OPERATION OF THE CARGO AND VEHICLE INSPECTION SYSTEM THAT SCANS STATIONARY VEHICLES. THIS WILL ALLOW THE SYSTEM TO SCAN SEVERAL VEHICLES AT ONE TIME.

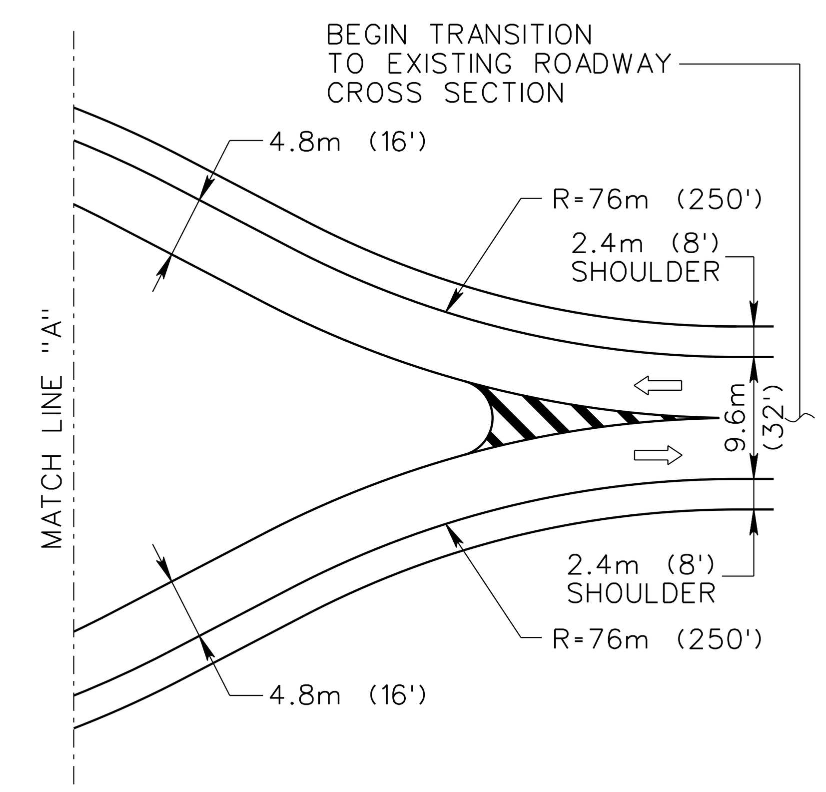
   B. PROVIDE NO CANOPY OVER THE INSPECTION AREA PLANNED OR DEDICATED FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM UNLESS THE CLEAR HEIGHT IS A MINIMUM OF 6.7m (22').

   C. SITE ALL PERMANENT FACILITIES SUCH THAT THEY ARE NOT IN THE DIRECTION OF TRAVEL OF THE RADIATION BEAM UNLESS THE DISTANCE BETWEEN THE INSPECTION VEHICLE AND THE FACILITY IS AT LEAST 90.0m (300'). THE INTENT IS TO ENSURE THAT THE 100mR/YEAR RADIATION DOSE LIMIT IS NOT EXCEEDED FOR PERSONNEL WHO MAY BE IN THE DIRECTION OF TRAVEL OF THE RADIATION. THIS DISTANCE CAN BE REDUCED TO 23.0m (75.5') IF A 305mm (12") WIDE X 2.4m (8') HIGH (MIN) CONCRETE SHIELDING WALL IS PROVIDED BETWEEN THE RADIATION SOURCE AND ANY FACILITY OF CONCERN. THE DETERMINATION OF EXCLUSION ZONES SHOULD ALSO CONSIDER OBLIQUE SCAN ANGLES, WHICH SOME INSPECTION SYSTEMS CAN EMPLOY. REFER TO ACTUAL EQUIPMENT TO BE USED FOR SPECIFIC EXCLUSION ZONE REQUIREMENTS.

   D. ADD CONDUIT FOR ELECTRICAL POWER AND PROVIDE SUFFICIENT ELECTRICAL POWER CAPACITY FOR POSSIBLE ADDITION OF A FIXED VEHICLE INSPECTION SYSTEM.

3. GATEHOUSE DOUBLES AS OVERWATCH.

4. NUMBER OF SPACES DETERMINED BY PERSONNEL REQUIREMENTS.




## COMMERCIAL VEHICLE ACP

BARRIER NORMALLY CLOSED (DEPLOYED) OPERATION

0 5 10 20 m

SCALE: 1:500

LEGEND

TRAFFIC FLOW PATTERN
Y/100mm (4") PAINT STRIPE STYLE/WIDTH
DY DOUBLE YELLOW LINE
SW SOLID WHITE LINE
TRAFFIC ARM
ACTIVE VEHICLE BARRIER
PASSIVE VEHICLE BARRIER
ORNAMENTAL FENCE
FENCE
BOLLARDS
CANOPY
BARRIER WALL
DOUBLE FACE GUARD RAIL
SINGLE FACE GUARD RAIL
GUARD BOOTH
GENERATOR PAD W/SIDEWALK
CURB RAMP

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X | DATE: NOV 2007
DWN BY: X.X.X | CKD BY: X.X.X
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

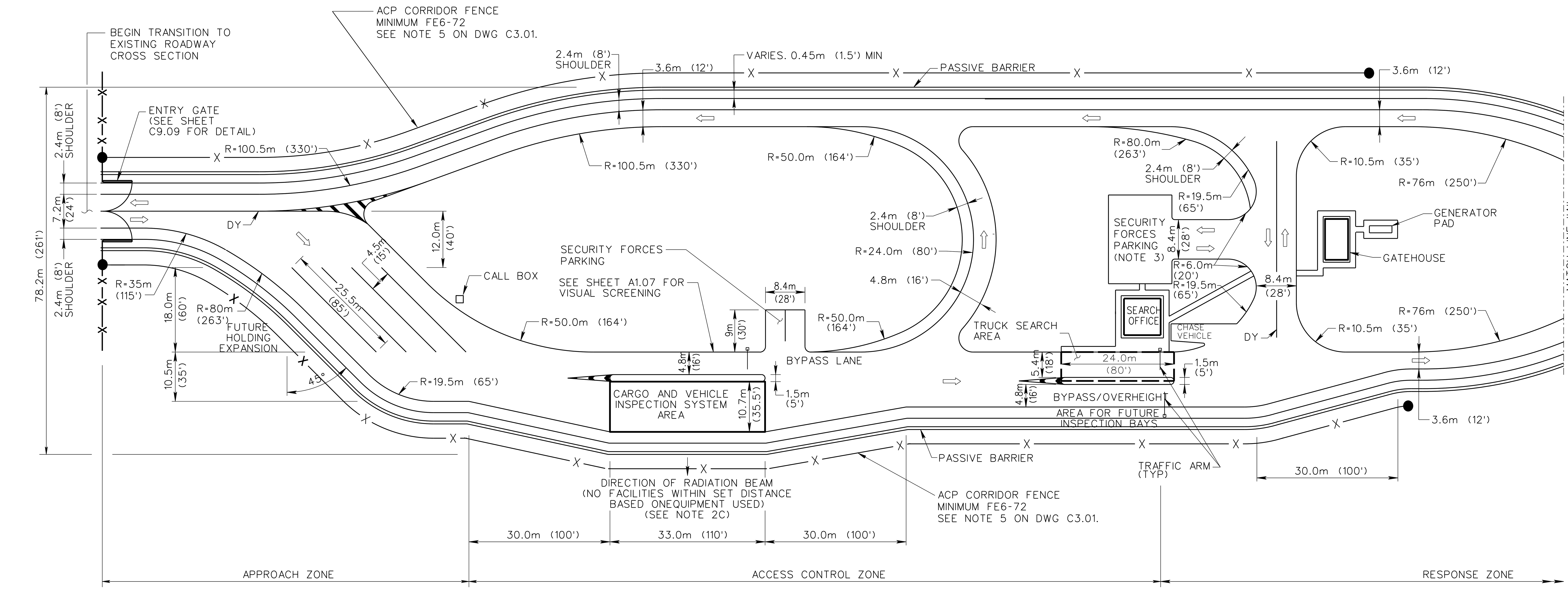
U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
COMMERCIAL VEHICLE ACP
BARRIER NORMALLY CLOSED (DEPLOYED) OPERATION

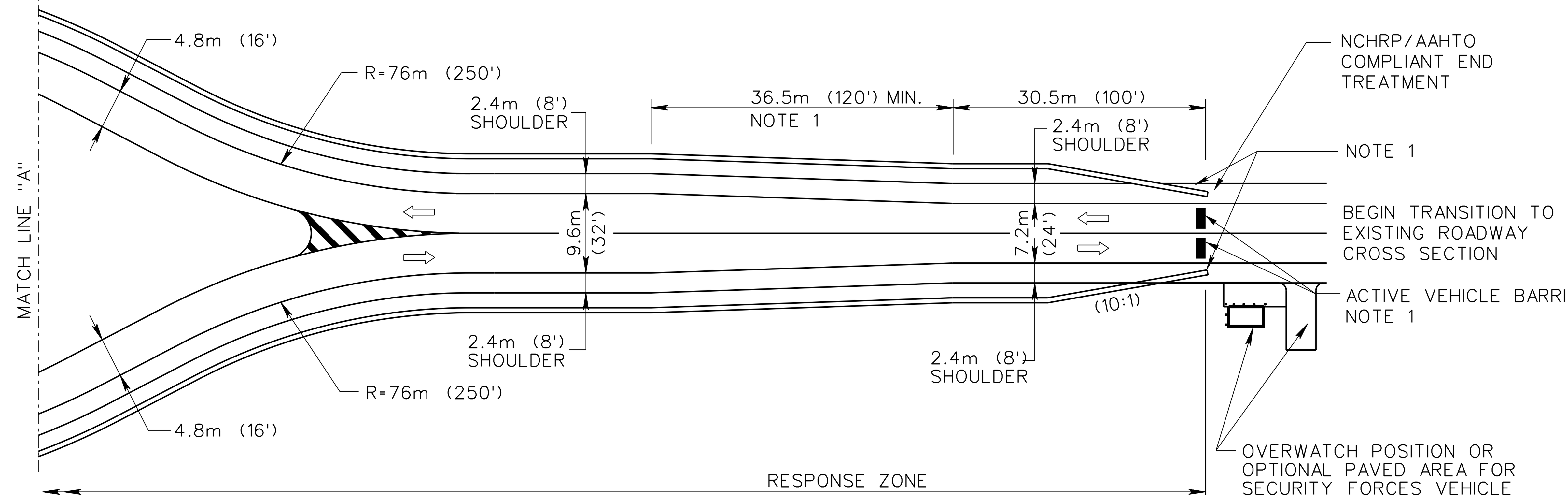
SHEET REFERENCE NUMBER
C3.05
SHEET 8 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG C9.14 FOR PAVEMENT MARKING DETAILS.
2. PROVIDE A 10.7m (35') WIDE X 33.5m (110') LONG PAVED INSPECTION AREA FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM. THIS PROVIDES ENOUGH WIDTH FOR THE INSPECTION SYSTEM AND THE LANE OF TRAVEL FOR THE VEHICLES TO BE INSPECTED. THE LENGTH IS SUFFICIENT TO ALLOW THE INSPECTION SYSTEM TO SCAN A LARGE STATIONARY VEHICLE AND MANEUVER.
   A. TO INCREASE THROUGHPUT A LONGER INSPECTION LANE CAN BE PROVIDED FOR OPERATION OF THE CARGO AND VEHICLE INSPECTION SYSTEM THAT SCANS STATIONARY VEHICLES. THIS WILL ALLOW THE SYSTEM TO SCAN SEVERAL VEHICLES AT ONE TIME.
   B. PROVIDE NO CANOPY OVER THE INSPECTION AREA PLANNED OR DEDICATED FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM UNLESS THE CLEAR HEIGHT IS A MINIMUM OF 6.7m (22').
   C. SITE ALL PERMANENT FACILITIES SUCH THAT THEY ARE NOT IN THE DIRECTION OF TRAVEL OF THE RADIATION BEAM UNLESS THE DISTANCE BETWEEN THE INSPECTION VEHICLE AND THE FACILITY IS AT LEAST 90.0m (300'). THE INTENT IS TO ENSURE THAT THE 100mR/YEAR RADIATION DOSE LIMIT IS NOT EXCEEDED FOR PERSONNEL WHO MAY BE IN THE DIRECTION OF TRAVEL OF THE RADIATION. THIS DISTANCE CAN BE REDUCED TO 23.0m (75.5') IF A 305mm (12") WIDE X 2.4m (8') HIGH (MIN) CONCRETE SHIELDING WALL IS PROVIDED BETWEEN THE RADIATION SOURCE AND ANY FACILITY OF CONCERN. THE DETERMINATION OF EXCLUSION ZONES SHOULD ALSO CONSIDER OBLIQUE SCAN ANGLES, WHICH SOME INSPECTION SYSTEMS CAN EMPLOY. REFER TO ACTUAL EQUIPMENT TO BE USED FOR SPECIFIC EXCLUSION ZONE REQUIREMENTS.
   D. ADD CONDUIT FOR ELECTRICAL POWER AND PROVIDE SUFFICIENT ELECTRICAL POWER CAPACITY FOR POSSIBLE ADDITION OF A FIXED VEHICLE INSPECTION SYSTEM.
3. NUMBER OF SPACES DETERMINED BY PERSONNEL REQUIREMENTS.




## COMMERCIAL VEHICLE ACP

BARRIER NORMALLY OPEN OPERATION

0 5 10 20 m

SCALE: 1:500

40 KPH
25 MPH DESIGN SPEED

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: XXX
DWN BY: XXX
CKD BY: XXX
SUBMITTED BY: X
FILE NAME: X
SIZE: ANSI D
PLOT SCALE: 1:1
DATE: NOV 2007
SOLICITATION NO.: W9128F-07-X-0204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

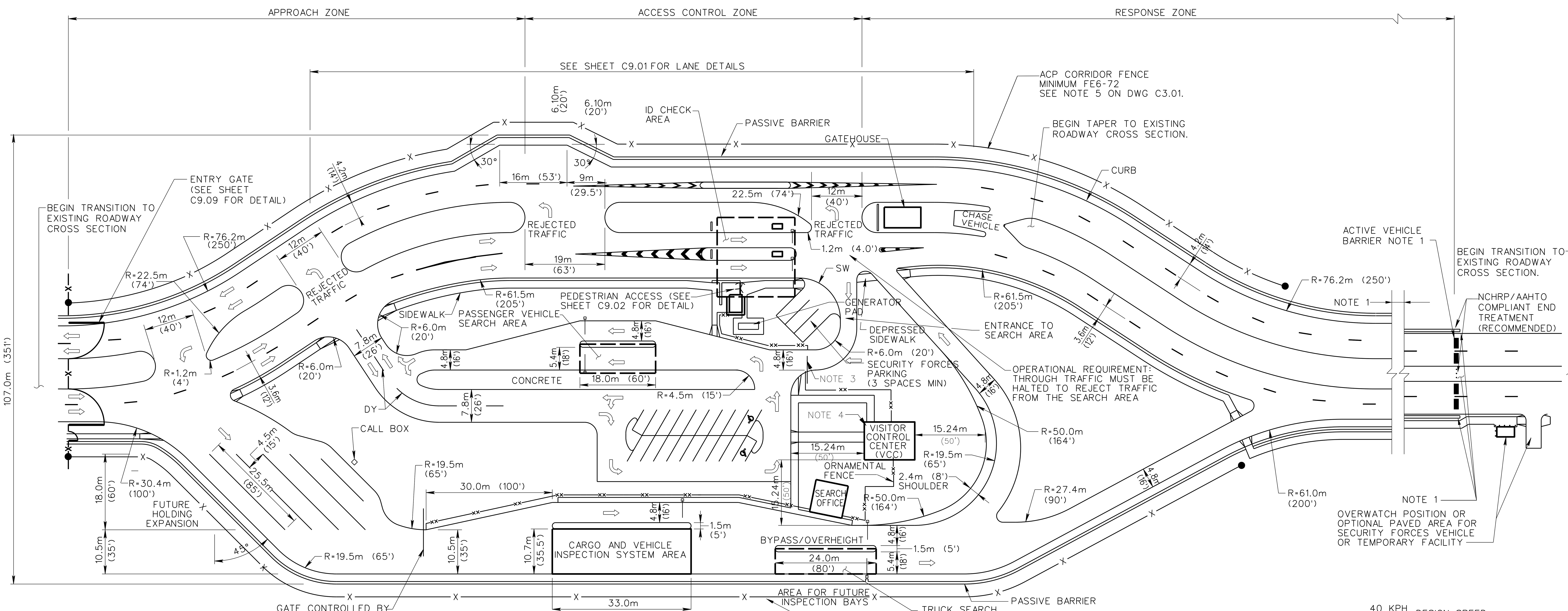
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
COMMERCIAL VEHICLE ACP
BARRIER NORMALLY OPEN OPERATION

SHEET
REFERENCE
NUMBER
C3.06



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG C9.14 FOR PAVEMENT MARKING DETAILS.

2. PROVIDE A 10.7m (35') WIDE X 33.5m (110') LONG PAVED INSPECTION AREA FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM. THIS PROVIDES ENOUGH WIDTH FOR THE INSPECTION SYSTEM AND THE LANE OF TRAVEL FOR THE VEHICLES TO BE INSPECTED. THE LENGTH IS SUFFICIENT TO ALLOW THE INSPECTION SYSTEM TO SCAN A LARGE STATIONARY VEHICLE AND MANEUVER.
   A. TO INCREASE THROUGHPUT A LONGER INSPECTION LANE CAN BE PROVIDED FOR OPERATION OF THE CARGO AND VEHICLE INSPECTION SYSTEM THAT SCANS STATIONARY VEHICLES. THIS WILL ALLOW THE SYSTEM TO SCAN SEVERAL VEHICLES AT ONE TIME.
   B. DO NOT PROVIDE CANOPY OVER THE INSPECTION AREA PLANNED OR DEDICATED FOR USE BY THE CARGO AND VEHICLE INSPECTION SYSTEM UNLESS THE CLEAR HEIGHT IS A MINIMUM OF 6.7m (22').
   C. SITE ALL PERMANENT FACILITIES SUCH THAT THEY ARE NOT IN THE DIRECTION OF TRAVEL OF THE RADIATION BEAM UNLESS THE DISTANCE BETWEEN THE INSPECTION VEHICLE AND THE FACILITY IS AT LEAST 90.0m (300'). THE INTENT IS TO ENSURE THAT THE 100mR/YEAR RADIATION DOSE LIMIT IS NOT EXCEEDED FOR PERSONNEL WHO MAY BE IN THE DIRECTION OF TRAVEL OF THE RADIATION. THIS DISTANCE CAN BE REDUCED TO 23.0m (75.5') IF A 305mm (12") WIDE X 2.4m (8') HIGH (MIN) CONCRETE SHIELDING WALL IS PROVIDED BETWEEN THE RADIATION SOURCE AND ANY FACILITY OF CONCERN. THE DETERMINATION OF EXCLUSION ZONES SHOULD ALSO CONSIDER OBLIQUE SCAN ANGLES, WHICH SOME INSPECTION SYSTEMS CAN EMPLOY. REFER TO ACTUAL EQUIPMENT TO BE USED FOR SPECIFIC EXCLUSION ZONE REQUIREMENTS.
   D. ADD CONDUIT FOR ELECTRICAL POWER AND PROVIDE SUFFICIENT ELECTRICAL POWER CAPACITY FOR POSSIBLE ADDITION OF A FIXED VEHICLE INSPECTION SYSTEM.

3. SLIDING GATES CONTROLLED BY GATEHOUSE PERSONNEL TO CLOSE SEARCH AREA DURING NON-MANNED HOURS.

4. IF 11 OR MORE PEOPLE INHABIT VCC ON A ROUTINE BASIS, THEN THE VCC IS AN INHABITED BUILDING WITHIN UNCONTROLLED PERIMETER. PER DOD MINIMUM ANTI-TERRORISM STANDARDS FOR BUILDINGS (UFC 4-010-01), REQUIRED STANDOFF DISTANCE FROM ROADS AND PARKING AREAS IS 25m (82") FOR CONVENTIONAL CONSTRUCTION. THIS AMOUNT OF STAND-OFF IS NOT AVAILABLE IN THIS RESTRICTED REAL ESTATE EXAMPLE, THEREFORE, THE VCC MUST BE HARDENED TO WITHSTAND THE EFFECTS OF THE THREAT EXPLOSIVE DETONATING AT THE AVAILABLE STANDOFF DISTANCE OF 50' SHOWN ON THE DRAWINGS.

# RESTRICTED REAL ESTATE ACP WITH VCC AND COMMERCIAL VEHICLE BARRIER NORMALLY OPEN OPERATION

NO DENIAL BETWEEN TRUCK HOLDING & TRUCK INSPECTION

0 5 10 20 m
SCALE: 1:500

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1 : 1 | PLOT DATE:

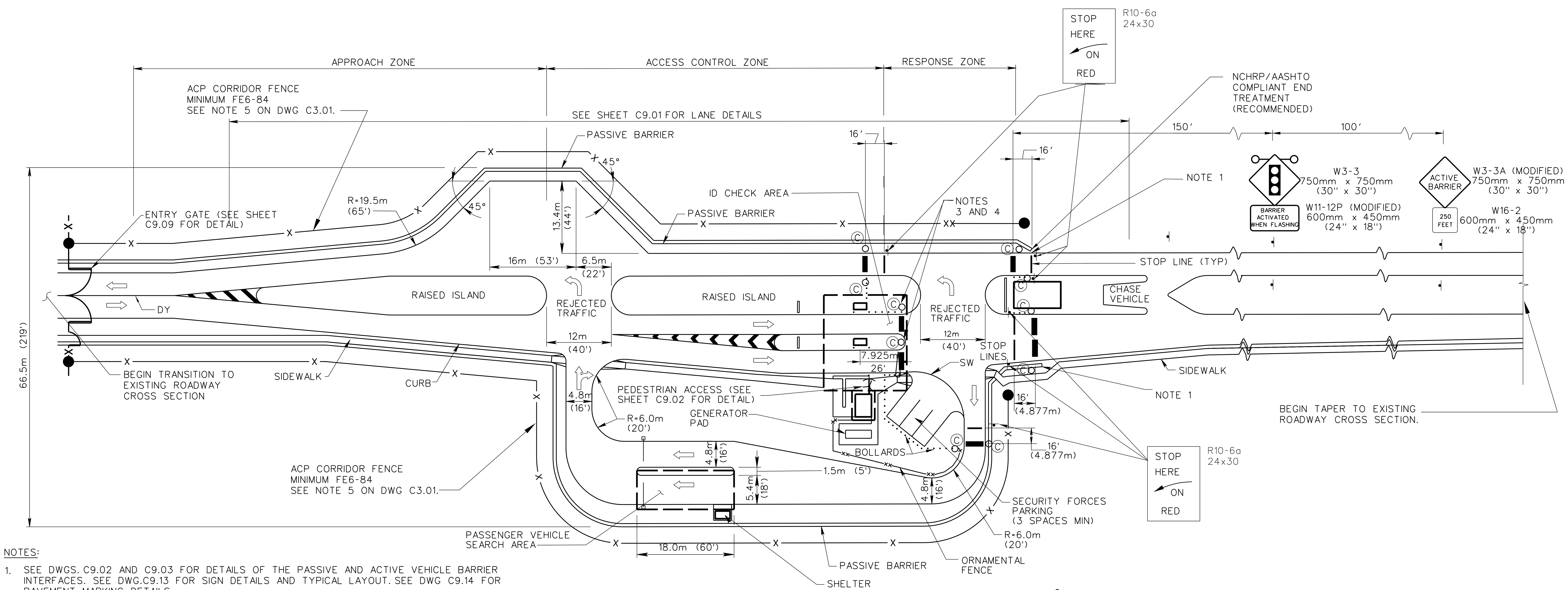
U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
RESTRICTED REAL ESTATE ACP WITH VCC AND COMMERCIAL VEHICLE ACCESS BARRIER NORMALLY OPEN OPERATION

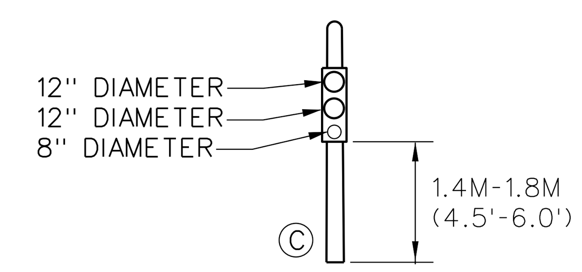
SHEET REFERENCE NUMBER
C3.07
SHEET 10 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




NOTES:

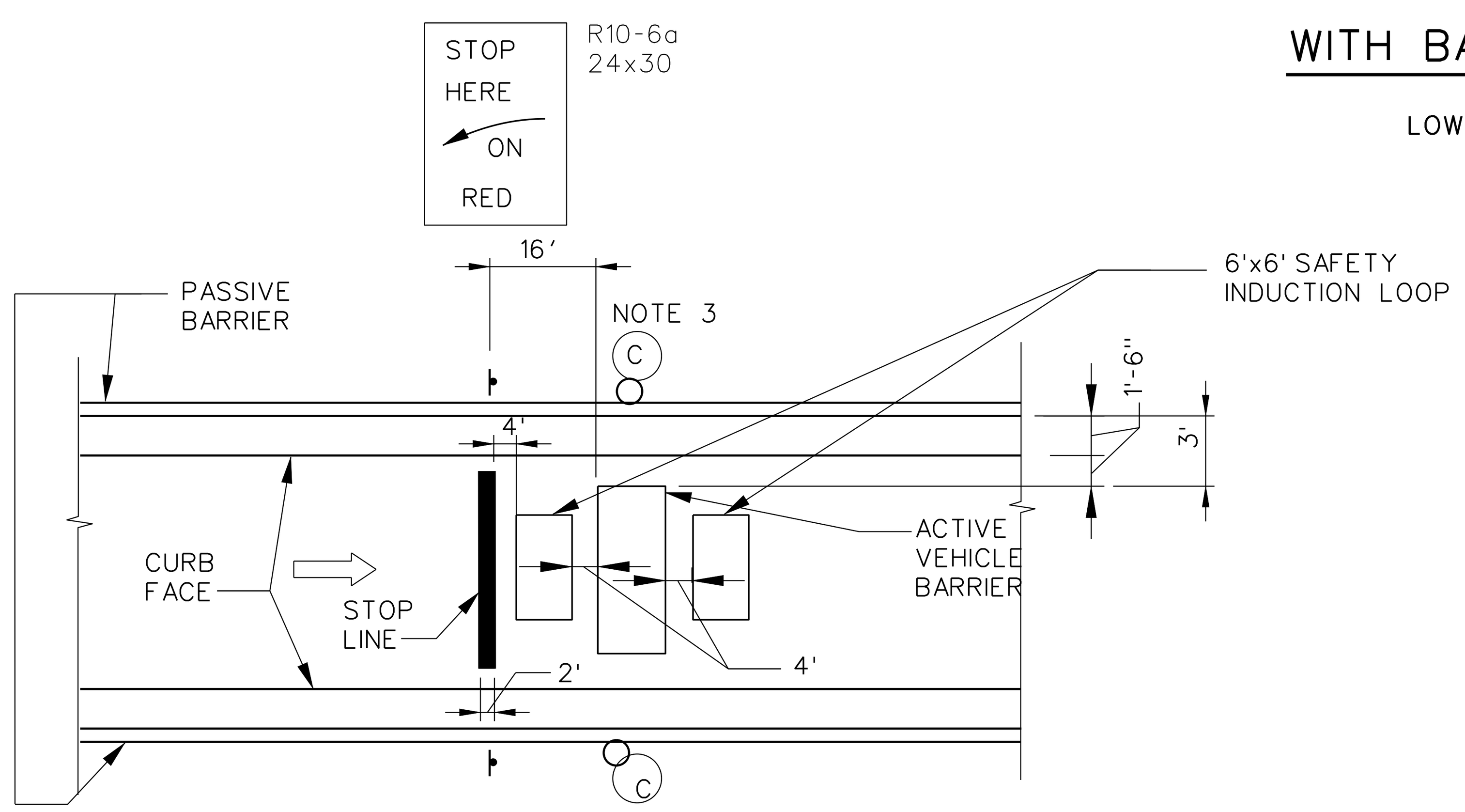
1. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG.C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG C9.14 FOR PAVEMENT MARKING DETAILS.
2. BARRIERS ARE NORMALLY CLOSED. ID CHECK AREA OR GATEHOUSE GUARD OPENS BARRIER FOR EACH INBOUND OR OUTBOUND VEHICLE AND THEN IMMEDIATELY CLOSES IT BEHIND THEM.
3. MOUNT TRAFFIC SIGNALS ON BOTH SIDES OF BARRIERS.
4. TILT TRAFFIC SIGNALS INWARD SUCH THAT THEY CAN BE SEEN ONLY FROM APPROPRIATE LANE.




## RESTRICTED REAL ESTATE ACP WITH BARRIER NORMALLY CLOSED (DEPLOYED) OPERATION

NO COMMERCIAL VEHICLES ALLOWED
LOW VOLUME APPLICATIONS ONLY (NOT SUITABLE FOR > 400 VEHICLES PER HOUR)

0 5 10 20 m
SCALE: 1:400




## SIGNALIZATION DETAIL FOR BARRIER NORMALLY CLOSED SAFETY SYSTEM

NOT TO SCALE

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP
- TRAFFIC SIGNAL DETAIL

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

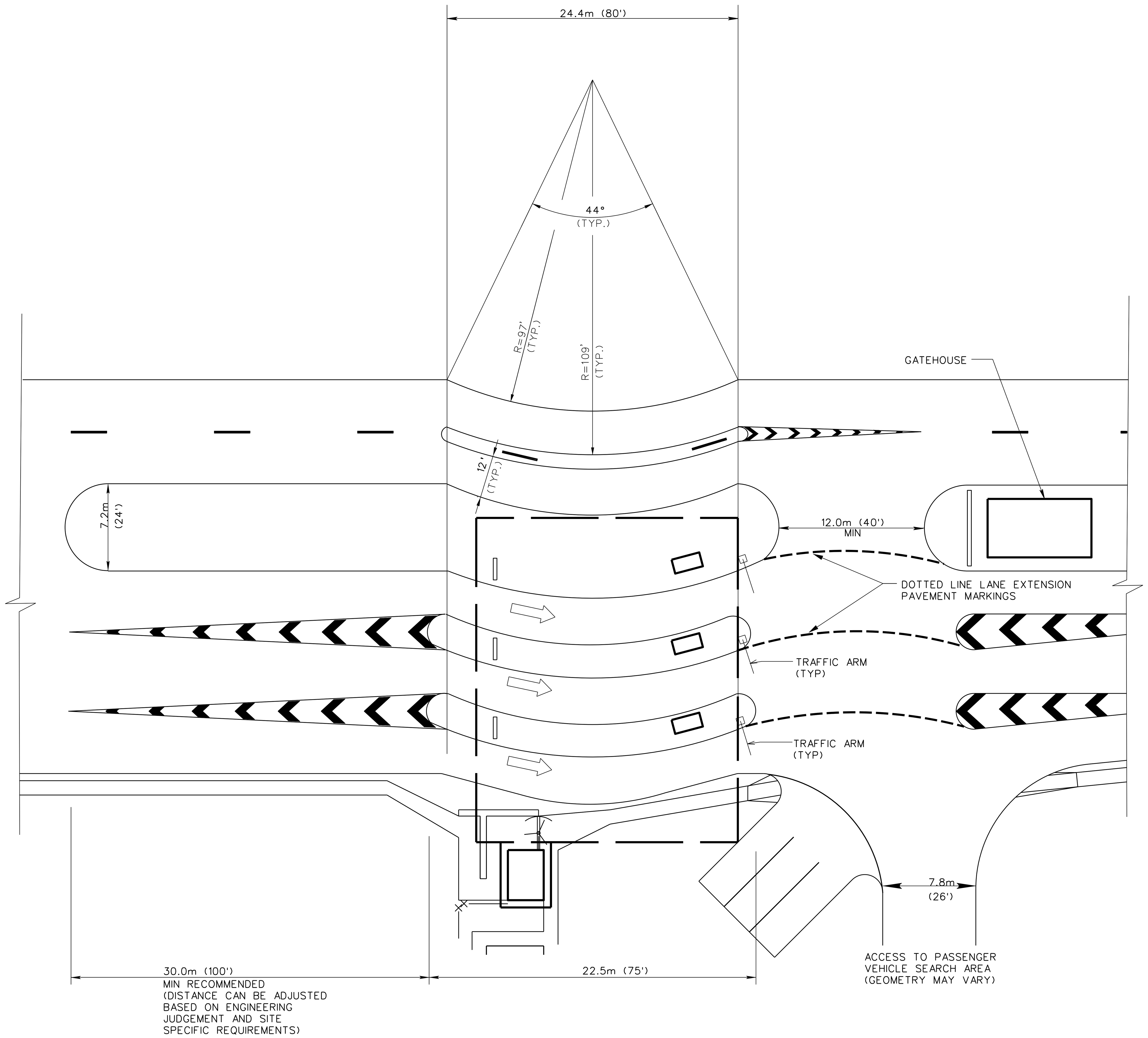
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
RESTRICTED REAL ESTATE ACP
WITH BARRIER NORMALLY CLOSED (DEPLOYED) OPERATION

SHEET REFERENCE NUMBER
C3.08
SHEET 11 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## ALTERNATE ID CHECK AREA CONFIGURATION

NOT TO SCALE

NOTES:
1. CURVED ID CHECK POINT ISLANDS SHOWN PROVIDE A LIMITING SPEED OF 113 KPH (70MPH) FOR PASSENGER VEHICLES. CURVED ID CHECK POINT ISLANDS ARE NOT SUITABLE FOR TRACTOR/TRAILERS.

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

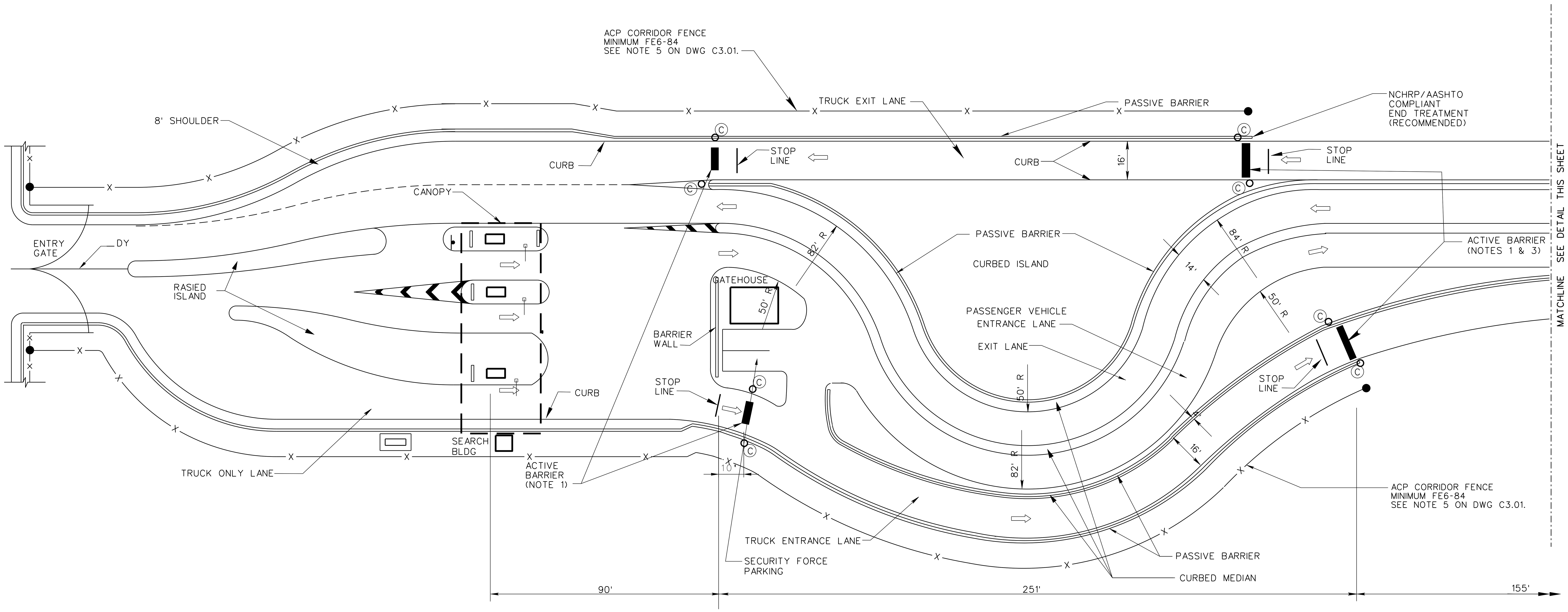
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
ALTERNATE ID CHECK AREA CONFIGURATION

SHEET REFERENCE NUMBER
C3.09
SHEET 12 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$



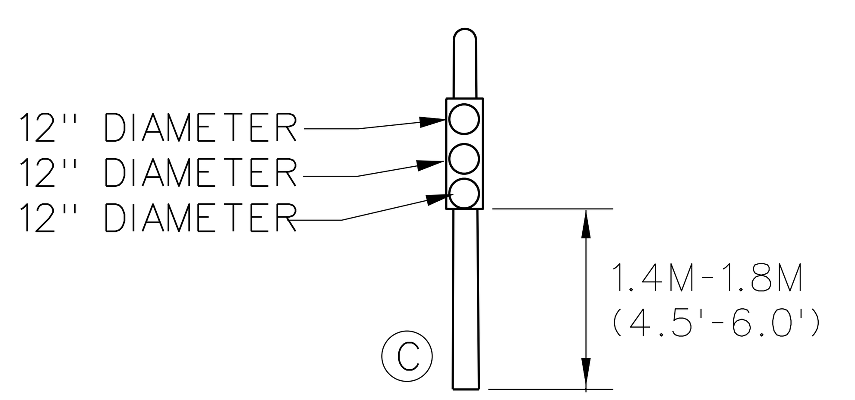

## SITE PLAN
## RESTRICTED REAL ESTATE ACP
## WITH PASSENGER AND COMMERICAL VEHICLE ACCESS

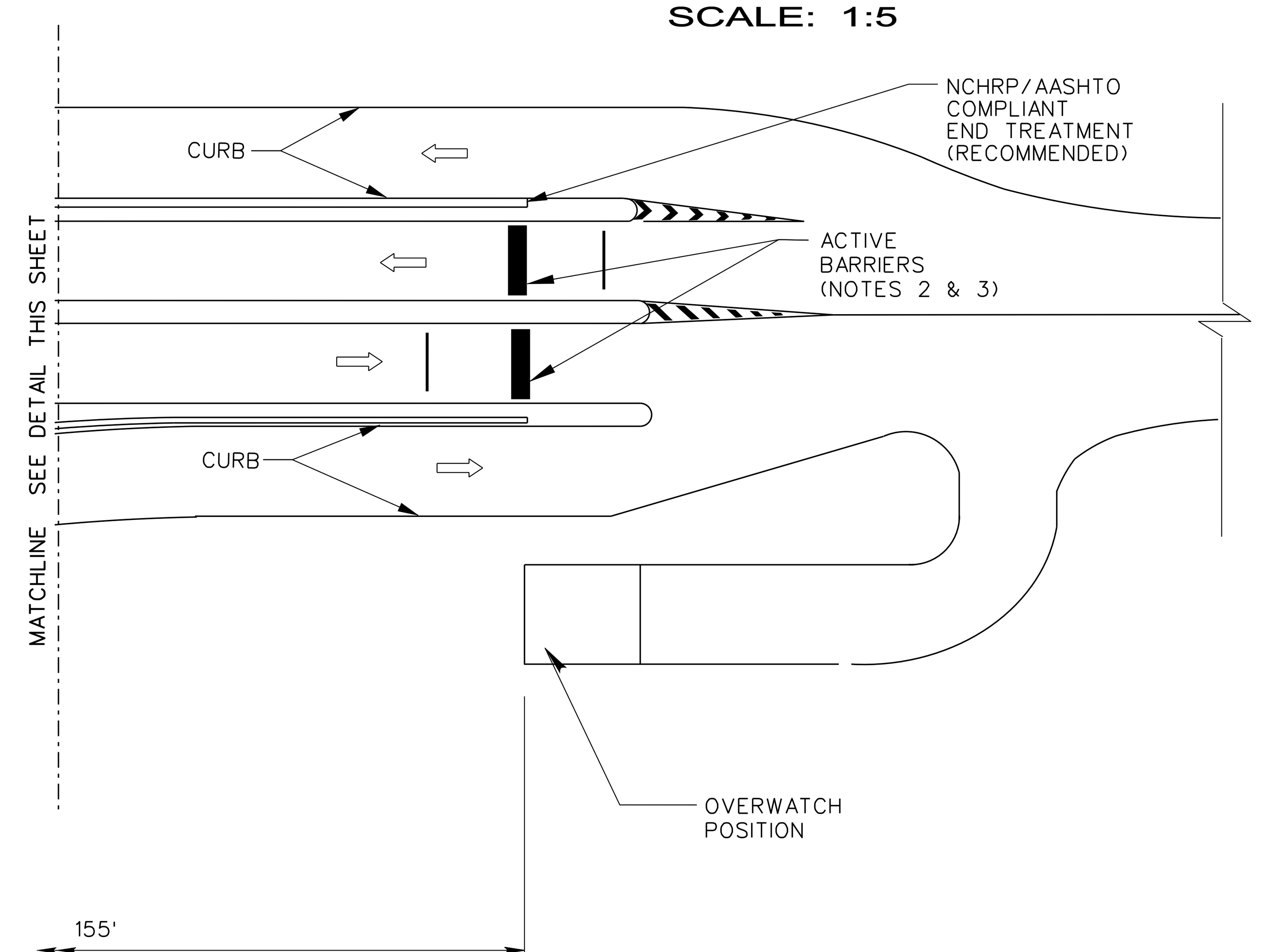
0 50 100 200

SCALE: 1:5

**NOTES:**

1. BARRIERS IN TRUCK ONLY LANES ARE OPERATED IN THE NORMALLY CLOSED (DEPLOYED) SAFETY SYSTEM.
2. BARRIERS IN PASSENGER VEHICLE ONLY LANES ARE NORMALLY OPEN WITH SIGNS AND SIGNALS SAFETY SYSTEM.
3. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIER IN THE PASSENGER VEHICLE ONLY LANES. SEE DWG 3.08 FOR SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS IN THE TRUCK ONLY LANES. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG C9.14 FOR PAVEMENT MARKINGS DETAILS.




0 50 100 200

SCALE: 1:5

**LEGEND**

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP
- C TRAFFIC SIGNAL DETAIL

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DATE: NOV 2007
SOLICITATION NO.: W912HN-07-X-0204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE:
DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
PLOT SCALE: 1:1
SIZE: ANSI D

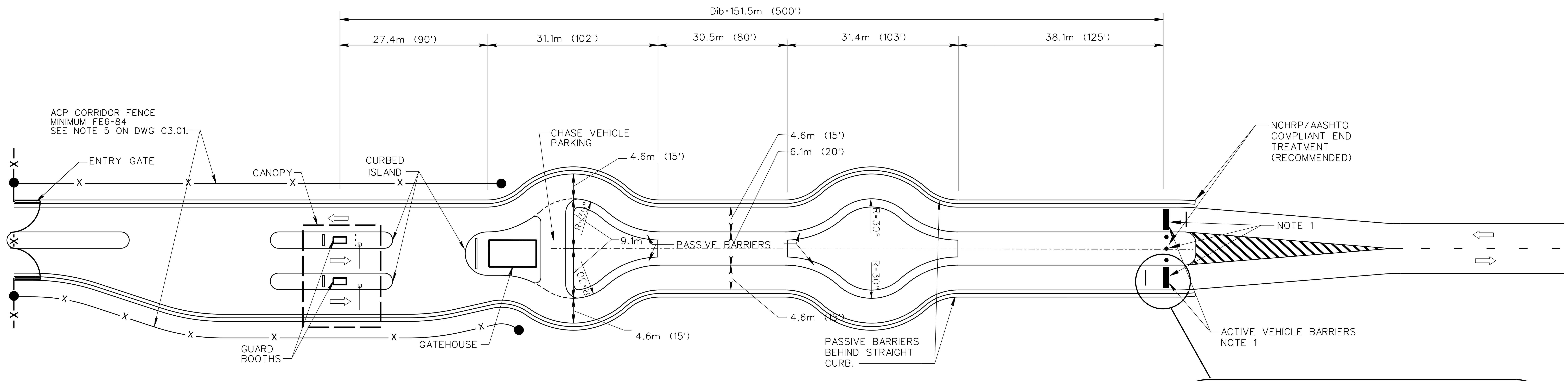
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

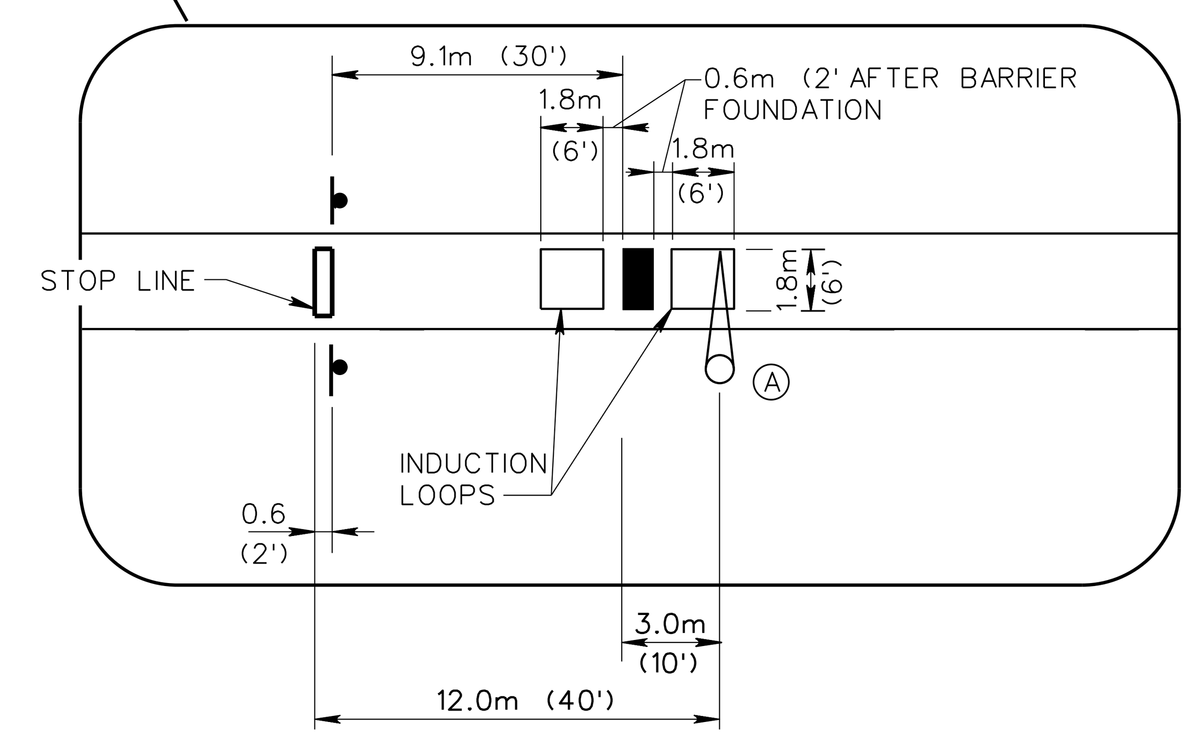
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
RESTRICTED REAL ESTATE ACP
WITH PASSENGER AND COMMERICAL VEHICLE ACCESS

SHEET REFERENCE NUMBER
C3.10
SHEET 13 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$



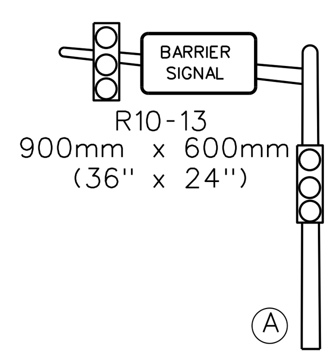




## LIMITED REAL ESTATE ACP WITH HALF CIRCLES
## NOT FOR COMMERCIAL VEHICLES

NOT TO SCALE

NOTES:

1. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG C9.14 FOR PAVEMENT MARKING DETAILS.
2. RESPONSE ZONE LENGTH IS REDUCED IN THIS EXAMPLE BY APPLYING 2 HALF CIRCLES. HALF CIRCLES ARE SIMILAR TO TRAFFIC TURNAROUNDS OR ROUND-A-BOUTS THAT ARE USED IN URBAN RESIDENTIAL AREAS.




LEGEND

| | |
|---|---|
| ⇨ | TRAFFIC FLOW PATTERN |
| Y/100mm (4") | PAINT STRIPE STYLE/WIDTH |
| DY | DOUBLE YELLOW LINE |
| SW | SOLID WHITE LINE |
| | TRAFFIC ARM |
| | ACTIVE VEHICLE BARRIER |
| | PASSIVE VEHICLE BARRIER |
| | ORNAMENTAL FENCE |
| | FENCE |
| · · · · · | BOLLARDS |
| | CANOPY |
| | BARRIER WALL |
| | DOUBLE FACE GUARD RAIL |
| | SINGLE FACE GUARD RAIL |
| | GUARD BOOTH |
| | GENERATOR PAD W/SIDEWALK |
| | CURB RAMP |

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
SIZE: ANSI D
DATE: NOV 2007
SOLICITATION NO.: W912HN-07-X-0204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT SCALE: 1:1
PLOT DATE:

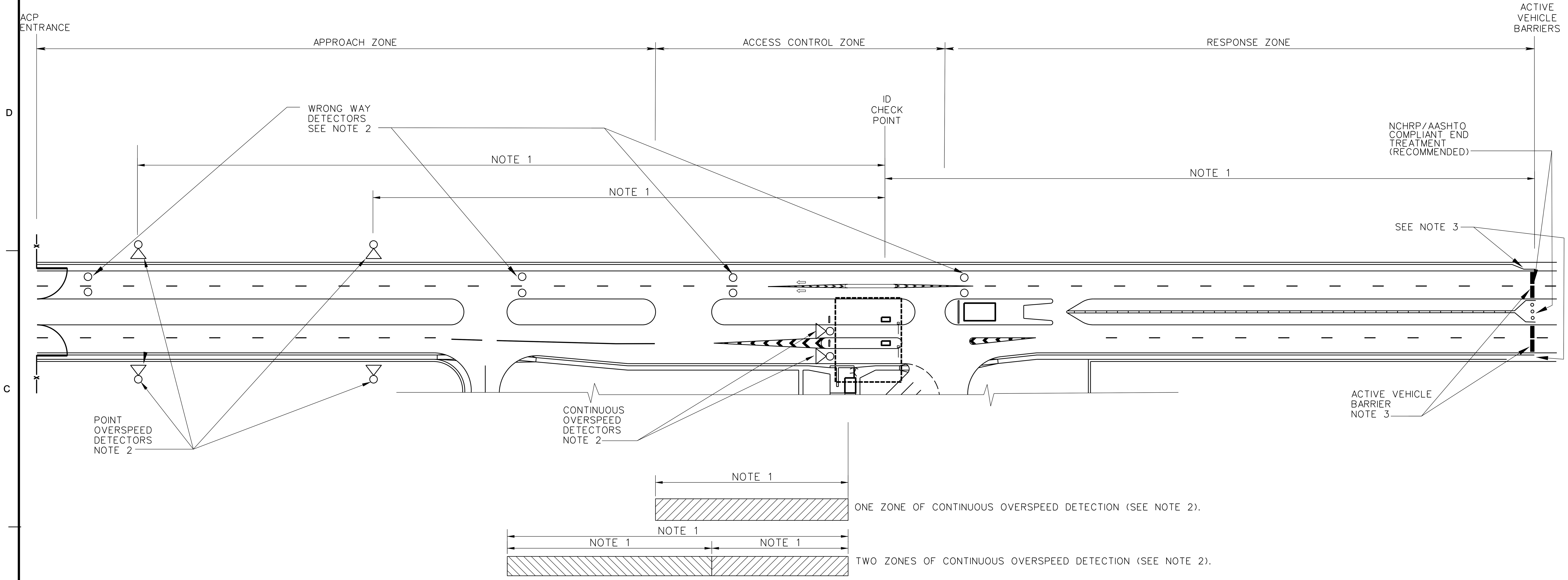
U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
LIMITED REAL ESTATE ACP WITH HALF CIRCLES

SHEET REFERENCE NUMBER
C3.11
SHEET 14 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## CONVENTIONAL ACP

NOT TO SCALE

NOTES:

1. THE CONVENTIONAL ACP HAS STRAIGHT ROADWAYS THROUGH THE ACP CORRIDOR. THE PROTECTIVE SYSTEM FOR A CONVENTIONAL ACP CONSISTS OF OVERSPEED AND WRONG-WAY SENSORS TO DETECT THE THREAT VEHICLE AS EARLY AS POSSIBLE IN ITS ATTACK. IT ALSO RELIES ON THE LENGTHS OF ROADWAY SEGMENTS IN THE ACP CORRIDOR TO DELAY THE THREAT VEHICLE. SEE EXAMPLES IN APPENDIX D FOR CALCULATIONS TO DETERMINE OVERSPEED DETECTOR LOCATIONS, RANGES, AND SETTINGS AND REQUIRED LENGTHS OF ACP ROADWAY SEGMENTS. APPENDIX D INCLUDES EXAMPLES USING THE SIGNS AND SIGNALS SAFETY SYSTEM AND THE PRESENCE DETECTION SAFETY SYSTEM.

2. SEE SECTION 4.1 OF THE STANDARD DESIGN/CRITERIA FOR DEFINITIONS OF POINT AND CONTINUOUS OVERSPEED DETECTION AND WRONG WAY DETECTION.

3. SEE DWG C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE BARRIER INTERFACES. SEE DWG. C9.10 FOR SIGNS AND SIGNALS REQUIRED FOR THE SIGNS AND SIGNALS SAFETY SYSTEM AND SEE DWGS. C3.17 AND C3.18 FOR SIGNS AND SIGNALS REQUIRED FOR THE PRESENCE DETECTION SAFETY SYSTEM. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAILS.

LEGEND

| | |
|---|---|
| ⇨ | TRAFFIC FLOW PATTERN |
| Y/100mm (4") | PAINT STRIPE STYLE/WIDTH |
| DY | DOUBLE YELLOW LINE |
| SW | SOLID WHITE LINE |
| | TRAFFIC ARM |
| | ACTIVE VEHICLE BARRIER |
| | PASSIVE VEHICLE BARRIER |
| | ORNAMENTAL FENCE |
| | FENCE |
| | BOLLARDS |
| | CANOPY |
| | BARRIER WALL |
| | DOUBLE FACE GUARD RAIL |
| | SINGLE FACE GUARD RAIL |
| | GUARD BOOTH |
| | GENERATOR PAD W/SIDEWALK |
| | CURB RAMP |

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X | DATE: NOV 2007 | DWN BY: X.X.X | CKD BY: X.X.X | SOLICITATION NO.: W9128F-07-X-0204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | CATEGORY CODE: X | SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

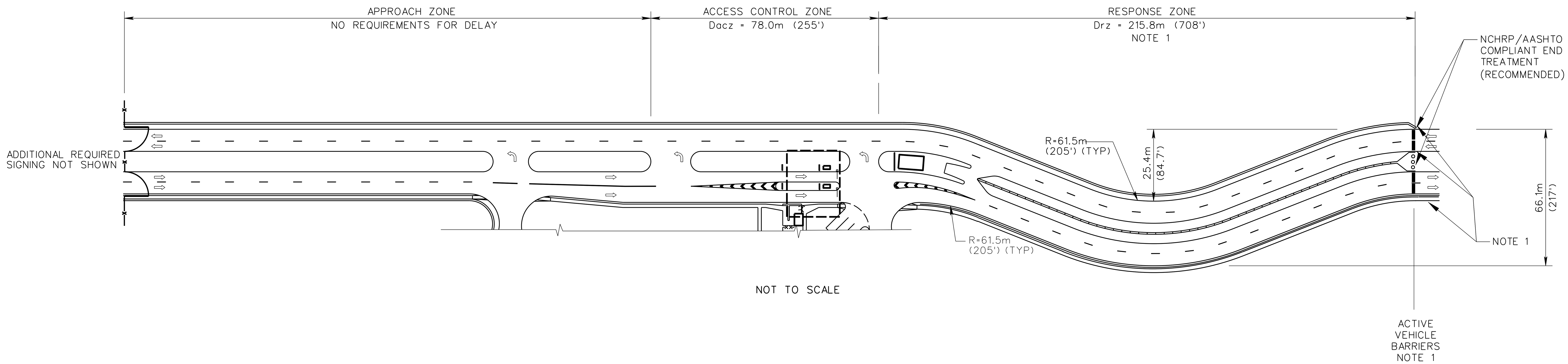
FACILITIES STANDARDIZATION PROGRAM ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

PROTECTIVE SYSTEMS CONVENTIONAL ACP

SHEET REFERENCE NUMBER C3.12

SHEET 15 OF 60

$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$




NOT TO SCALE

| DESIGN PARAMETERS | MAX THREAT SPEED | PROS | CONS | APPLICABILITY/ CONSIDERATIONS |
|---|---|---|---|---|
| NORMAL CONDITIONS DESIGN SPEED = 40 KPH (25 MPH)<br>Emax = 4% (SUPERELERATION)<br>R = 61.5m (205') (NOTE 2)<br>ANGLE OF DEFLECTION= 50° | SEE PARAGRAPH F AND TABLE 3 OF APPENDIX D FOR METHODOLOGY | PHYSICALLY LIMITS NORMAL AND THREAT VEHICLE SPEEDS | MAY CAUSE MINOR REDUCTIONS IN ROADWAY CAPACITY DUE TO CONTROLLED SPEEDS<br>TRACTOR TRAILERS NEED TO USE BOTH LANES<br>MINOR CRASHES MAY INCREASE | CURVATURE CAN ENCOMPASS ID AND/OR BARRIER AREA |

## CHICANE-95KPH (59 MPH) MAXIMUM SPEED

NOT TO SCALE
40 KPH (25 MPH) DESIGN SPEED

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAIL.
2. CONTACT THE PROTECTIVE DESIGN CENTER (PDC) FOR CHICANES WITH SMALLER RADII TURNS.

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

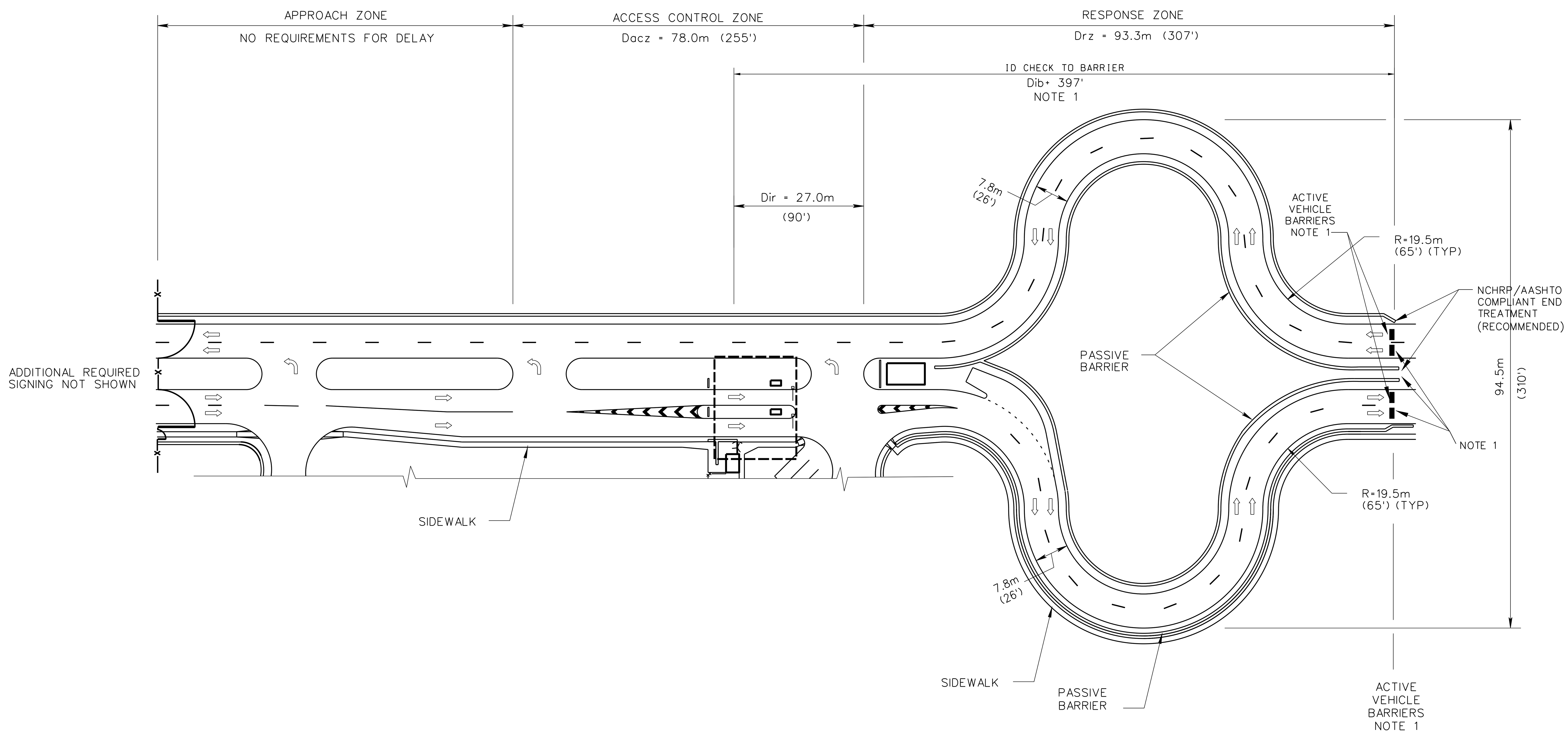
DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W912HN-07-X-6204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1 : 1 | PLOT DATE: .

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

PROTECTIVE SYSTEMS
CHICANE-95 KPH (59 MPH) MAXIMUM SPEED

SHEET REFERENCE NUMBER
C3.13




| DESIGN PARAMETERS | MAX THREAT SPEED | PROS | CONS | APPLICABILITY/ CONSIDERATIONS |
|---|---|---|---|---|
| NORMAL CONDITIONS DESIGN SPEED = 24 KPH (15 MPH)<br>Emax = 2% (SUPERELEVATION)<br>R = 19.5m (65')<br>ANGLE OF DEFLECTION= 80° | SEE PARAGRAPH F AND TABLE 4 OF APPENDIX D FOR METHODOLOGY | CAN HELP ACHIEVE NEEDED APPROACH AND RESPONSE DISTANCE<br>PHYSICALLY LIMITS NORMAL AND THREAT SPEEDS | REQUIRES ADDITIONAL R/W AND ROADWAY CONSTRUCTION<br>MAY CAUSE SOME MINOR REDUCTION IN CAPACITY<br>CONSISTS OF 4 TURNS AS DEFINED BY MUTCD<br>MINOR CRASHES MAY INCREASE W/O LANE SEPARATION | REQUIRES MUTCD SIGNING |

## LOOP - 58 KPH (36 MPH) MAXIMUM SPEED

NOT TO SCALE
24 KPH (15 MPH) DESIGN SPEED
NOT FOR COMMERCIAL USE

NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAIL.

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

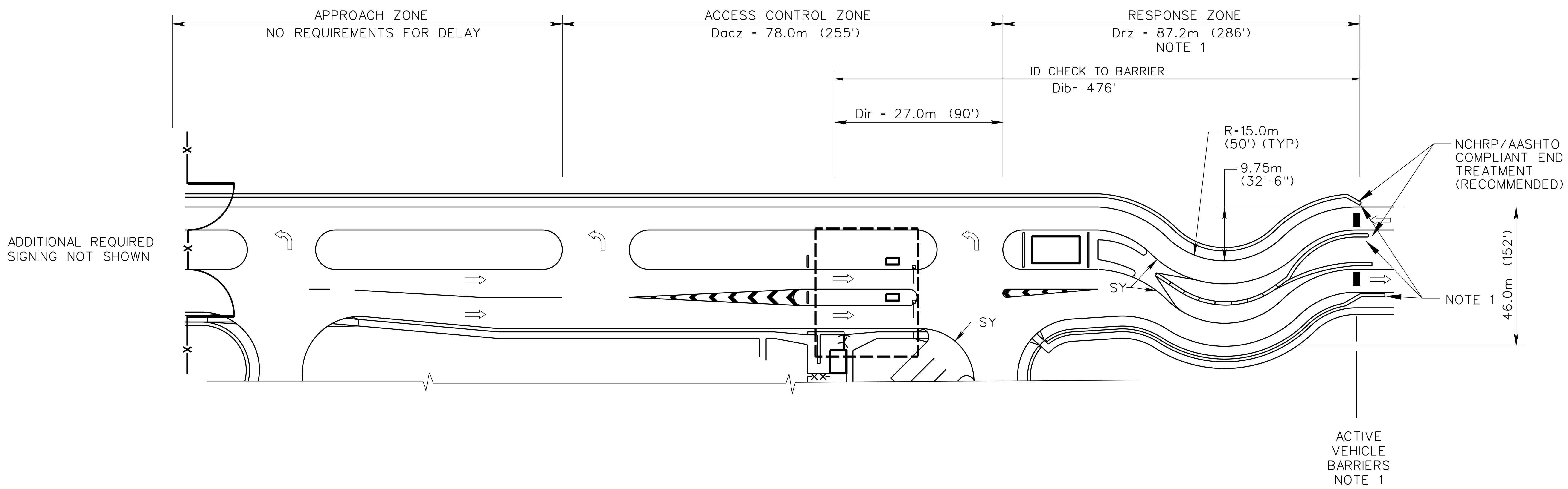
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

PROTECTIVE SYSTEMS
TURN - 58 KPH (36 MPH) MAXIMUM SPEED

SHEET
REFERENCE
NUMBER
C3.14
SHEET 17 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




| DESIGN PARAMETERS | MAX THREAT SPEED | PROS | CONS | APPLICABILITY/ CONSIDERATIONS |
|---|---|---|---|---|
| NORMAL CONDITIONS DESIGN SPEED < 24 KPH (15 MPH)<br>Emax = 2% (SUPERELEVATION)<br>R = 15.0m (50')<br>ANGLE OF DEFLECTION= 70° | SEE PARAGRAPH F AND TABLE 3 OF APPENDIX D FOR METHODOLOGY | PHYSICALLY LIMITS NORMAL AND THREAT SPEEDS | MAY CAUSE MINOR REDUCTIONS IN ROADWAY CAPACITY DUE TO CONTROLLED SPEEDS<br>DIFFICULT FOR LARGER VEHICLES TO MANEUVER<br>MINOR CRASHES MAY INCREASE<br>NOT APPROPRIATE FOR TRUCKS | CURVATURE CAN ENCOMPASS ID AND/OR BARRIER AREA<br>MORE SUITABLE FOR LOW-VOLUME AND/OR RESIDENTIAL USE |

## CHICANE - 60 KPH (37.5 MPH) MAXIMUM SPEED

NOT TO SCALE
24 KPH (15 MPH) DESIGN SPEED
NOT FOR COMMERCIAL VEHICLE USE

NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.10 FOR FOR SIGNS AND SIGNALS REQUIRED FOR THE ACTIVE VEHICLE BARRIERS. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAIL.

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

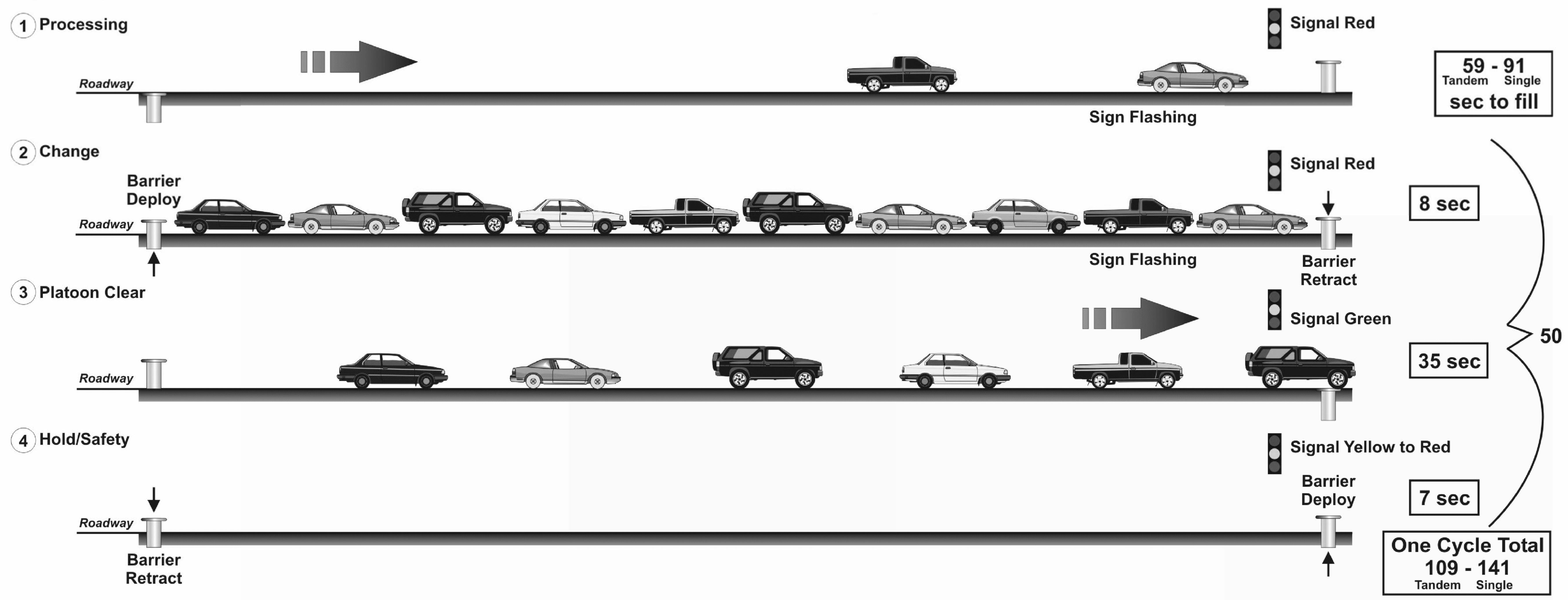
PROTECTIVE SYSTEMS
CHICANE - 60 KPH (37.5 MPH) MAXIMUM SPEED

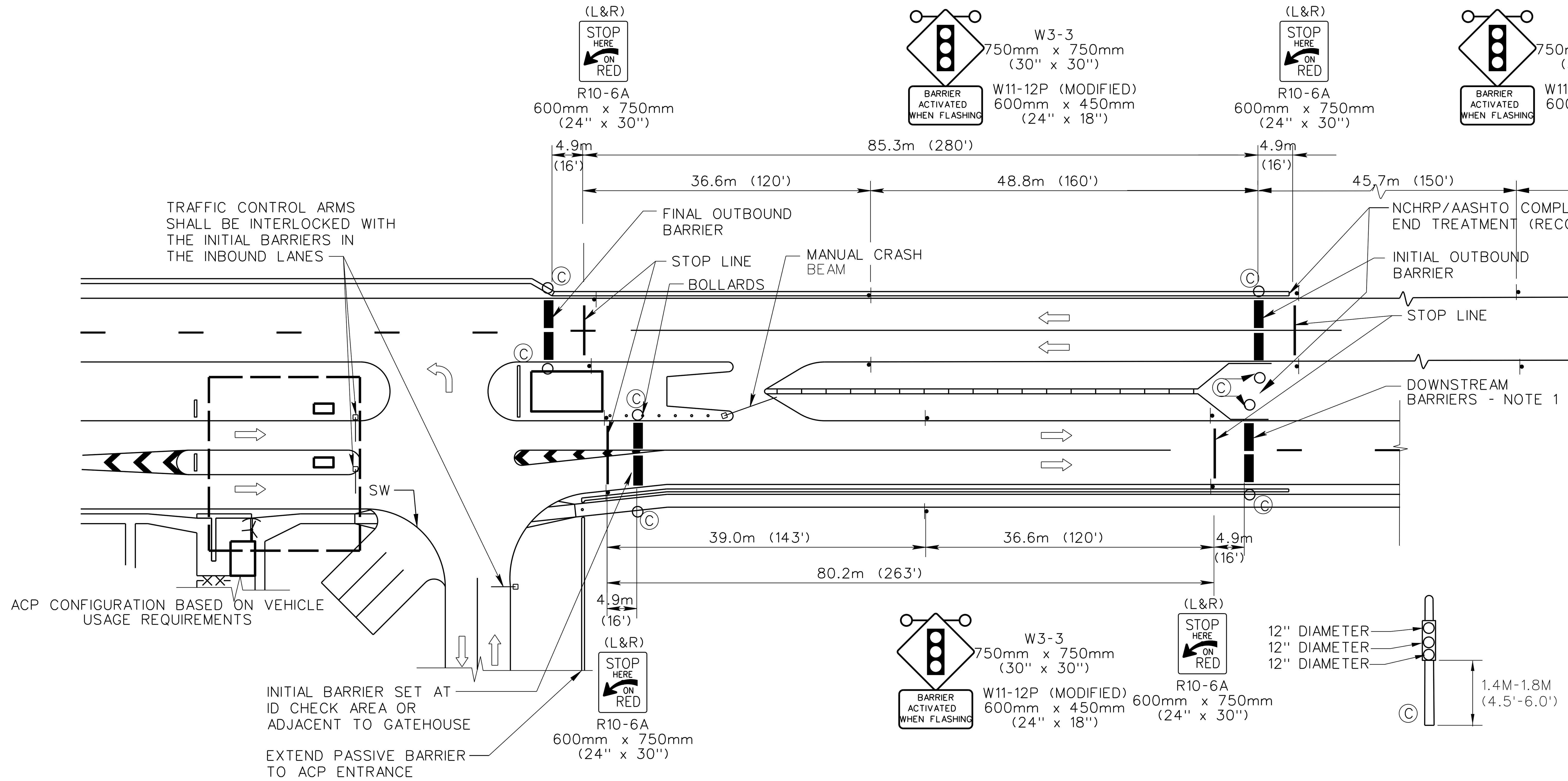
SHEET REFERENCE NUMBER
C3.15



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## Typical Operations




LEGEND

| | |
|---|---|
| | TRAFFIC FLOW PATTERN |
| Y/100mm (4") | PAINT STRIPE STYLE/WIDTH |
| DY | DOUBLE YELLOW LINE |
| SW | SOLID WHITE LINE |
| | TRAFFIC ARM |
| | ACTIVE VEHICLE BARRIER |
| | PASSIVE VEHICLE BARRIER |
| | ORNAMENTAL FENCE |
| | FENCE |
| | BOLLARDS |
| | CANOPY |
| | BARRIER WALL |
| | DOUBLE FACE GUARD RAIL |
| | SINGLE FACE GUARD RAIL |
| | GUARD BOOTH |
| | GENERATOR PAD W/SIDEWALK |
| | CURB RAMP |
| Ⓒ | TRAFFIC SIGNAL DETAIL |

NOTES:

1. SEE DWG. C3.08 FOR SIGNS AND SIGNALS REQUIRED FOR ACTIVE VEHICLE BARRIERS. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAILS.
2. RESPONSE ZONE LENGTH VARIES WITH THE NUMBER AND TYPE OF VEHICLES TO BE QUEUED AND AVAILABLE REAL ESTATE. ADJUST SIGNS AND SIGN SPACING AS NECESSARY, BUT IN CONFORMANCE WITH THE MUTCD.

| DESIGN PARAMETERS | RESPONSE ZONE | MAX THREAT SPEED WITH LANE DIVIDERS | PROS | CONS | APPLICABILITY/ CONSIDERATIONS |
|---|---|---|---|---|---|
| NORMAL CONDITIONS DESIGN SPEED - N/A<br>Emax (SUPERELEVATION) = N/A<br>R = N/A | N/A | N/A | MULTIPLE LINES OF SECURITY<br>SINCE BARRIERS ARE UP OR DOWN IN A CONTROLLED SITUATION, MOTORISTS ARE MORE AWARE OF BARRIER DEPLOYMENTS | DECREASES TRAFFIC PROCESSING BY 38% FOR SINGLE PROCESSING AND 46% FOR TANDEM PROCESSING<br>HIGHER COSTS DUE TO MORE BARRIERS AND INCREASED USAGE | FOR LOW TRAFFIC VOLUMES.<br>SIZE ENTRAPMENT AREA FOR ANTICIPATED VOLUME. |

VEHICLE PLATOONING

NOT TO SCALE

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

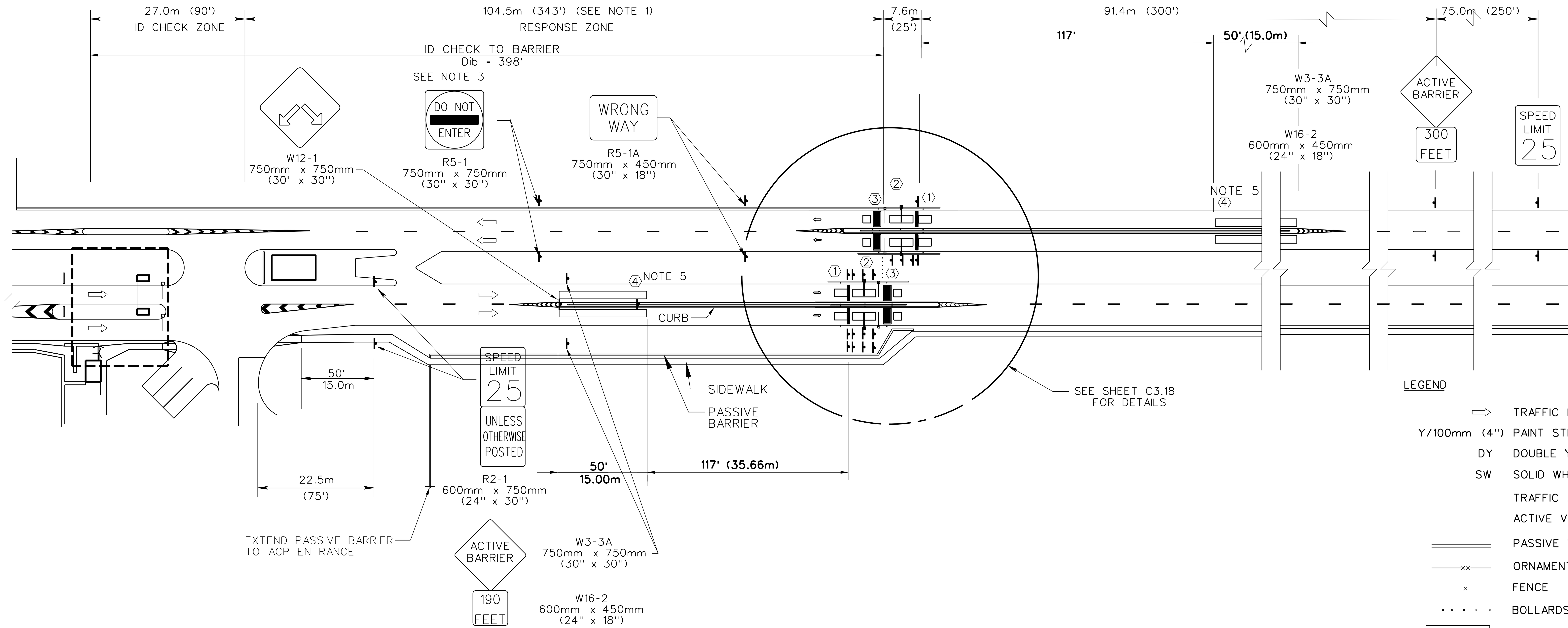
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

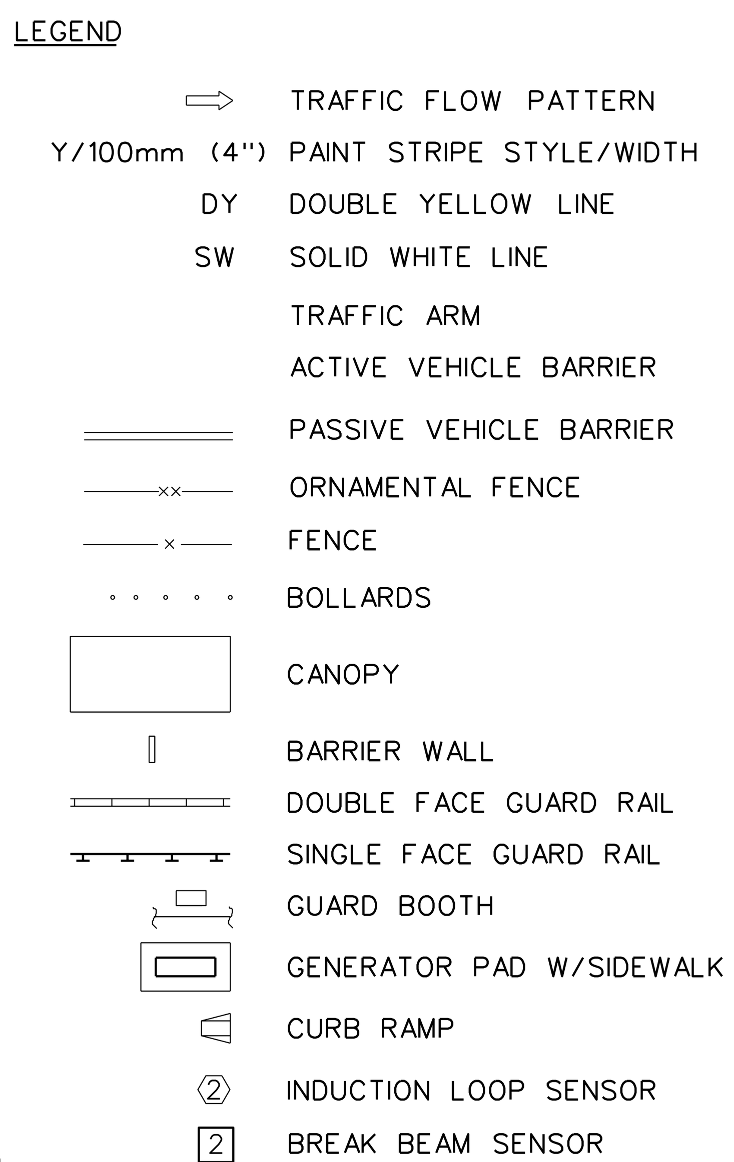
PROTECTIVE SYSTEMS
VEHICLE PLATOONING

SHEET REFERENCE NUMBER
C3.16



$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$



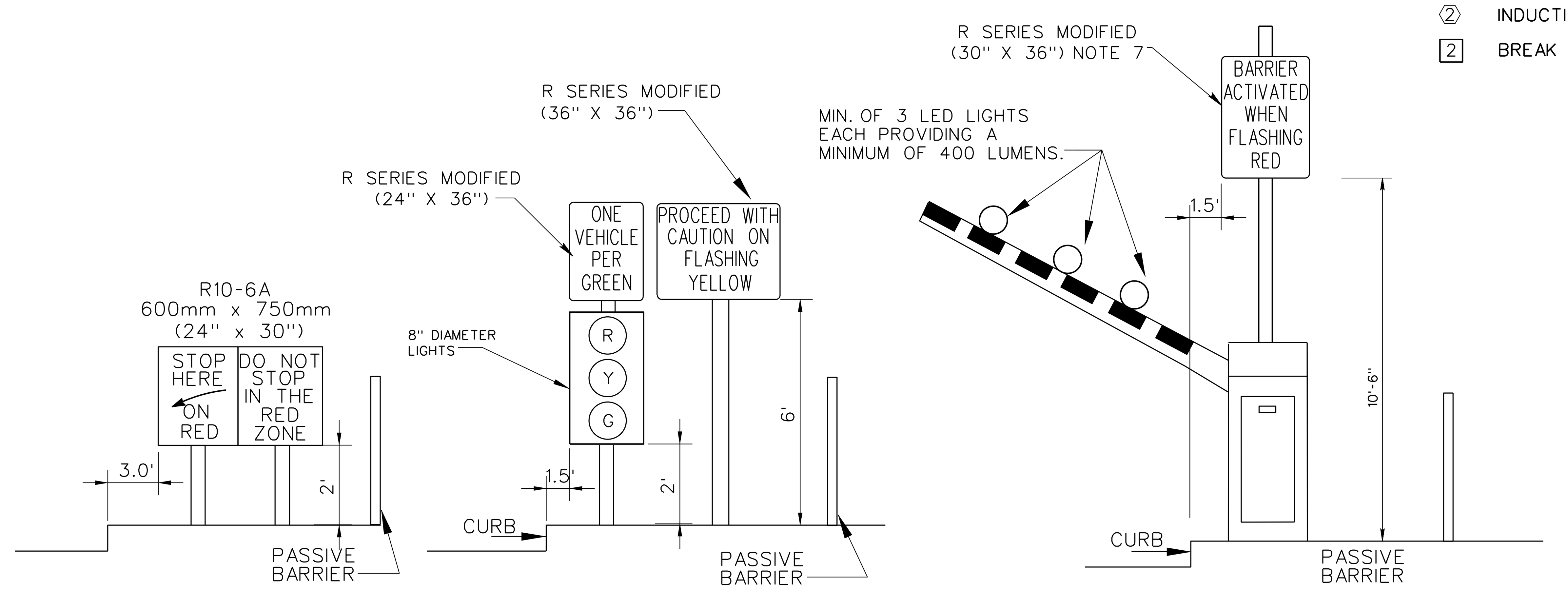




## PRESENCE DETECTION WITH ONE CONTINUOUS SPEED ZONE

NOT TO SCALE

NOTES:

1. SEE APPENDIX D FOR METHOD TO DETERMINE DETECTION AND DELAY REQUIREMENTS INCLUDING THE LENGTH OF THE RESPONSE ZONE (LENGTH SHOWN IS FOR ONE ZONE OF CONTINUOUS OVERSPEED DETECTION SET AT 40 mph). SEE DWG.C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAILS.
2. ISLANDS BETWEEN INBOUND AND OUTBOUND LAMES AT THE BARRIER ARE REQUIRED FOR PLACEMENT OF SIGNS, SIGNALS AND BEAM SENSORS. PASSIVE BARRIERS BETWEEN ADJACENT LANES AT THE BARRIER ARE REQUIRED TO PREVENT THE THREAT VEHICLE FROM CHANGING FROM A LANE WITH A CLOSED BARRIER TO ONE WITH AN OPEN BARRIER. THE ROADWAY DRAINAGE SYSTEM MUST BE DESIGNED ACCORDINGLY.
3. SIGN PLACEMENT MUST BE BASED ON MUTCD, LOCAL CONDITIONS, GEOMETRY, TRAFFIC ISLAND, OTHER TRAFFIC CONTROL DEVICES, LANDSCAPING, ROADSIDE FEATURES, ETC. DRIVERS APPROACHING THE BARRIER MUST HAVE A CLEAR VIEW OF THE TRAFFIC SIGNAL AND ALL SIGNS. DIMENSIONS AND MOUNTING HEIGHTS SHOWN ON THE DRAWINGS ARE FOR A STRAIGHT RESPONSE ZONE.
4. BARRIERS SHALL BE CONTROLLED BY A TRAFFIC CONTROLLER UNIT IN ACCORDANCE WITH UFGS 34 41 26.00 10 "ACCESS CONTROL POINT CONTROL SYSTEM"; DRAWINGS E1.03, E1,05, AND E1.06; AND APPENDIX G.
5. WHEN QUEUE PREEMPTION IS REQUIRED, PROVIDE ADVANCED VEHICLE PRESENCE DETECTORS (LOOP 4) AS SHOWN ON THE DRAWINGS. SEE DRAWING E1.06 AND APPENDIX G FOR REQUIRED CONTROL SEQUENCES.
6. PAVEMENT DEFINED BY THE "DO NOT STOP IN RED ZONE" SIGN SHALL CONSIST OF RED PIGMENTED CONCRETE PAVEMENT.
7. AS ALTERNATIVE TO THE SIGN SHOWN HERE A BLANK OUT SIGN WITH THE MESSAGE "BARRIER ACTIVATED" MAY BE PROVIDED. THE MESSAGE WOULD APPEAR WHENEVER THE GATE ARM IS IN THE DOWN (CLOSED) POSITION.
8. WHEN GATE ARM IS ACTIVATED, AN 80db AUDIIBLE ALARM SHALL SOUND FOR 10 SECONDS.




DETAIL A
(L&R)

DETAIL B
(L&R)

DETAIL C
(L&R)
(NOTE 8)

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

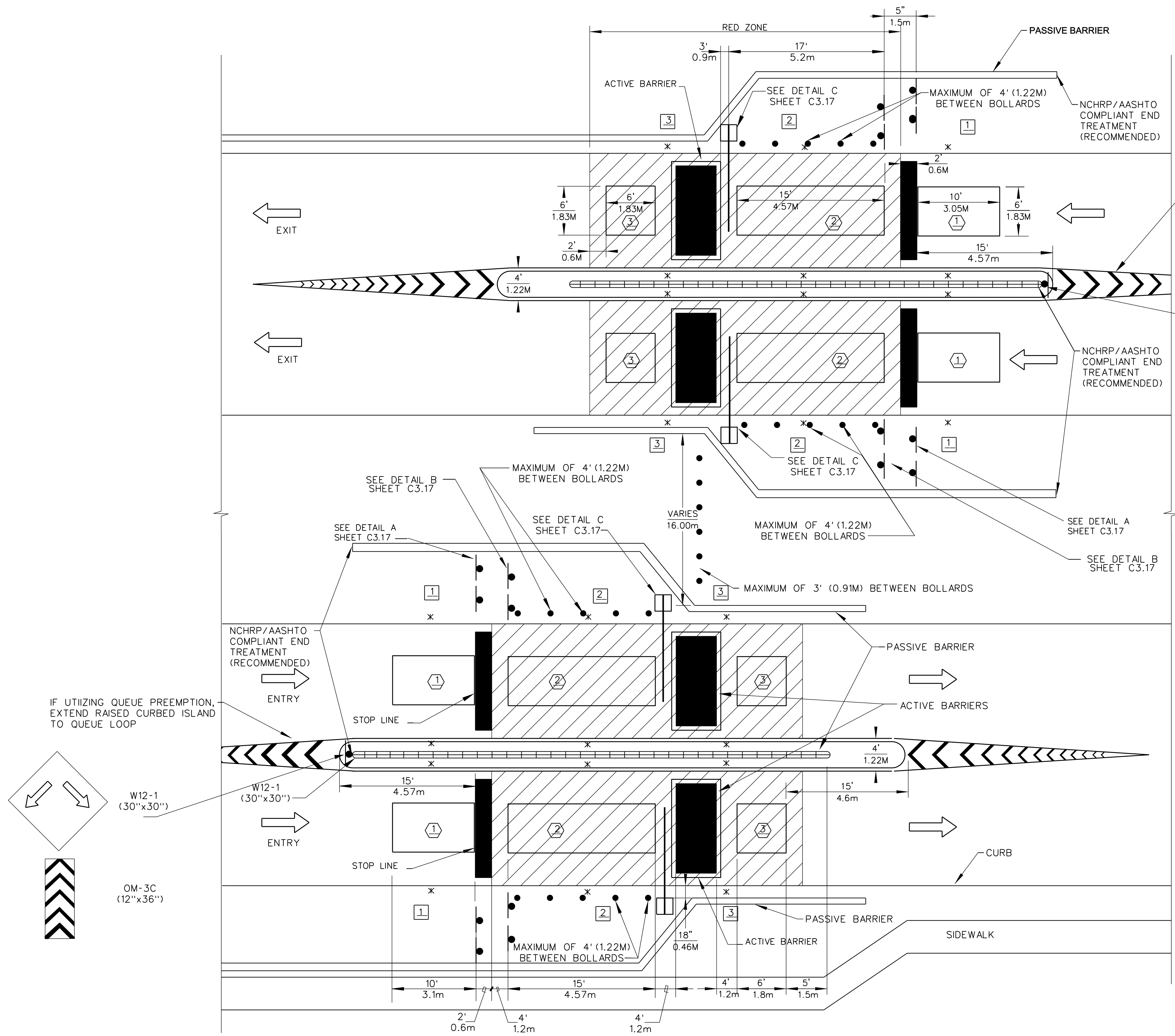
DESIGNED BY: X.X.X. | DATE: NOV 2007 | DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W912HN07X4204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | CATEGORY CODE: X | SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

PROTECTIVE SYSTEMS
VEHICLE PRESENCE DETECTION

SHEET
REFERENCE
NUMBER
C3.17
SHEET 20 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




PRESENCE DETECTION LAYOUT DETAILS

NOT TO SCALE

NOTES:

1. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG C9.14 FOR PAVEMENT MARKING DETAILS.
2. LOOP DETECTORS SHALL NOT BE INSTALLED ACROSS THE TRANSITION IN PAVING MATERIALS WITHOUT APPROPRIATE PROTECTION.

LEGEND

| | |
| --- | --- |
| ⇨ | TRAFFIC FLOW PATTERN |
| Y/100mm (4") | PAINT STRIPE STYLE/WIDTH |
| DY | DOUBLE YELLOW LINE |
| SW | SOLID WHITE LINE |
| | TRAFFIC ARM |
| | ACTIVE VEHICLE BARRIER |
| | PASSIVE VEHICLE BARRIER |
| | ORNAMENTAL FENCE |
| | FENCE |
| | BOLLARDS |
| | CANOPY |
| | BARRIER WALL |
| | DOUBLE FACE GUARD RAIL |
| | SINGLE FACE GUARD RAIL |
| | GUARD BOOTH |
| | GENERATOR PAD W/SIDEWALK |
| | CURB RAMP |
| 3 | INDUCTION LOOP SENSOR |
| 2 | BROOK BEAM SENSOR |

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
| --- | --- | --- | --- |

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | PLOT SCALE: 1:1 | CATEGORY CODE: X
SIZE: ANSI D | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

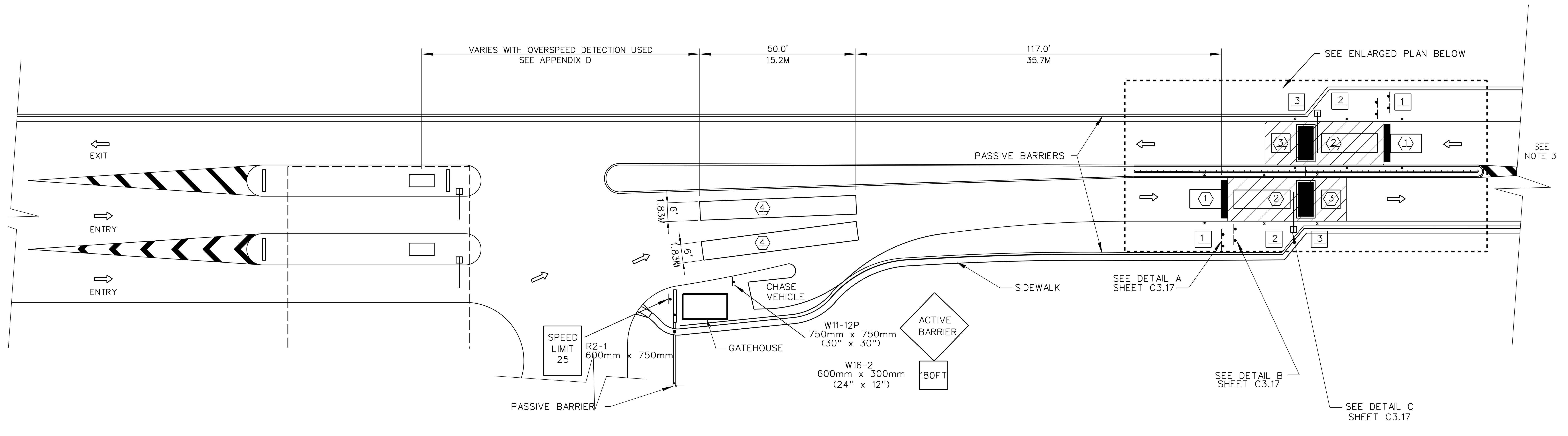
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

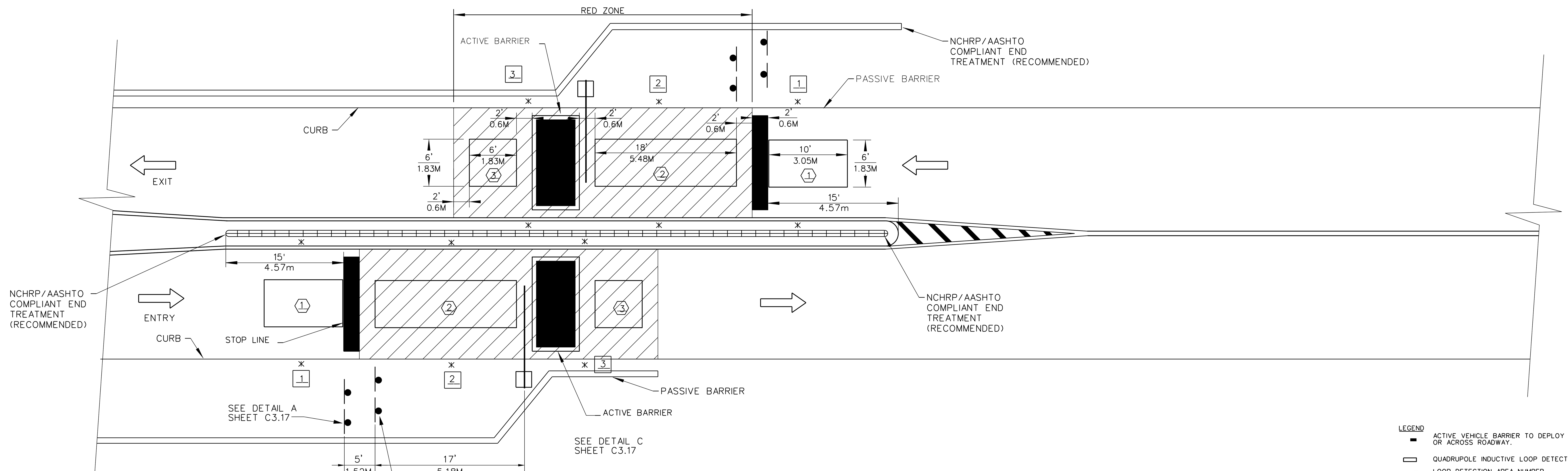
PROTECTIVE SYSTEMS
VEHICLE PRESENCE DETECTION
4-LANE DIVIDED PLAN

SHEET REFERENCE NUMBER
C3.18

SHEET 21 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## ENLARGED PLAN

NOT TO SCALE

NOTES:

1. SEE DWGS. C9.02 AND C9.03 FOR DETAILS OF THE PASSIVE AND ACTIVE VEHICLE BARRIER INTERFACES. SEE DWG. C9.13 FOR SIGN DETAILS AND TYPICAL LAYOUT. SEE DWG. C9.14 FOR PAVEMENT MARKING DETAILS.
2. LOOP DETECTORS SHALL NOT BE INSTALLED ACROSS THE TRANSITION IN PAVING MATERIALS WITHOUT APPROPRIATE PROTECTION (AS DETERMINED BY PROJECT ENGINEER)
3. SEE SHEET C3.17 FOR DETAILS OF OUTBOUND QUEUE DETECTION IF REQUIRED.

LEGEND

- ACTIVE VEHICLE BARRIER TO DEPLOY UP FROM LANE OR ACROSS ROADWAY.
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- BEAM DETECTION AREA NUMBER
- POST MOUNTED SIGN ON SHOULDER, LANE ISLAND, OR IN MEDIAN.
- TRAFFIC GATE ARM.
- * ELECTRONIC BEAM LANE SENSORS.
- RED ZONE.
- 3 INDUCTION LOOP SENSOR
- 2 BROOK BEAM SENSOR

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

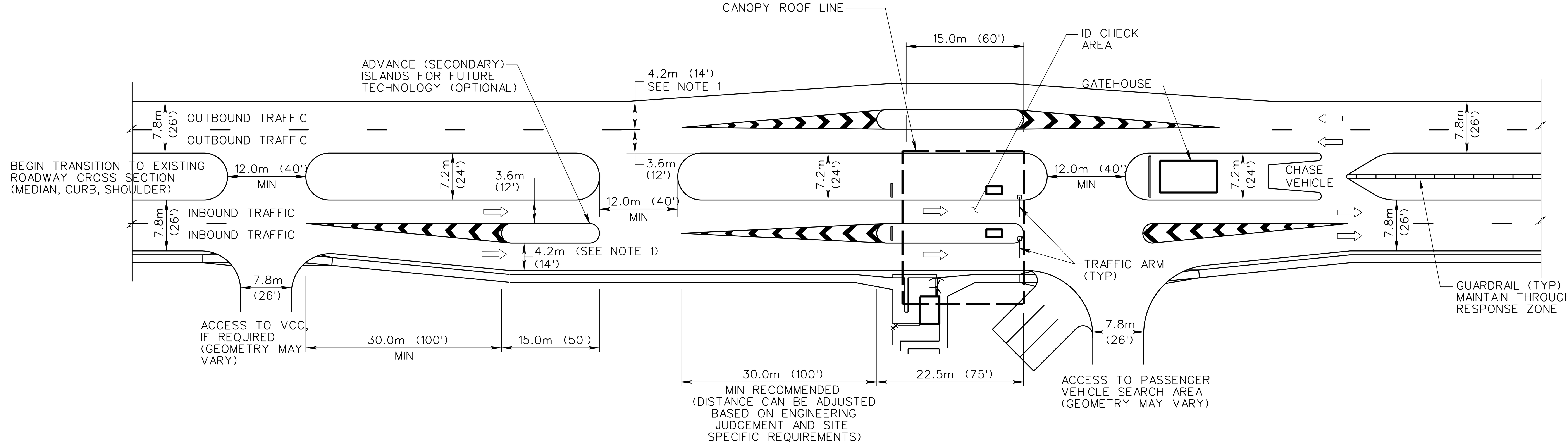
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

PROTECTIVE SYSTEMS
VEHICLE PRESENCE DETECTION 2-LANE PLAN

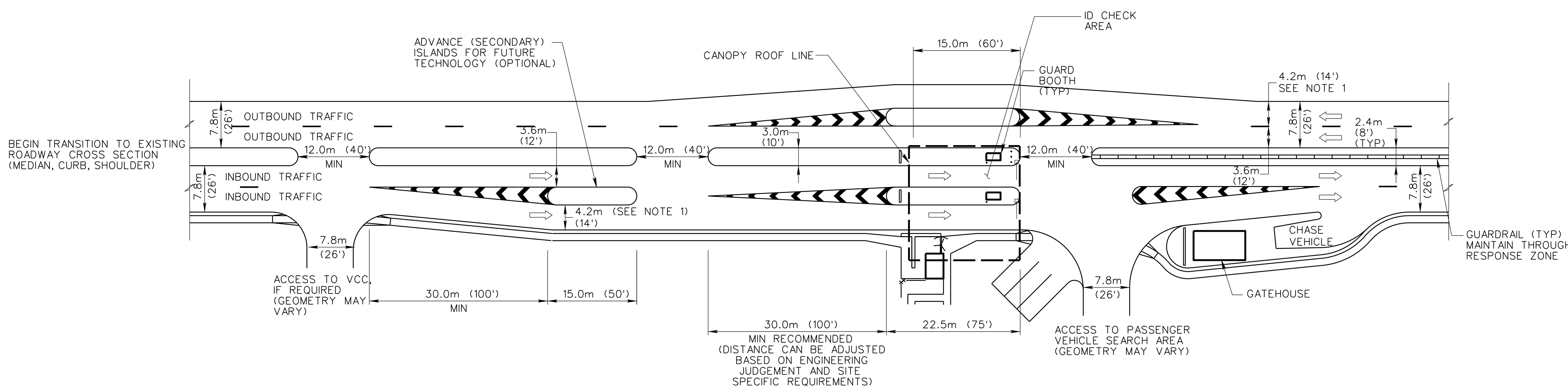
SHEET REFERENCE NUMBER
C3.19



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## ACCESS CONTROL ZONE - MEDIAN GATEHOUSE LANE DETAILS




## ACCESS CONTROL ZONE - RIGHT SHOULDER GATEHOUSE LANE DETAILS

NOTES:

1. LANE SHOULD BE 3.6m (12') WIDE, PLUS 0.6m (2') FOR CURB & GUTTER. PROVIDE 5.1m (17') TO ACCOMMODATE BICYCLE ACTIVITY IF APPROPRIATE.

0 5 10 20 m

SCALE: 1:400

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007 | DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | PLOT SCALE: 1:1 | CATEGORY CODE: X | SIZE: ANSI D | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
ACCESS CONTROL ZONE DETAILS

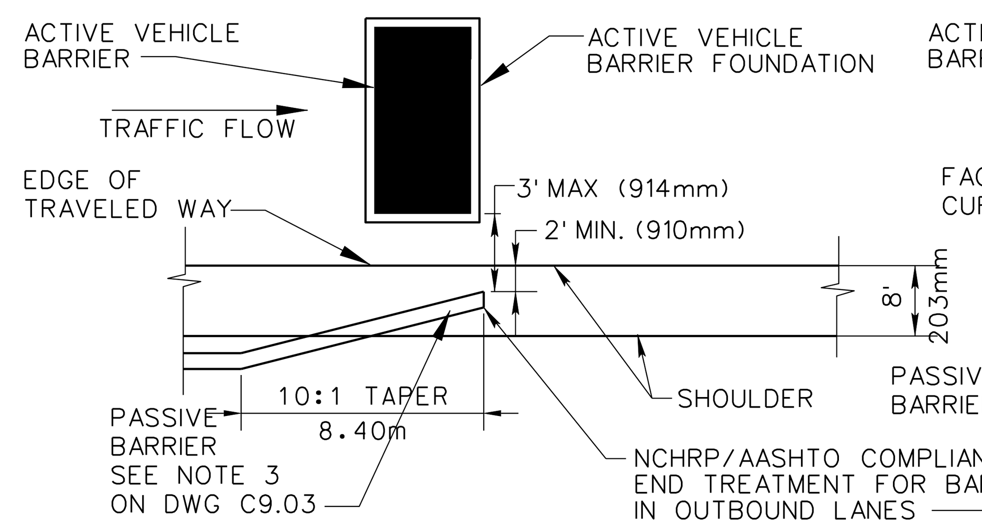
SHEET REFERENCE NUMBER
C9.01



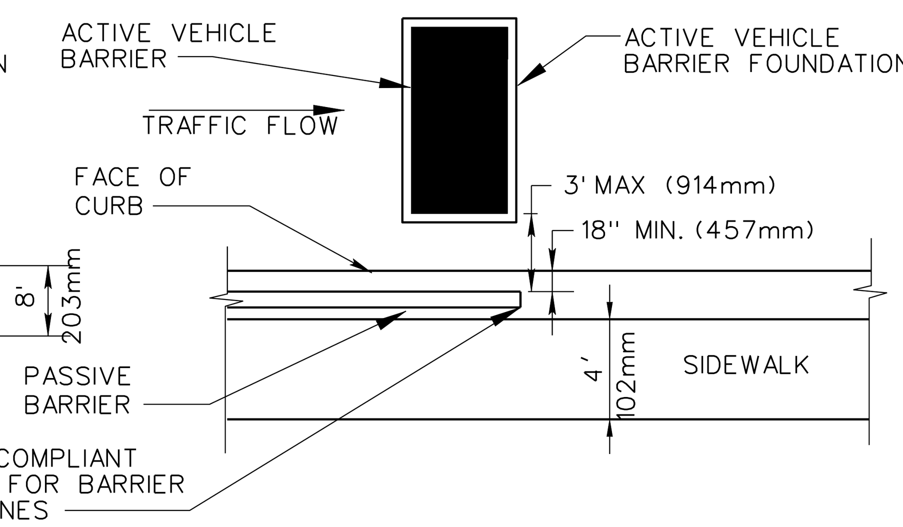
$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

1 2 3 4 5

D C B A



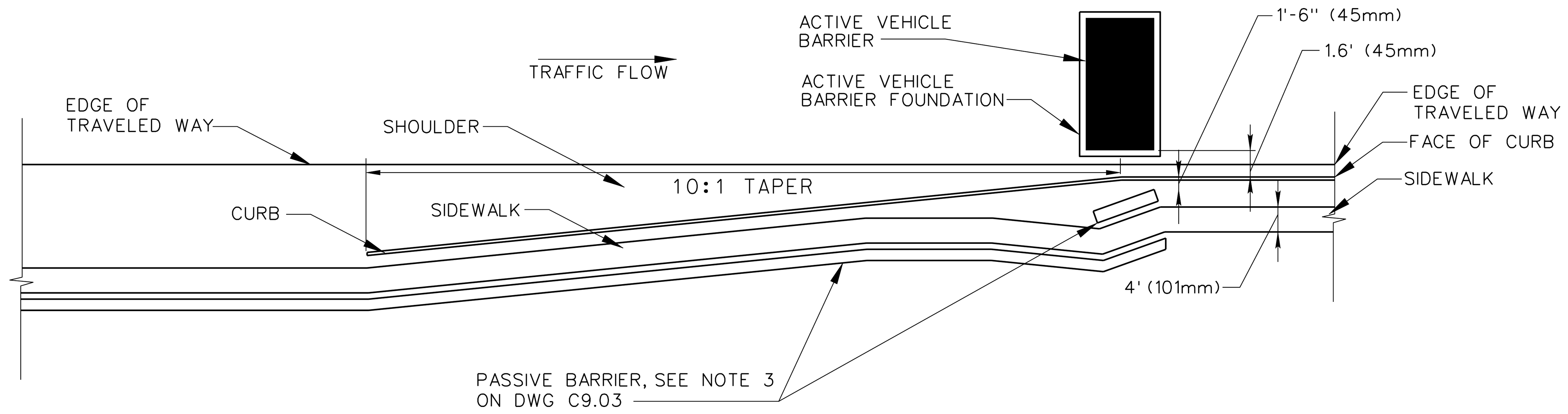

ACTIVE VEHICLE BARRIER IN A SHOULDERED ROADWAY SECTION




ACTIVE VEHICLE BARRIER IN A CURBED ROADWAY SECTION

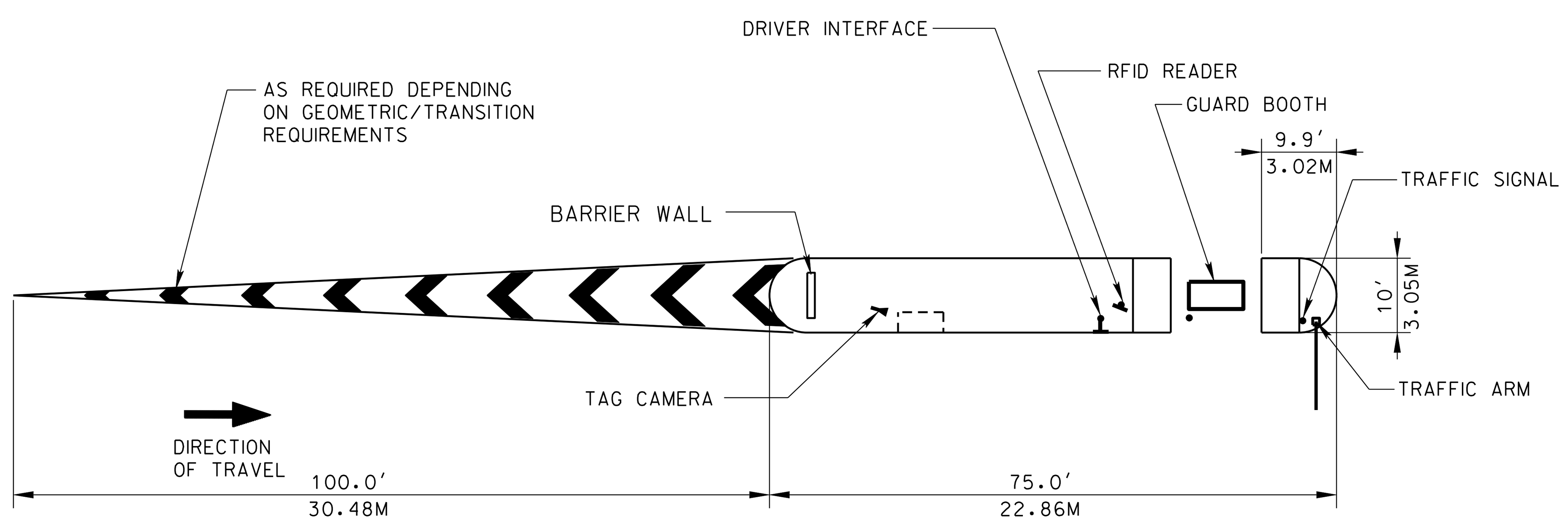
ACTIVE VEHICLE BARRIER/PASSIVE BARRIER PLANS

NOT TO SCALE




ACTIVE VEHICLE BARRIER IN A SHOULDER TO CURB TRANSITION (WITH SIDEWALK)

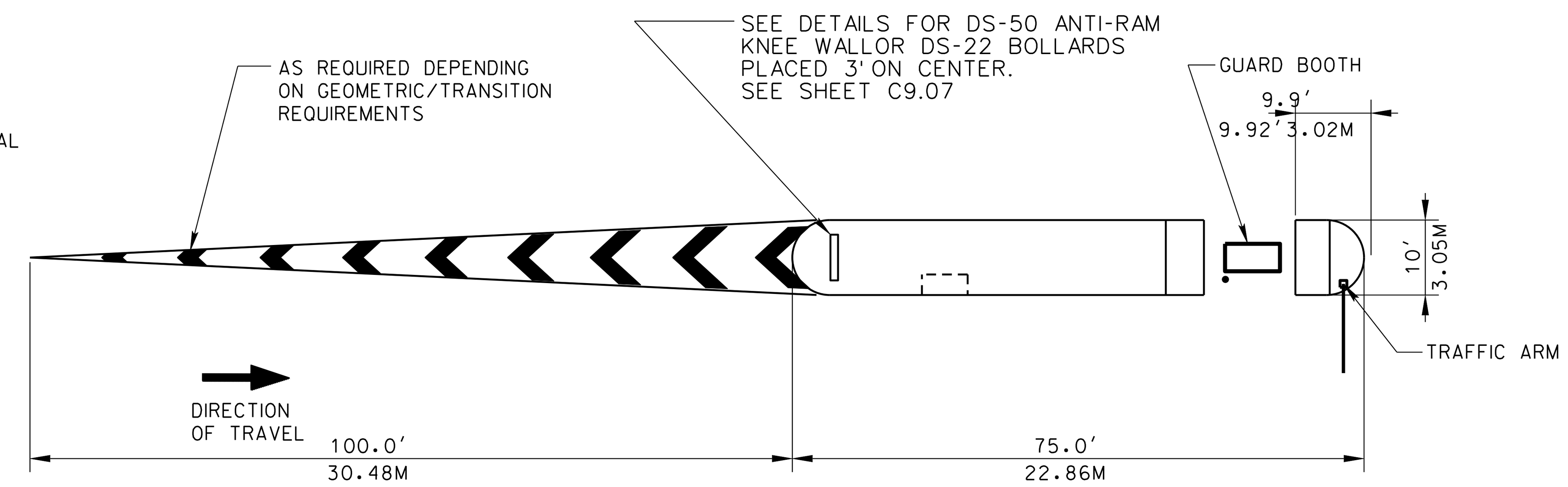
NOT TO SCALE




NOTE: DESIGN MAY VARY TO FIT EXISTING CONDITIONS

TRAFFIC ISLAND WITH AUTOMATION GUARD BOOTH NOT ON ISLAND PLAN

NOT TO SCALE

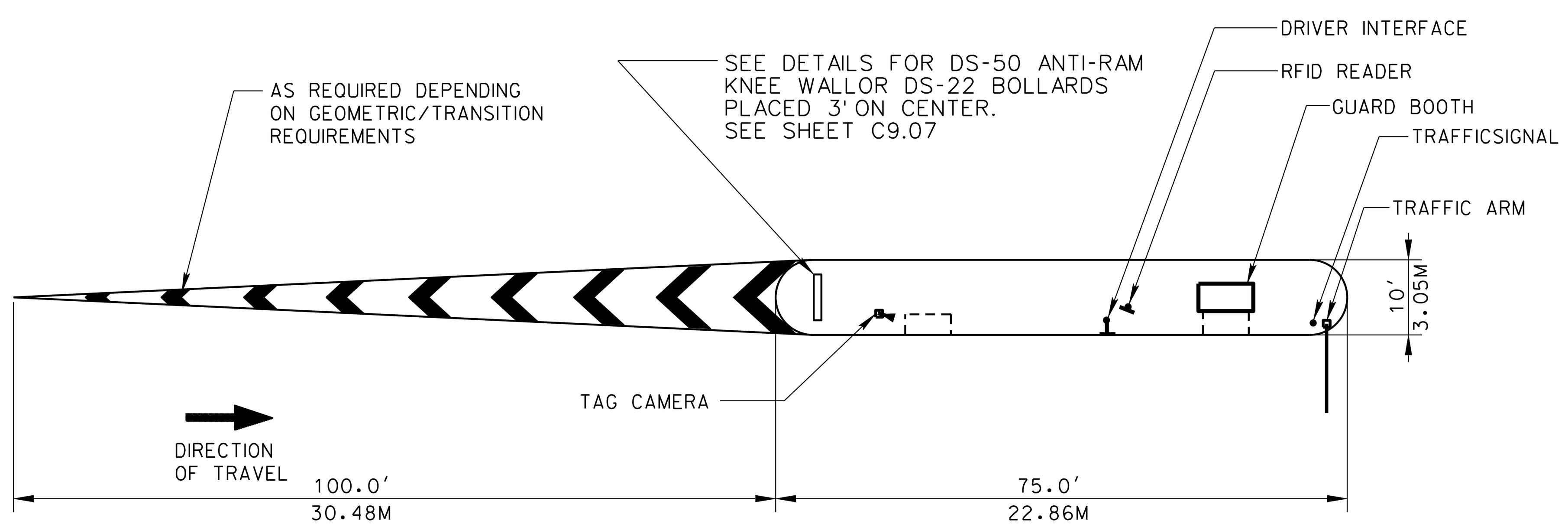



NOTE: DESIGN MAY VARY TO FIT EXISTING CONDITIONS

TRAFFIC ISLAND W/O AUTOMATION GUARD BOOTH NOT ON ISLAND PLAN

NOT TO SCALE

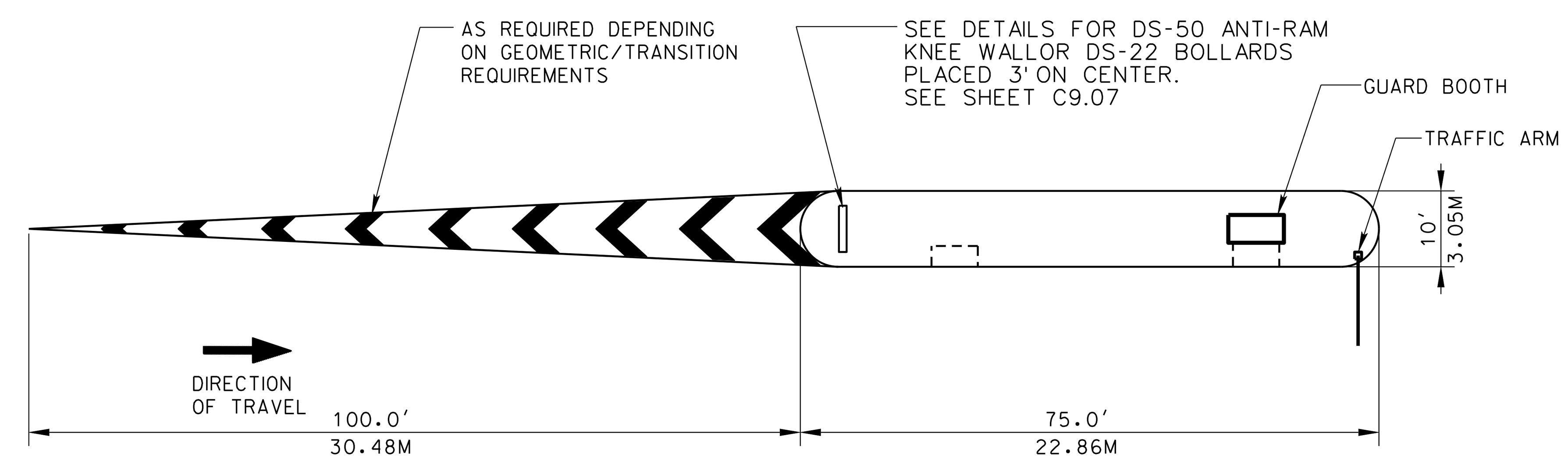
NOTE:
ALL TRAFFIC ISLANDS IN THE ID CHECK AREA SHALL BE A MINIMUM 6" HIGH AND SHALL HAVE VERTICAL FACES.




NOTE: DESIGN MAY VARY TO FIT EXISTING CONDITIONS

TRAFFIC ISLAND W/O AUTOMATION GUARD BOOTH ON ISLAND PLAN

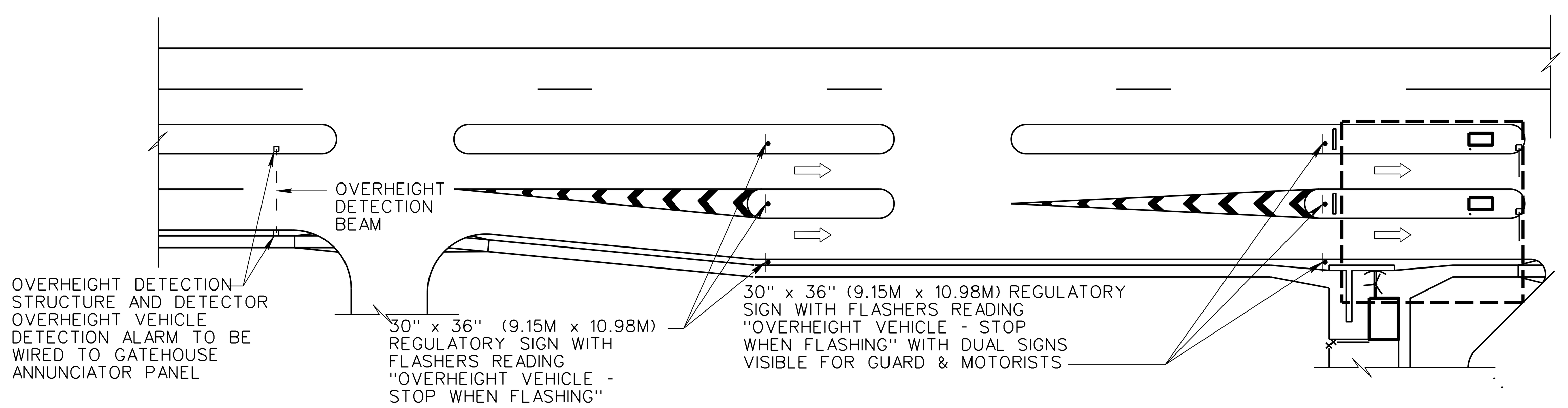
NOT TO SCALE




NOTE: DESIGN MAY VARY TO FIT EXISTING CONDITIONS

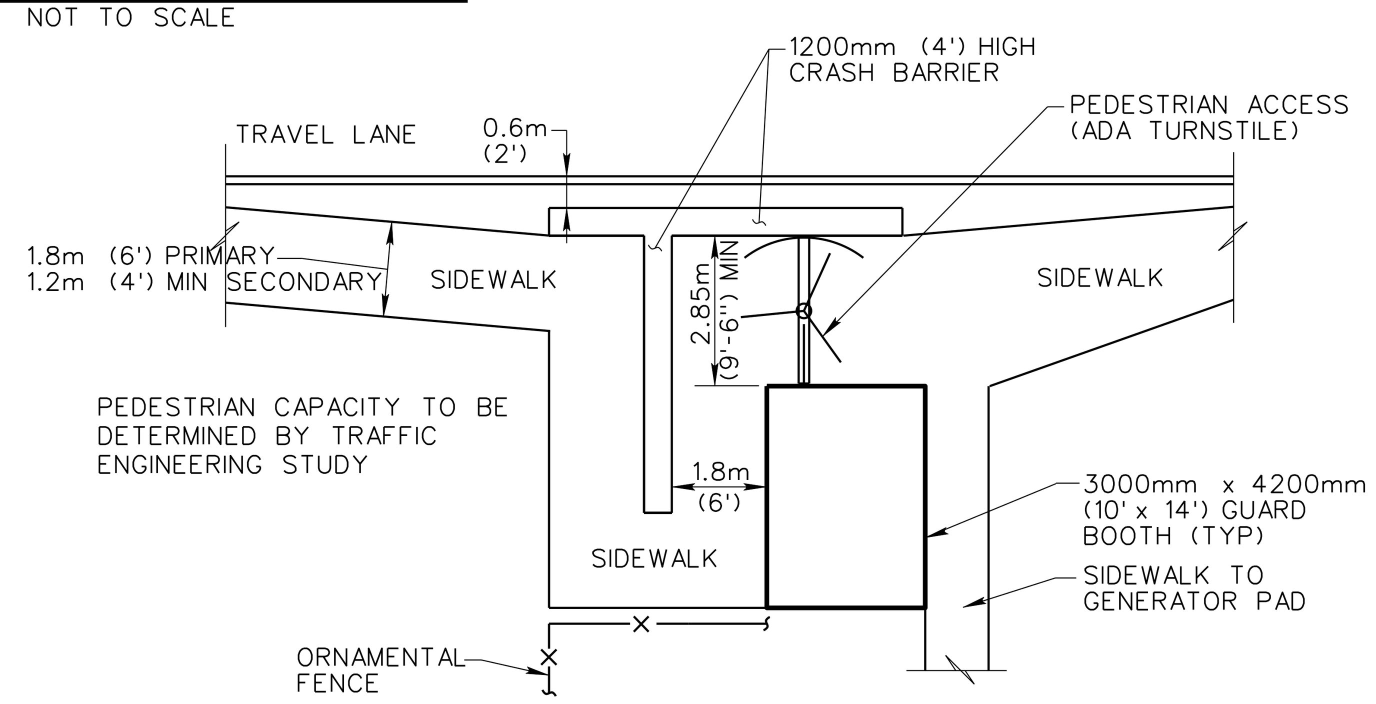
TRAFFIC ISLAND W/O AUTOMATION GUARD BOOTH ON ISLAND PLAN

NOT TO SCALE




OPTIONAL OVERHEIGHT DETECTION

NOT TO SCALE




PEDESTRIAN GUARD BOOTH PLAN

NOT TO SCALE

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128H-07-X-0024
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

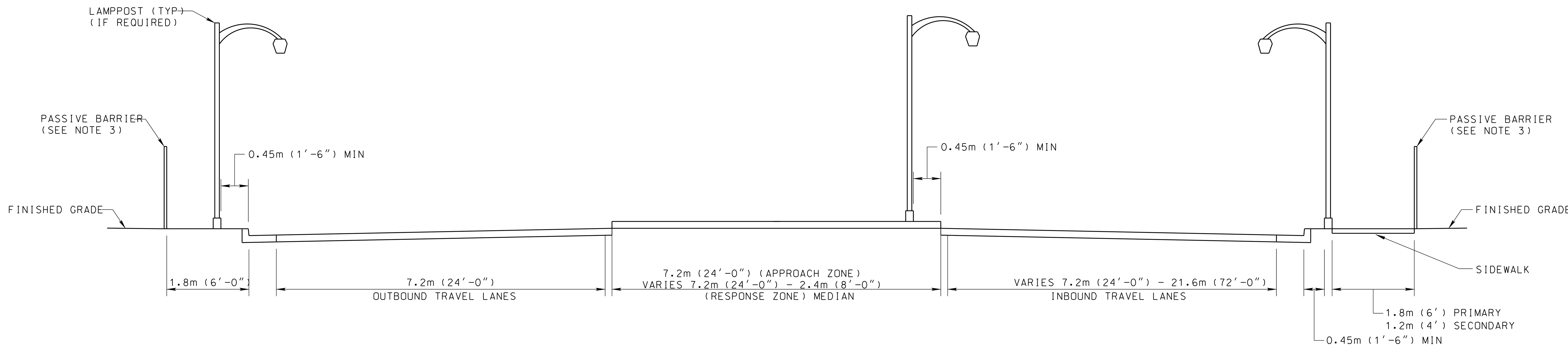
U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN ACP DETAILS

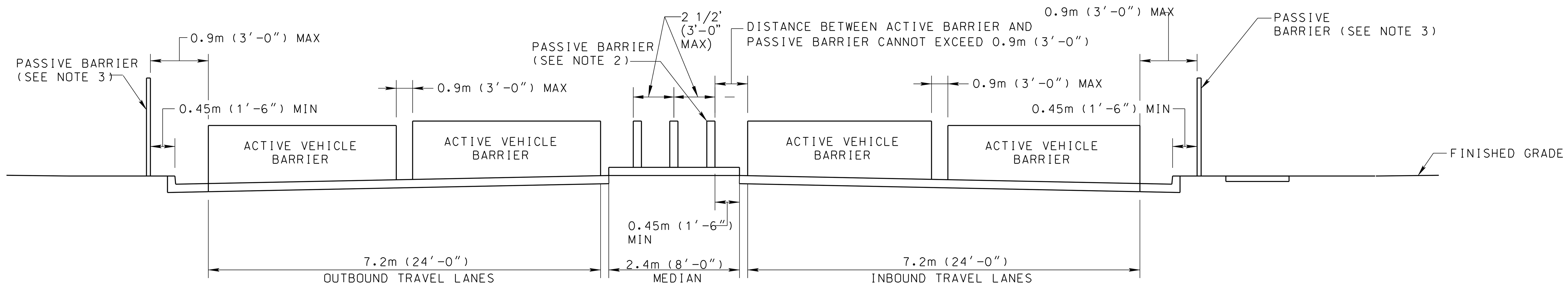
SHEET REFERENCE NUMBER C9.02

SHEET 24 OF 60



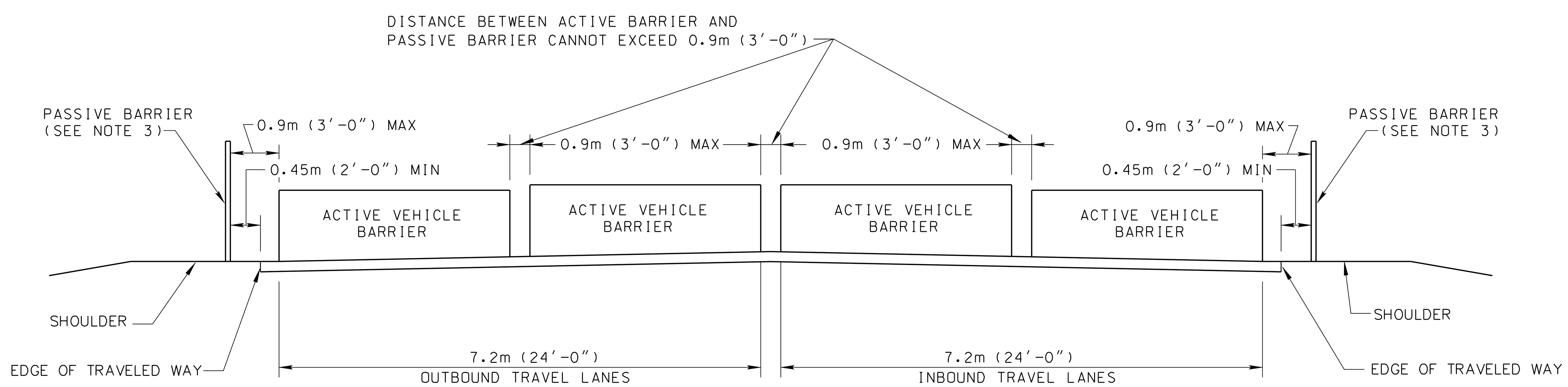

APPROACH AND RESPONSE ZONE TYPICAL SECTION

NOT TO SCALE




ACTIVE VEHICLE BARRIER TYPICAL SECTION

NOT TO SCALE




ACTIVE VEHICLE BARRIER TYPICAL SECTION

SHOULDERED ROADWAY W/O MEDIAN

NOT TO SCALE

NOTES:

1. PROVIDE 1.5m (5') BIKEWAY IF APPROPRIATE.
2. NUMBER OF PASSIVE BARRIERS IS DETERMINED BY WIDTH OF MEDIAN AND DISTANCE BETWEEN PASSIVE BARRIES NOT EXCEEDING 0.9m (3'-0").
3. TYPE AND SIZE OF PASSIVE BARRIERS TO BE DETERMINED IN FINAL DESIGN. PASSIVE BARRIERS MUST PROVIDE VEHICLE PENETRATION RESISTANCE. PASSIVE BARRIERS IN THE CLEAR ZONE MUST BE OF THE TYPI THAT REDIRECT VEHICLES BACK ON THE ROADWAY FOR A SIDE SWIPE IMPACT SEE ASSHTO ROADSIDE DESIGN GUIDE.

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007 | DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W912HN-07-X-0204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | CATEGORY CODE: X | SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

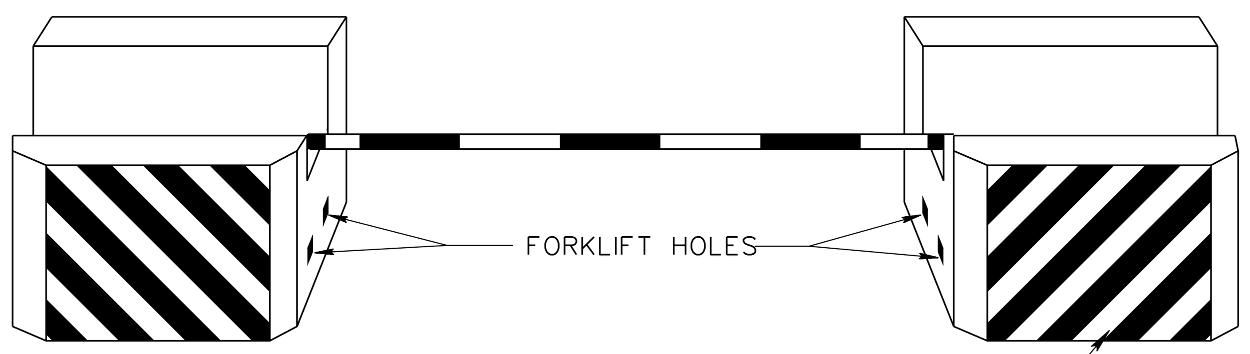
SITE PLAN
TYPICAL SECTIONS

SHEET
REFERENCE
NUMBER
C9.03
SHEET 25 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

1 2 3 4 5

D



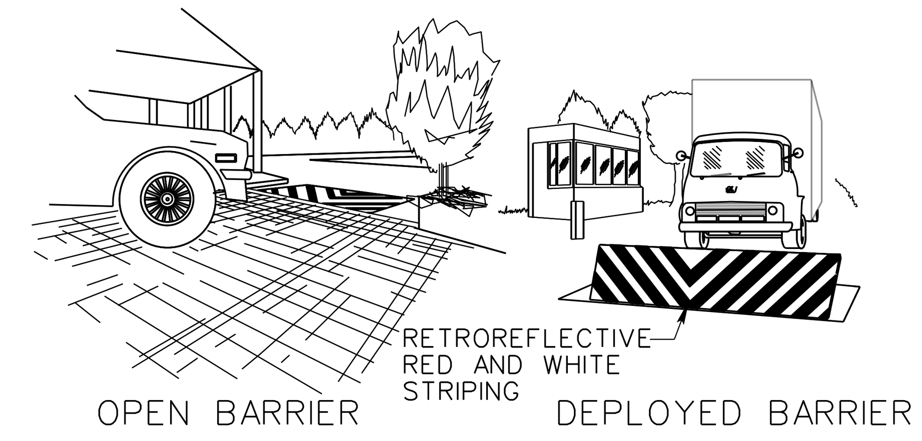

BARRIER RATING: K-4

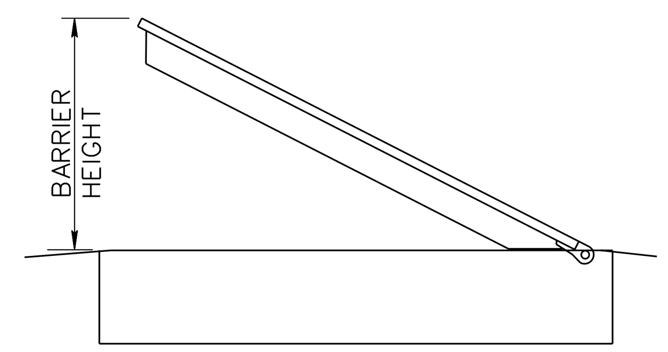
OPERATION: TRANSPORTABLE VEHICLE BARRIER, MANUAL OR HYDRAULIC OPERATION.

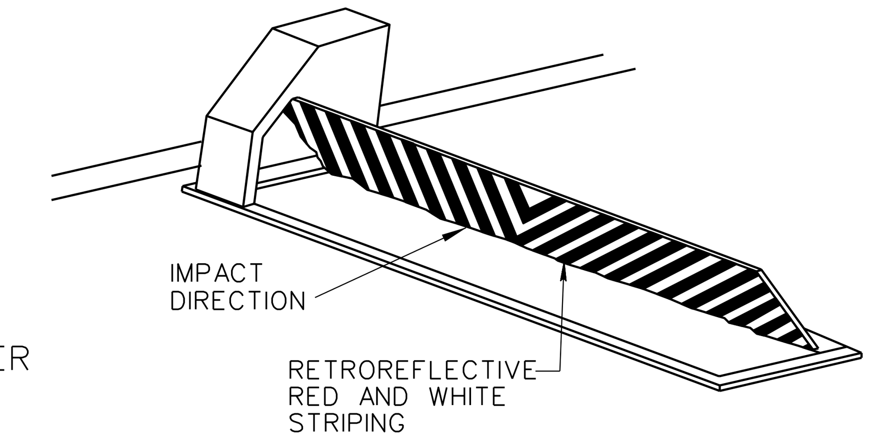
RETROREFLECTIVE RED AND WHITE STRIPING (TYP)

## TRANSPORTABLE ACTIVE VEHICLE BARRIER

NOT TO SCALE

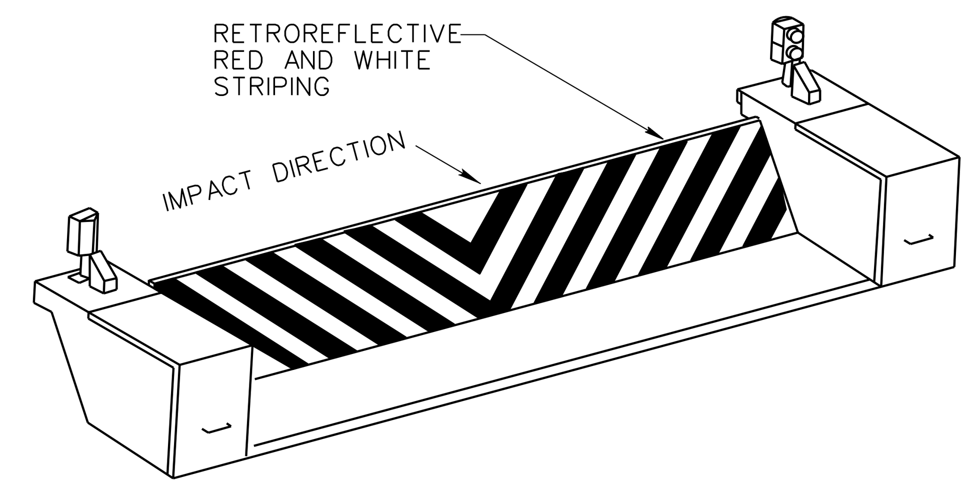



BARRIER RATING: K4, K8, K12

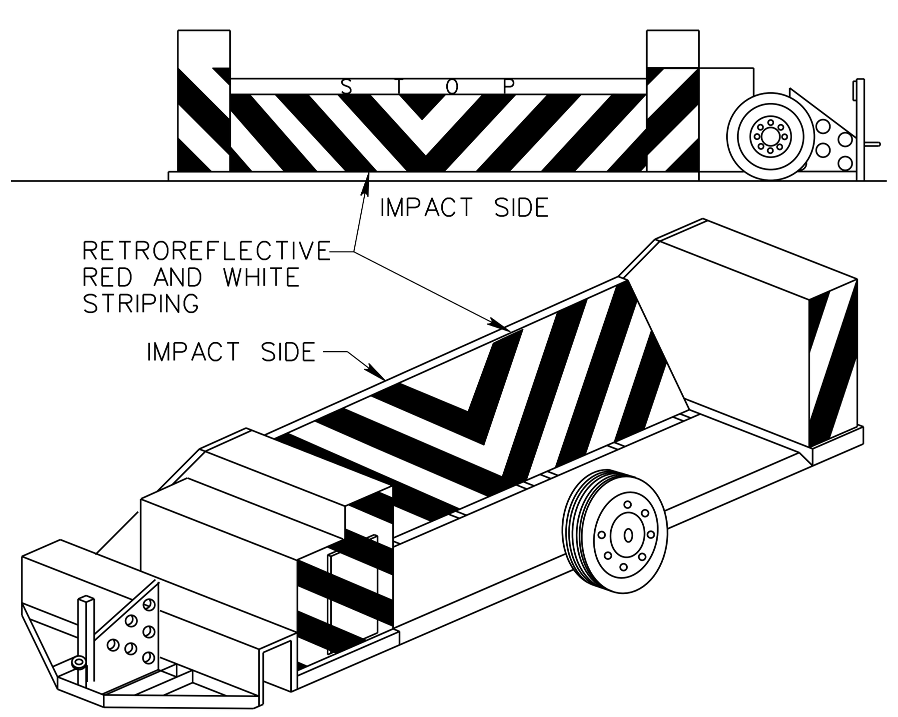
OPERATION: RAMP RISES FROM A RECESS IN THE ROADWAY




## SHALLOW FOUNDATION AND SURFACE MOUNT BARRIERS

NOT TO SCALE

C

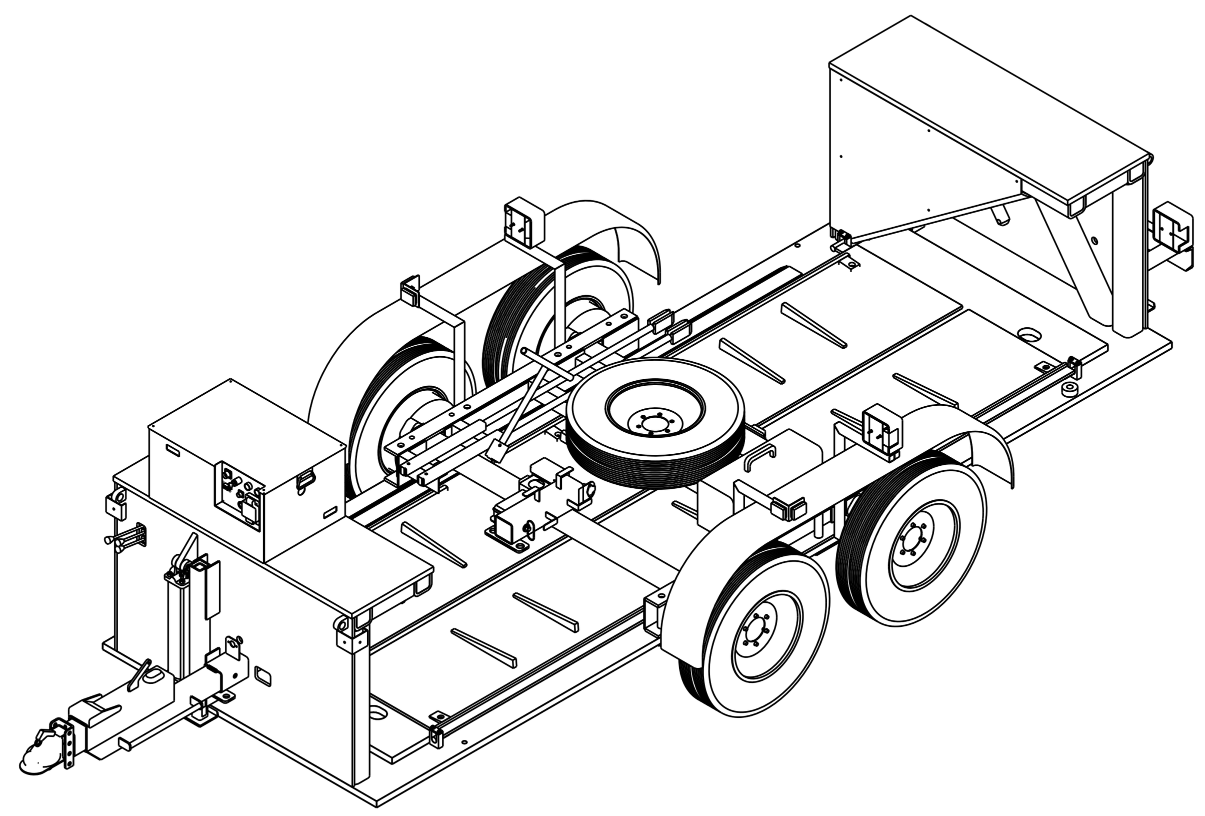



B

BARRIER RATING: CONDITION DESIGNATION K4 & K12

OPERATION: PORTABLE VEHICLE BARRIER, N & D MODELS CAN BE SPECIFIED FOR MANUAL OR HYDRAULIC OPERATION

A



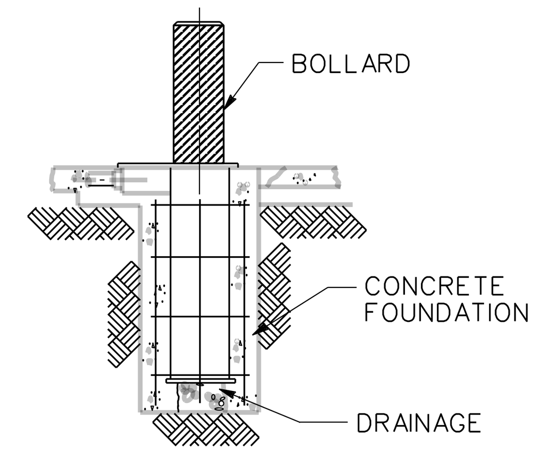
## PORTABLE ACTIVE VEHICLE BARRIERS

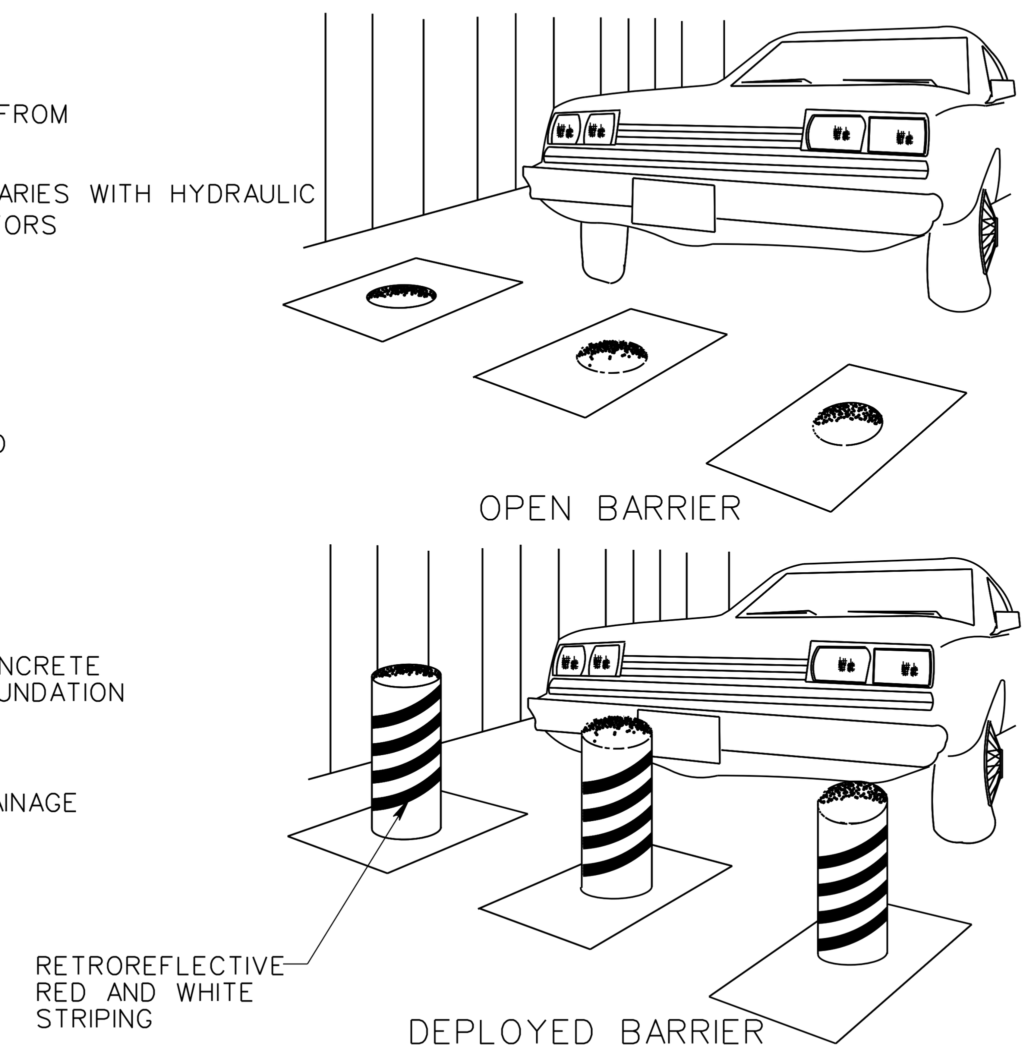
NOT TO SCALE

BARRIER RATING: K4, K8, K12

OPERATION: THE BOLLARDS RISE FROM THE ROADWAY

COMMENT: DEPLOYMENT SPEED VARIES WITH HYDRAULIC OR PNEUMATIC OPERATORS




## BOLLARDS

NOT TO SCALE

REFERENCE MATERIAL:

DEPARTMENT OF STATE AND DEPARTMENT OF DEFENSE LIST OF CERTIFIED ANTI-RAM VEHICLE BARRIERS (https://pdc.usace.army.mil/library/BarrierCertification/)

UFC 4-020-01/UFC 4-020-02 SECURITY ENGINEERING PLANNING AND DESIGN MANUALS

UFC 4-022-01 ENTRY CONTROL FACILITIES/ACCESS CONTROL POINTS

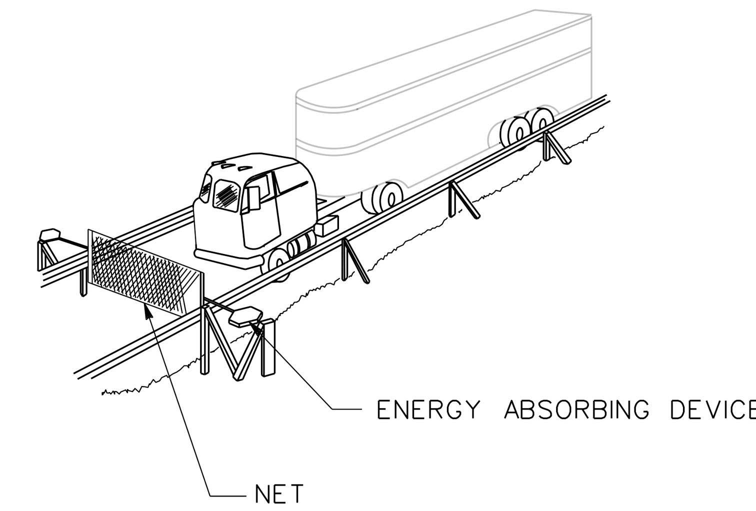
UFGS 34-71-13-19 ACTIVE BARRIERS SPECIFICATIONS

UFGS 34-41-26.00 10 2 ACCESS CONTROL POINT CONTROL SYSTEM.

AMERICAN SOCIETY OF TESTING MATERIALS (ASTM) F2656-07 STANDARD TEST METHOD FOR VEHICLE CRASH TESTING OF PERIMETER BARRIERS.

ACTIVE VEHICLE BARRIERS:

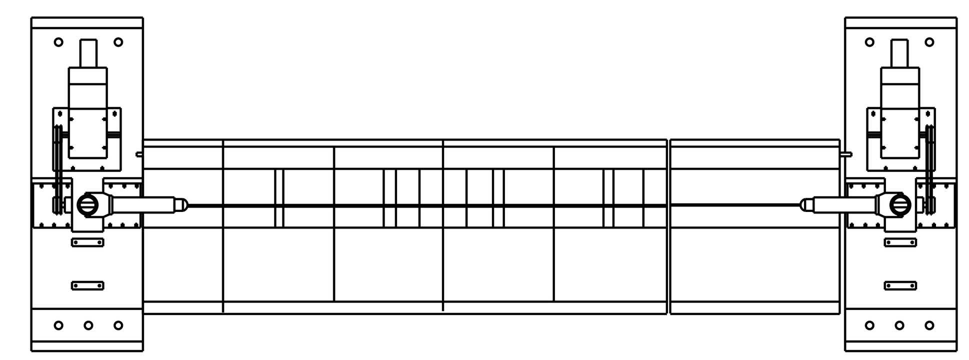
CAUTION: THE FORCE OF IMPACT CONDITIONS BASED ON A RANGE OF ANY VEHICLE RAMMING THESE BARRIERS AT SPEEDS ABOVE 20 MPH MAY BE LETHAL TO THE OCCUPANTS OF THAT VEHICLE. CERTAIN CIRCUMSTANCES MAY RESULT IN FATALITIES AT SPEEDS SIGNIFICANTLY LOWER THAT 20 MPH. THEREFORE, EXTREME CAUTION MUST BE EXERCISED TO ENSURE THAT THEY ARE NOT ACTIVATED AT THE WRONG TIME.

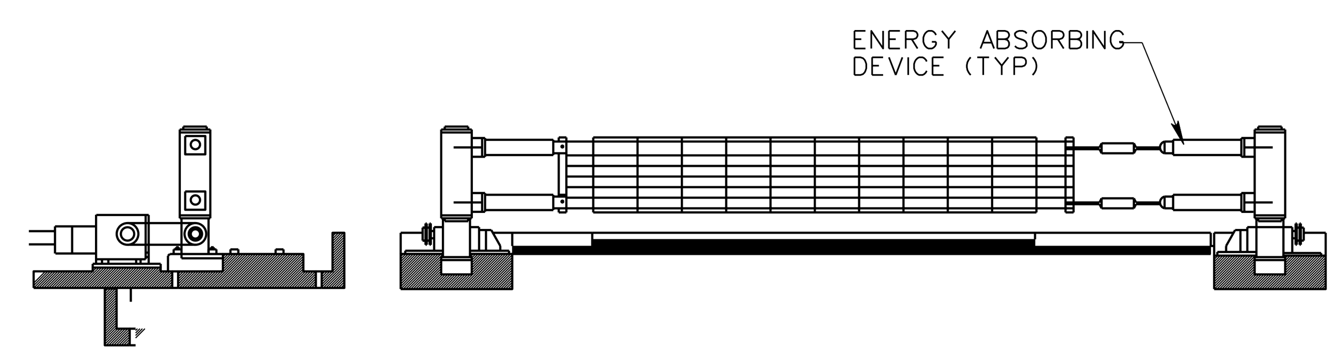



BARRIER RATING: K8, K12

OPERATION: ENERGY OF RAMMING VEHICLE IS ABSORBED BY A NET OR CABLE SYSTEM.

COMMENT: BRINGS VEHICLE TO A STOP IN A SHORT DISTANCE.






## NET BARRIERS

NOT TO SCALE

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

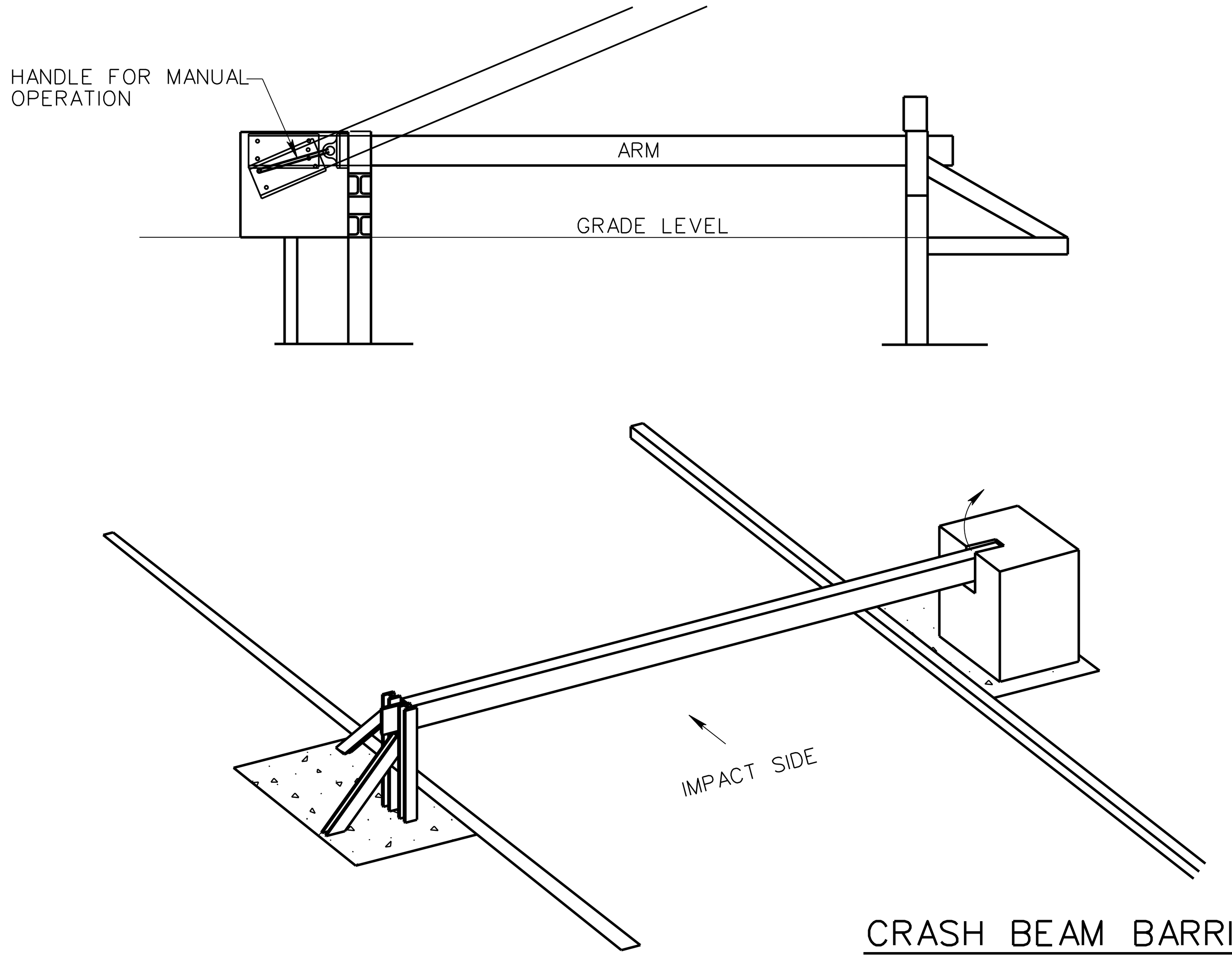
DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

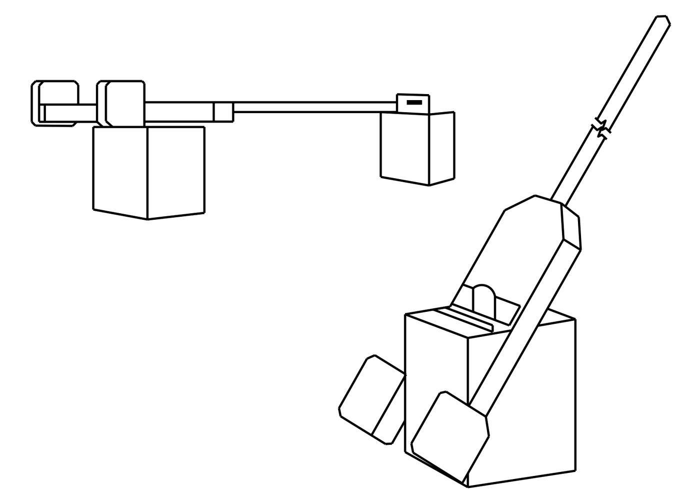
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

BARRIERS
ACTIVE VEHICLE BARRIERS

SHEET REFERENCE NUMBER
C9.04
SHEET 26 OF 60



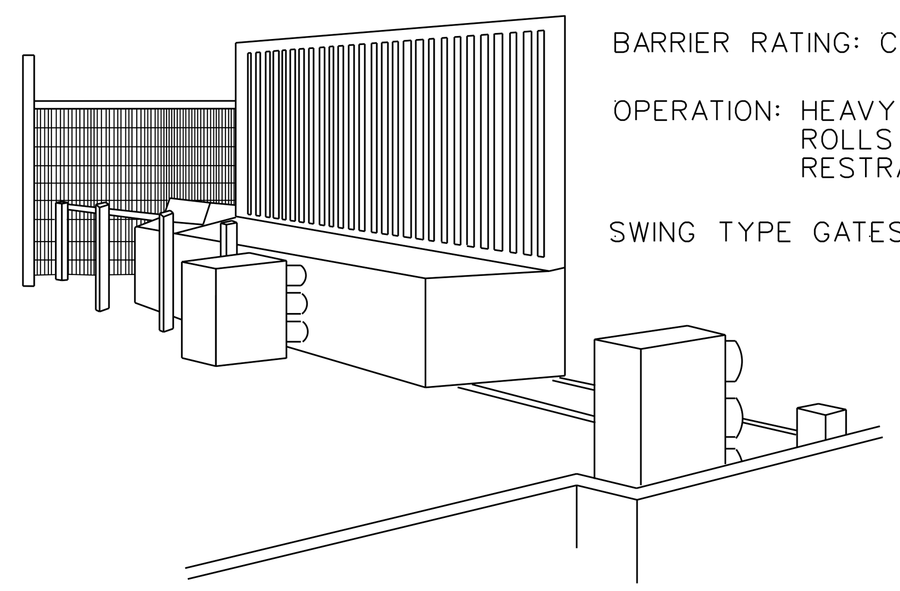



BARRIER RATING: K4, K8, K12

OPERATION: MANUAL RAISING AND LOWERING
(OPTION FOR HYDRAULIC OR ELECTRICAL OPERATION)

## CRASH BEAM BARRIERS

NOT TO SCALE



BARRIER RATING: CONDITION DESIGNATION K4, K8, K12

OPERATION: HEAVY RAILING SECTION
ROLLS HORIZONTALLY INTO PLACE TO BE
RESTRAINED BY HEAVY STANDARDS.

SWING TYPE GATES ARE ALSO AVAILABLE

## ANTI-CRASH GATE

NOT TO SCALE

Notes:

1. IMPACT KINETIC ENERGY
   Impact kinetic energy in Ft-Lbs = KE = 1/2 * Mass * (Velocity)$^2$
   Where Mass = Weight (Lbs)/32.2 feet/(second)$^2$
   Velocity = Speed (feet/second) * Sin($\theta$)
   $\theta$ = Impact Angle in degrees between the vehicle and barrier
   For the vehicle weight (W) given in Lbs and the vehicle speed (S) given in miles per hour, the kinetic energy in Ft-Lbs is:
   $KE = 0.03344 * W * (S * \sin(\theta))^2$
   For active barriers deployed in the roadway at the end of the ACP corridor, the vehicle impact angle is 90^. For passive barriers along the perimeter of the ACP corridor, the maximum impact angle must be determined by evaluating the vehicle's speed, the roadway alignment, and the clear roadway width. Maximum vehicle impact angles and speeds will vary along ACP corridors with speed management features such as curves and turns. Passive barrier systems must be capable of stopping the threat vehicle anywhere along the ACP corridor. See Draft UFC 4-022-02 "Selection and Application of Vehicle Barriers" and Appendix D for information on determining impact angles.

2. Examples of both active and passive barriers are shown on these drawings. Some of the examples show actual barriers supplied by barrier manufacturers. For additional information on any barrier shown or other barriers not shown, contact the Protective Design Center at the USACE, Omaha District.

## BARRIER SELECTION

THESE STANDARD DRAWINGS SHOW ACTIVE AND PASSIVE BARRIERS. THE SELECTION OF BARRIER TYPE IS LEFT TO LOCAL SECURITY PLANNERS. BASE SELECTION ON THE DEFINED THREAT, THE TERRAIN ENCOUNTERED, THE SPEED OF DEPLOYMENT, AND THE INITIAL COST OF THE BARRIERS. ALSO CONSIDER FACTORS SUCH AS ANNUAL MAINTENANCE COST, REPLACEMENT OR REPAIR COST SHOULD THE BARRIER EVER BE USED, AND THE SAFETY OF INNOCENT PERSONS WHO COULD POTENTIALLY BE CAUGHT IN THE BARRIER WHEN IT IS DEPLOYED.

## STATE DEPARTMENT RATING

K4 = 15,000 POUND VEHICLE TRAVELING AT 48 KPH (30 MPH)

K8 = 15,000 POUND VEHICLE TRAVELING AT 64 KPH (40MPH)

K12 = 15,000 POUND VEHICLE TRAVELING AT 80 KPH (50 MPH)

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
| --- | --- | --- | --- |

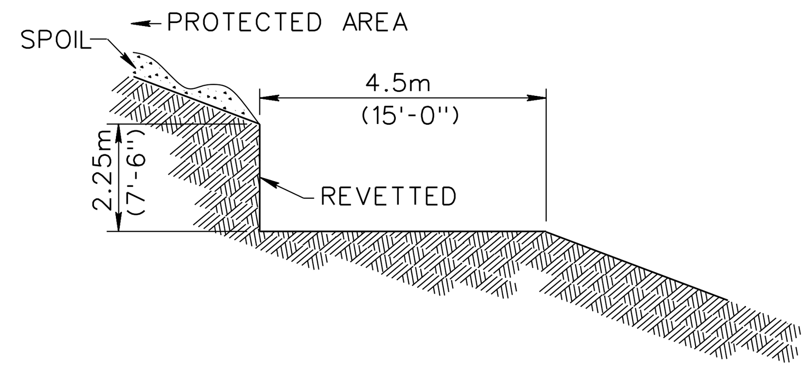
| | |
| --- | --- |
| DESIGNED BY: X.X.X. | DATE: NOV 2007 |
| DWN BY: X.X.X. | CKD BY: X.X.X. |
| SOLICITATION NO.: W912HN-07-X-6204 | |
| SUBMITTED BY: X | CONTRACT NO.: X |
| FILE NAME: X | CATEGORY CODE: X |
| SIZE: ANSI D | PLOT SCALE: 1 : 1 |
| PLOT DATE: . | |

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

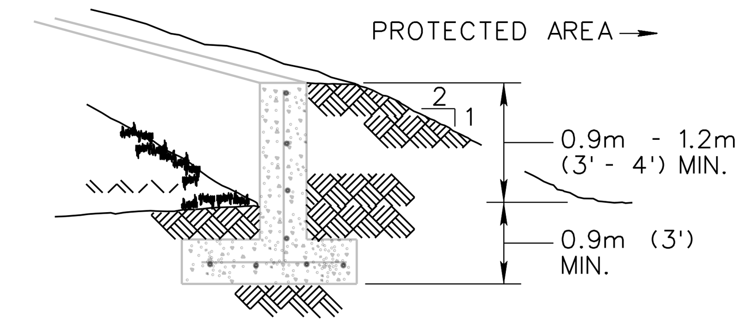
BARRIERS
ACTIVE VEHICLE BARRIERS

SHEET
REFERENCE
NUMBER
C9.05
SHEET 27 OF 60




DESCRIPTION: THE SIDEHILL CUT DITCH IS A VARIATION OF THE TRIANGULAR DITCH ADAPTED TO HILLY LOCATIONS. THESE DITCHES ARE RELATIVELY EASY TO CONSTRUCT; HOWEVER, A VEHICLE STOPPED IN THE DITCH CAN BACK OUT AND TRY ANOTHER ROUTE. SIDEHILL CUT DITCHES ARE USUALLY APPROXIMATELY 2.25m (7.5') DEEP AND 4.5m (15') WIDE, BUT THESE DIMENSIONS CAN BE VARIED TO MAKE THE BEST USE OF THE NATURAL TERRAIN.

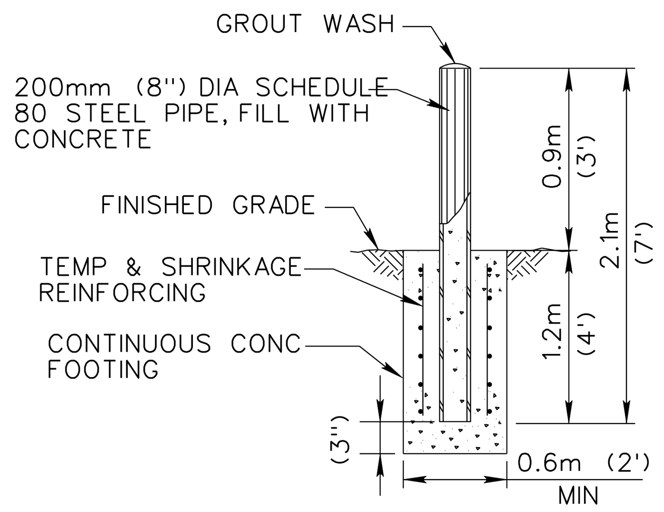
## SIDEHILL CUT DITCH
NOT TO SCALE




BARRIER RATING: NOT TESTED

CONSTRUCTION: CONCRETE RETAINING WALL BACKED UP WITH EARTH BERM, WALL FACES THREAT.

## BERM @ RETAINING WALL
NOT TO SCALE

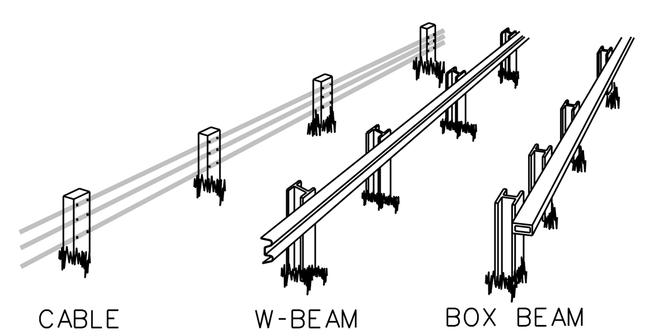


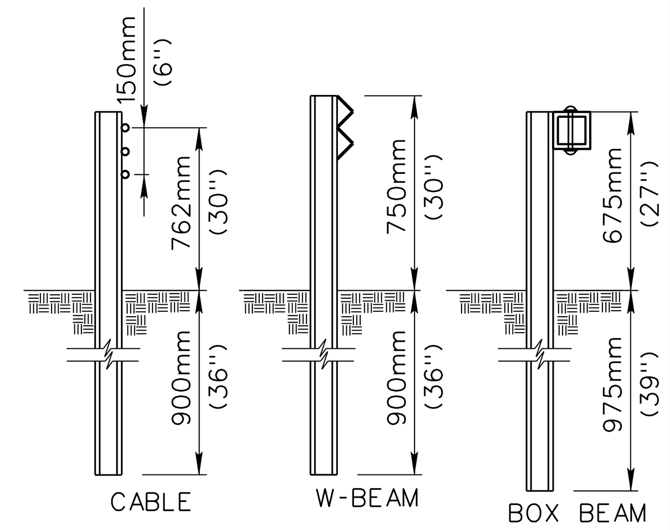

NOTE: KINETIC ENERGY RATING IS DEPENDANT ON BOLLARD SPACING

CONSTRUCTION: 200mm (8") DIA. STEEL PIPE FILLED WITH CONCRETE SET IN CONCRETE FOOTING, LOCATED 0.9m (3') ON CENTER FOR 90 IMPACT AND 1.2m (4') ON CENTER FOR PARALLEL TRAFFIC FLOW. (K.E. RATING OF 135,000 FT. LBS.)

COMMENT: A STEEL CABLE RUNNING THROUGH OR LOOPED OVER THESE POSTS MAY BE USED TO EXCLUDE MOTORCYCLES.

## BOLLARDS
NOT TO SCALE



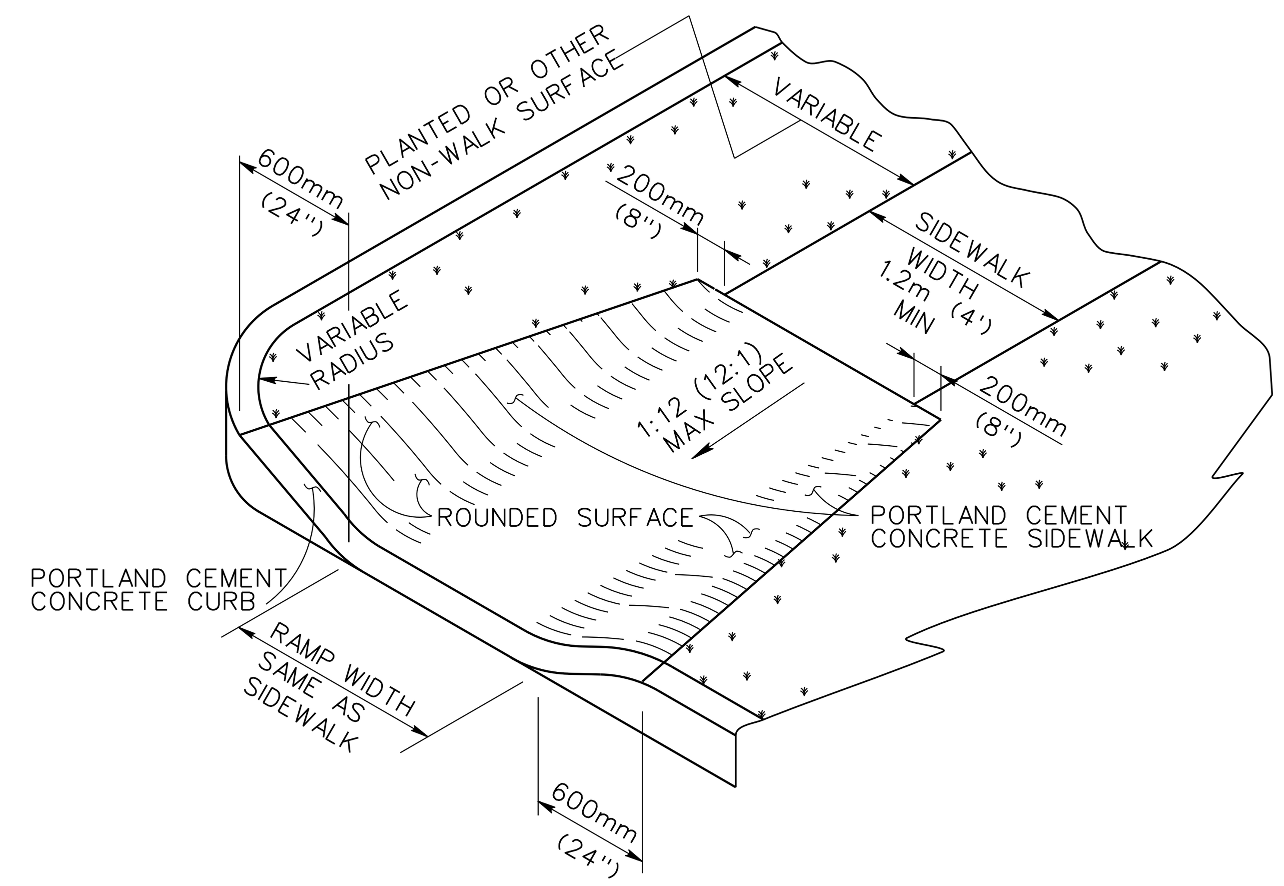




BARRIER RATING: NOT TESTED.

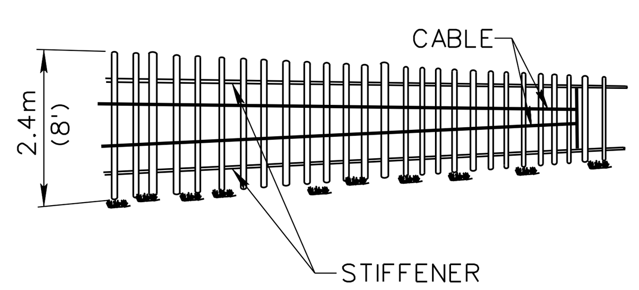
CONSTRUCTION:
CABLE: 3-19mm (3/4") DIA. STEEL CABLES @ 75mm (3") O.C. ON POSTS SET ON 4.8m (16') CENTERS, 762mm (30") HIGH;
W-BEAM: CORRUGATED W BEAM ON POSTS SET ON 3.66m (12') CENTERS, 762mm (30") HIGH;
BOX BEAM: 150X150 (6X6) OR 150X200 (6X8) STEEL TUBE ON POSTS SET 1.2m - 1.8m (4' - 6') APART; 685mm (27") HIGH.

COMMENT: NOT DESIGNED TO PREVENT HEAD-ON PENETRATION. DESIGNED TO DEFLECT IMPACT FROM STRIKING AT 25 DEGREE ANGLE OR LESS FOR CARS AND 15 DEGREE ANGLE OR LESS FOR SINGLE UNIT TRUCKS.

## GUARDRAILS
NOT TO SCALE



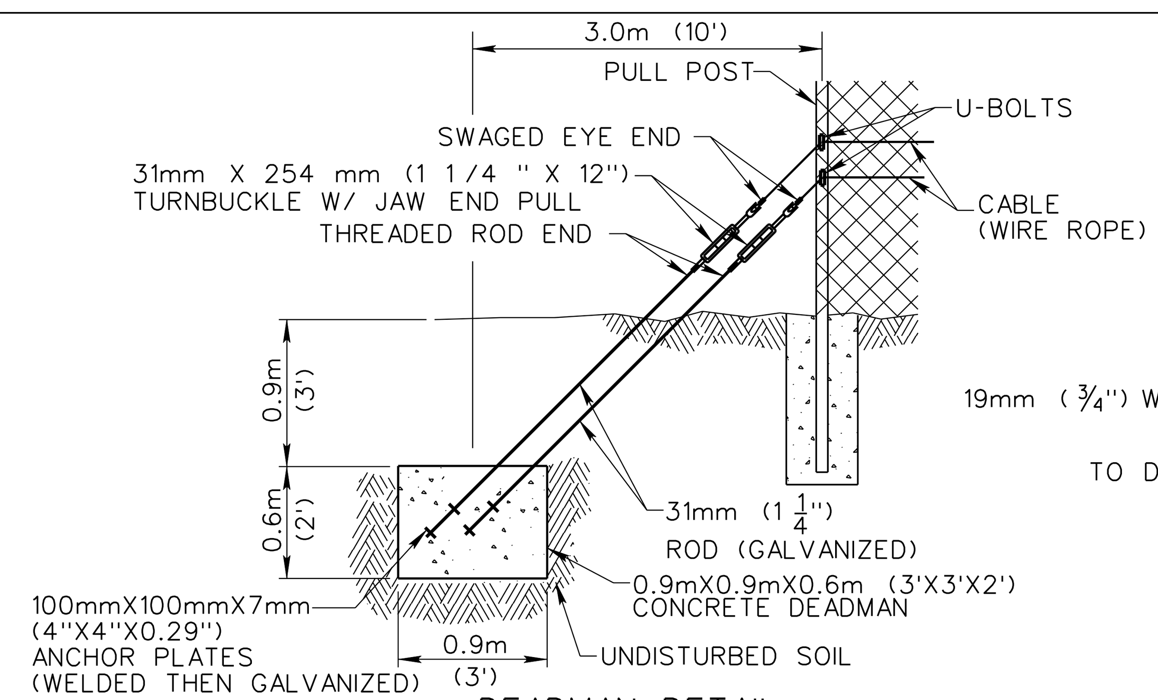

## CURB RAMP DETAIL
NOT TO SCALE



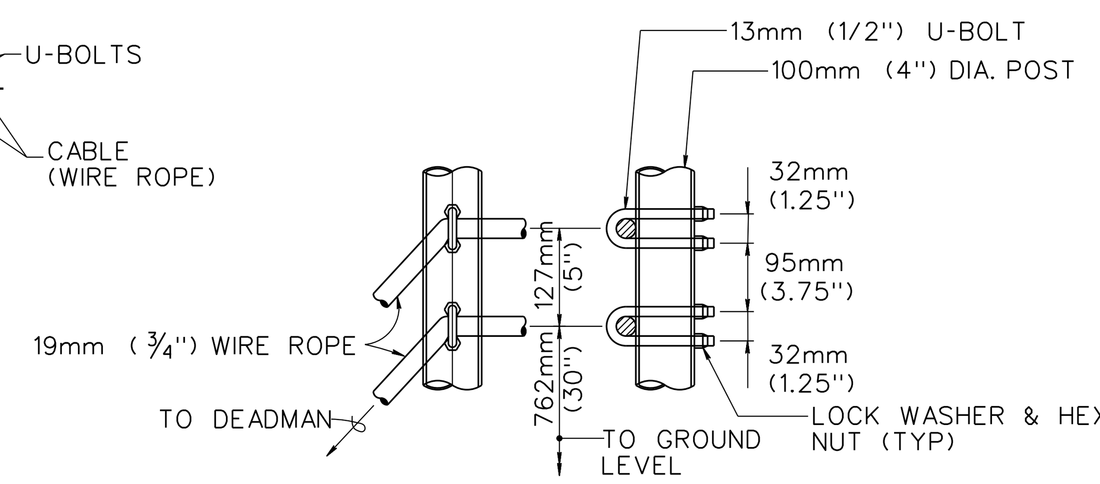

BARRIER RATING: K8, K12

CONSTRUCTION: IMPROVED STEEL FENCE.

## REINFORCED ORNAMENTAL FENCE
NOT TO SCALE




### DEADMAN DETAIL
NOT TO SCALE




### U-BOLT AT CABLE PULL POST DETAIL
NOT TO SCALE

BARRIER RATING: LESS THAN K4

COMMENT: MINIMUM DEADMAN SPACING OF 60.0m (200')

## REINFORCED CHAIN-LINK SECURITY FENCE
NOT TO SCALE

COMMENT: SEE STD 872-90-19 FOR ADDITIONAL DETAILS

# PASSIVE BARRIERS

### VEHICLE BARRIER

A BARRIER IS PASSIVE IF ITS EFFECTIVENESS RELIES ON ITS BULK, MASS, OR POSITION. PASSIVE BARRIERS HAVE NO MOVING PARTS. A BARRIER IS ACTIVE IF IT REQUIRES ACTION BY PERSONNEL OR EQUIPMENT TO PERMIT OR DENY ENTRY. ACTIVE BARRIERS ARE THOSE DEVICES USED TO CONTROL ACCESS THROUGH AN ACP OR ENTRANCE. PASSIVE BARRIERS ARE USED TO CHANNEL THE FLOW OF TRAFFIC TO PREVENT VEHICLES FROM BYPASSING ACCESS POINTS.

### SELECTION OF PASSIVE BARRIERS

THE SELECTION OF A SPECIFIC BARRIER IS LEFT TO THE LOCAL SECURITY PLANNERS. SELECT BARRIERS BASED ON THE THREAT IDENTIFIED, THE TERRAIN ENCOUNTERED, THE VISUAL APPEARANCE DESIRED, AND THE BUDGET FOR THE BARRIERS. ALSO CONSIDER MAINTENANCE COSTS INCLUDING REMOVAL OF PLANT GROWTH, TRASH AND SNOW REMOVAL; REPAIR OR REPLACEMENT COSTS IF THE BARRIER IS BREACHED; EASE OF RELOCATING THE BARRIER; AND THE HAZARD PRESENTED TO INNOCENT PERSONNEL WHO MAY ACCIDENTALLY STRIKE THE BARRIER.

### NOTES

1. APPEARANCE IS OFTEN A MAJOR CONSIDERATION WHEN SELECTING PASSIVE BARRIERS. THE INSTALLATION OF VEHICLE BARRIERS AROUND A SITE WILL NOT PREVENT PENETRATION OF THE SITE BY UNAUTHORIZED PERSONNEL. GIVEN TIME, ANY OF THESE BARRIERS MAY BE PENETRATED. THE BARRIERS DO PREVENT EASY MOBILE ACCESS FROM BOTH OUTSIDE AND INSIDE, DO DELAY BREACHING, AND DO DEMONSTRATE AN ADVERSARY'S INTENT. PLACING BARRIERS NEAR THE OUTSIDE PERIMETER FORCES THE ADVERSARY TO HAND CARRY HIS WEAPON TO HIS TARGET.
2. MOST PASSIVE BARRIERS WILL NOT EXCLUDE PERSONNEL ON FOOT OR ON MOTORCYCLES. THESE BARRIERS SHOULD BE SUPPLEMENTED TO EXCLUDE MOTORCYCLES AND PEDESTRIANS IF THEY ARE IDENTIFIED AS THREATS.
3. IN ADDITION TO THE PROBLEMS OF PLANT GROWTH, WINDBLOWN TRASH, AND SNOW, DETECTION SENSOR LOCATIONS AND VIDEO ASSESSMENT POSITIONS MUST BE CONSIDERED WHEN ADDING PASSIVE BARRIERS TO A SITE. ALSO PASSIVE BARRIERS MAY BE USED BY AN ADVERSARY FOR FIRING POSITIONS OR CONCEALMENT. GROWTH CHARACTERISTICS OF PLANTS USED IN PLANTERS MUST BE CONSIDERED TO AVOID OBSTRUCTING THE GUARD'S VIEWS OF ONCOMING TRAFFIC.

### REFERENCE MATERIAL

1. DEPT. OF STATE, D.O.S., SD-SDT-02.01: SPECIFICATION FOR VEHICLE CRASH TESTING OF PERIMETER BARRIERS AND GATES
2. UFC 4-020-01 SECURITY ENGINEERING: PLANNING MANUAL
3. UFC 4-020-02 SECURITY ENGINEERING: DESIGN MANUAL
4. UFC 4-022-01 ENTRY CONTROL FACILITIES/ACCESS CONTROL POINTS

### RELATED DRAWINGS

STD 872-90-01 STANDARD DETAILS FOR CHAIN-LINK SECURITY FENCES, FARM STYLE FENCES AND A DOUBLE CABLE BARRIER

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

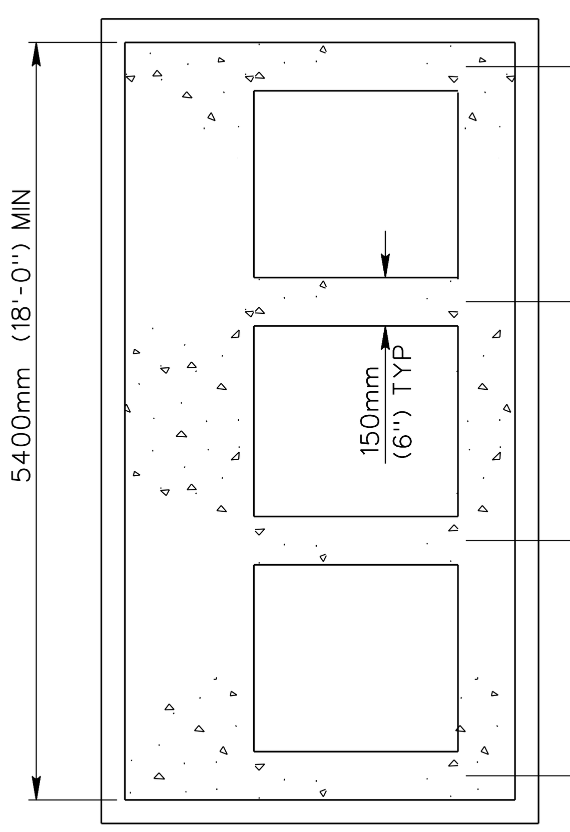
DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

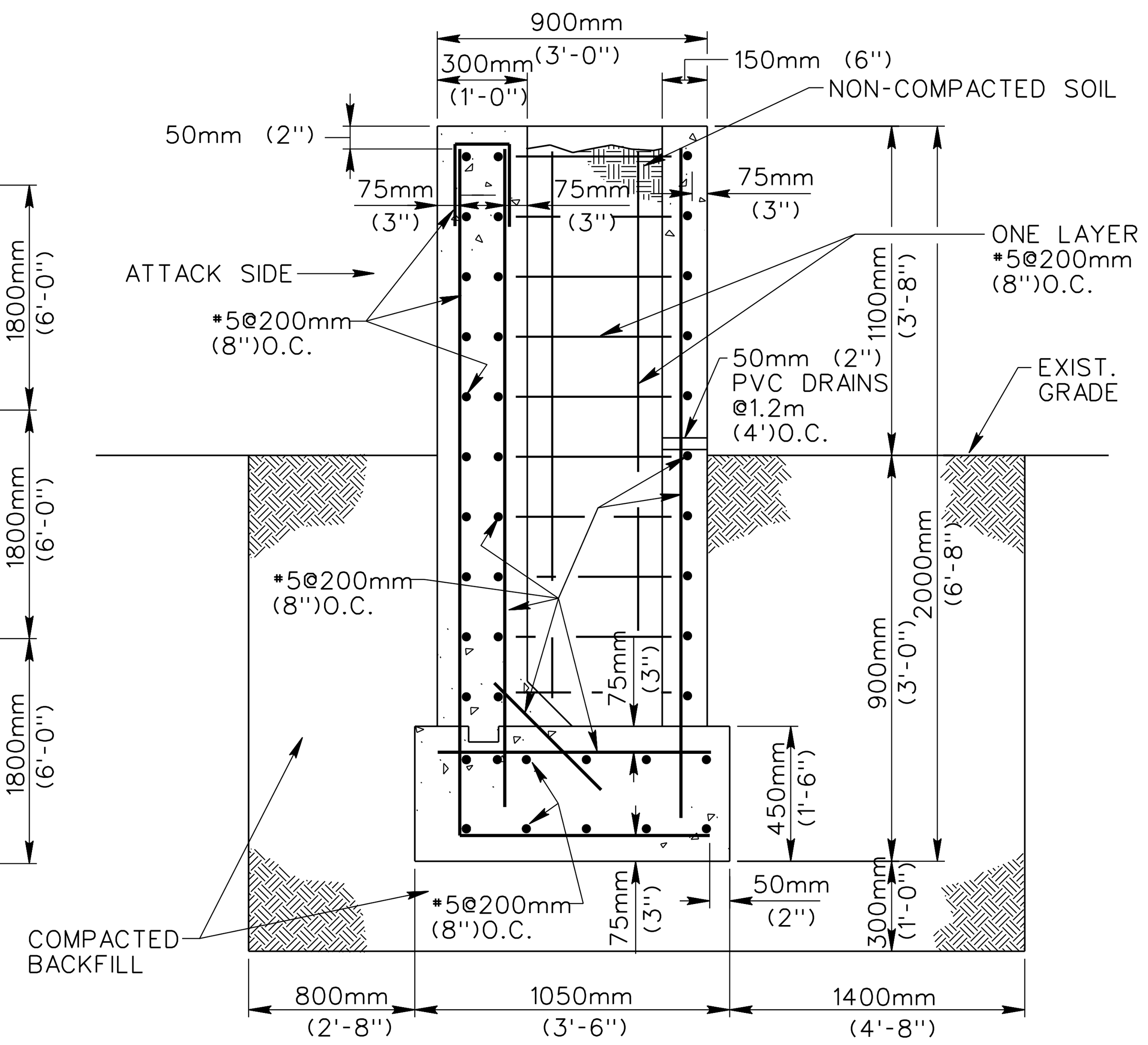
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

BARRIERS
PASSIVE VEHICLE BARRIERS

SHEET REFERENCE NUMBER
C9.06
SHEET 28 OF 60



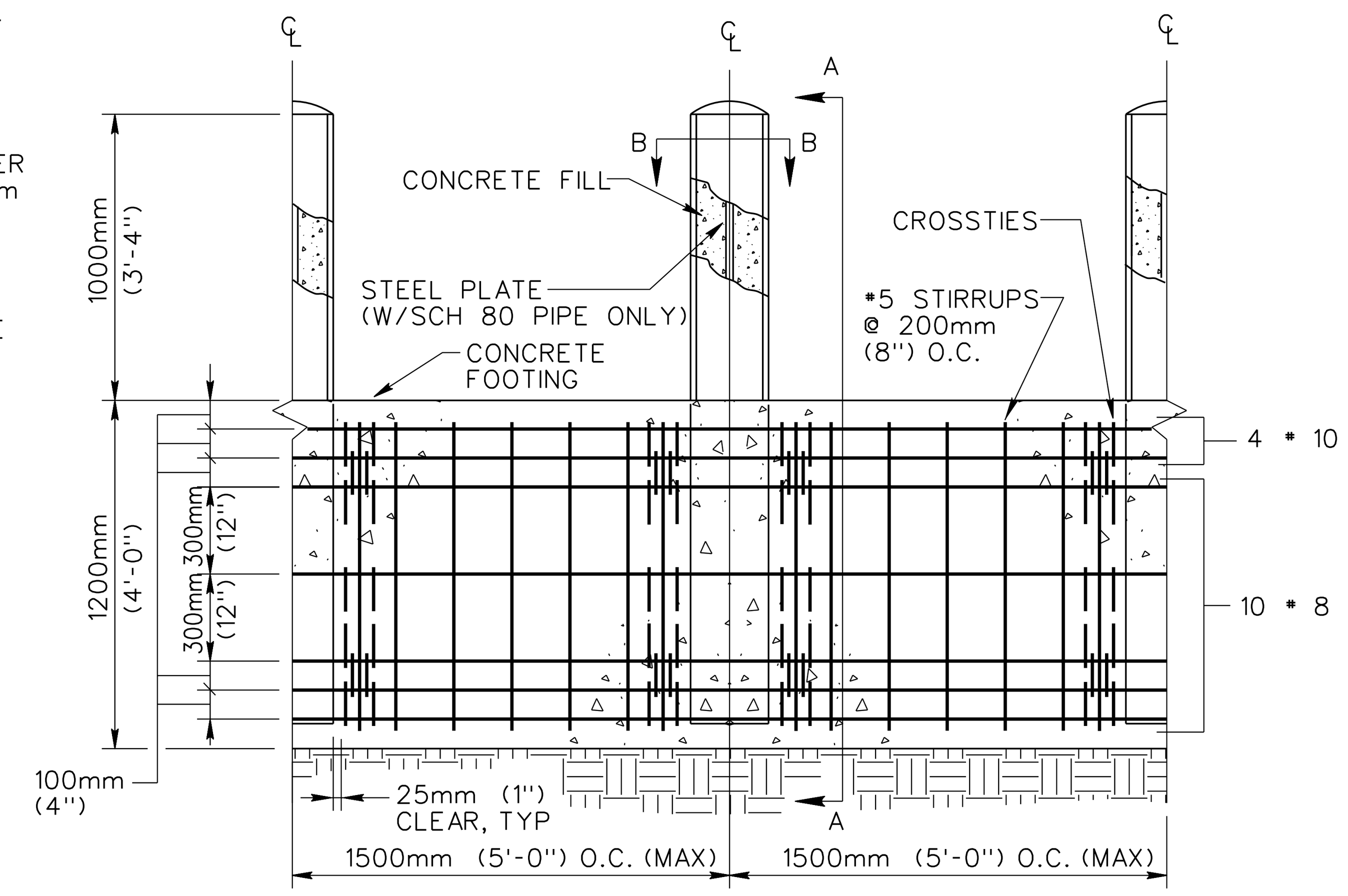

PLAN




SECTION

DS-9 PLANTER; K12 RATING

NOT TO SCALE




ELEVATION (ATTACK SIDE)

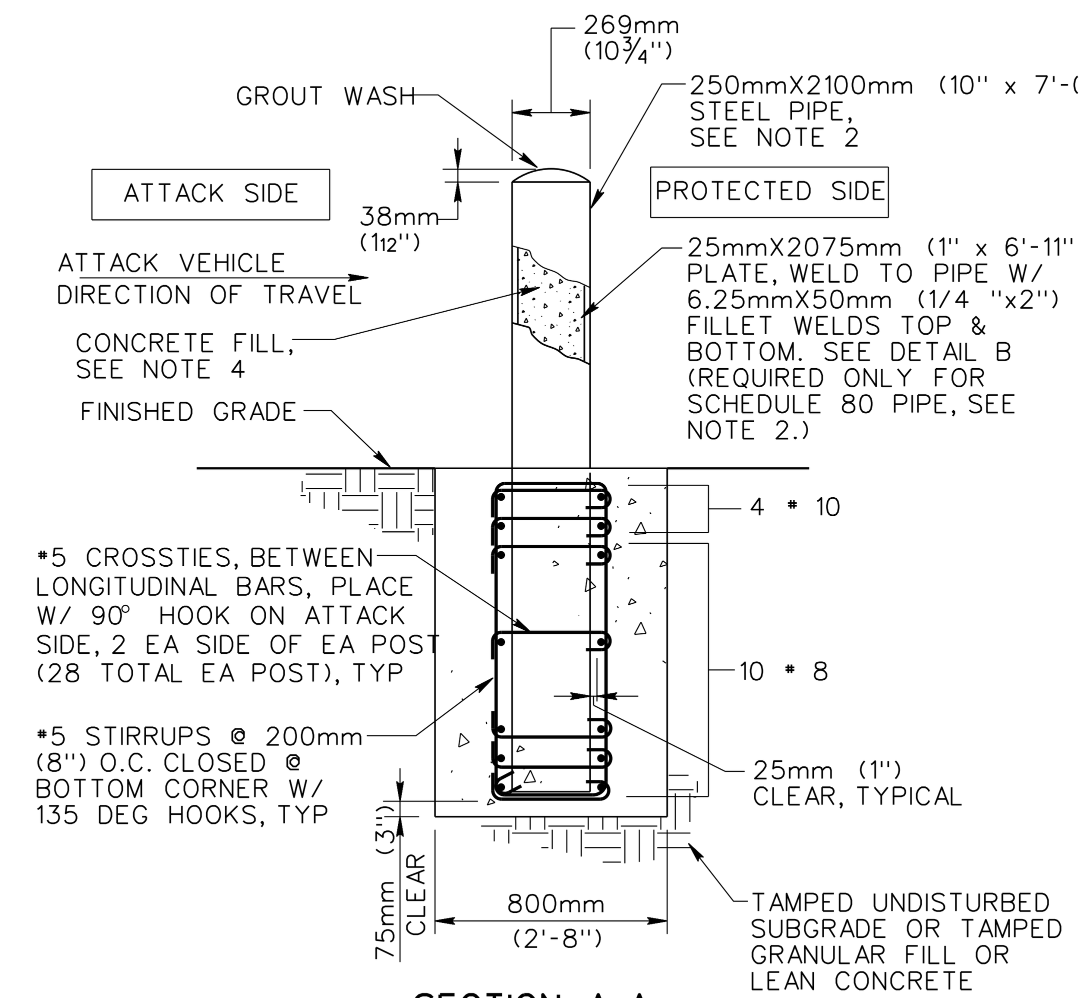
NOT TO SCALE

GENERAL NOTES:

1. REINFORCING SHALL BE ASTM A-615, Fy = 60 KSI.
2. STEEL PIPE SHALL BE ASTM A-53 GRADE B, Fy = 36 KSI

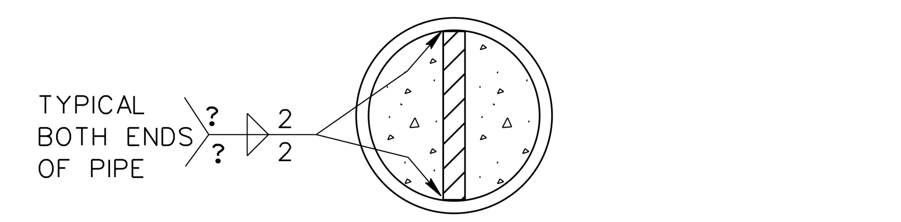
OPTION 1: SCHEDULE 140 (25mm (1") WALL THICKNESS)
OPTION 2: SCHEDULE 80 (12mm (1/2") WALL THICKNESS WITH 25mmX2075mm (1"X83") PLATE (SEE DETAILS).

3. STEEL PLATE SHALL BE ASTM A-36, Fy = 36 KSI.
4. CONCRETE MINIMUM F'c = 24,130 kPa (3500 PSI) IN ACCORDANCE WITH ASTM C31, C39 AND C470.
5. SOILS SHALL BE COMPACTED TO 90% MAXIMUM DENSITY.
6. STAGGERED CLASS A TENSION SPLICES SHALL BA ALLOWED FOR HORIZONTAL REINFORCING.
7. CROSSTIES SHALL HAVE STANDARD 90 AND 180 BENDS AND SHALL BE PLACED WITH 90 BEND TOWARD THE ATTACK SIDE OF THE FOOTING. PROVIDE 7 PAIRS OF CROSSTIES COMBINED WITH FIRST STIRRUP EACH SIDE OF EACH BOLLARD (SEE ELEVATION).
8. ALL EXPOSED CORNERS SHALL HAVE A 3/4" CHAMFER.




SECTION A-A

NOT TO SCALE



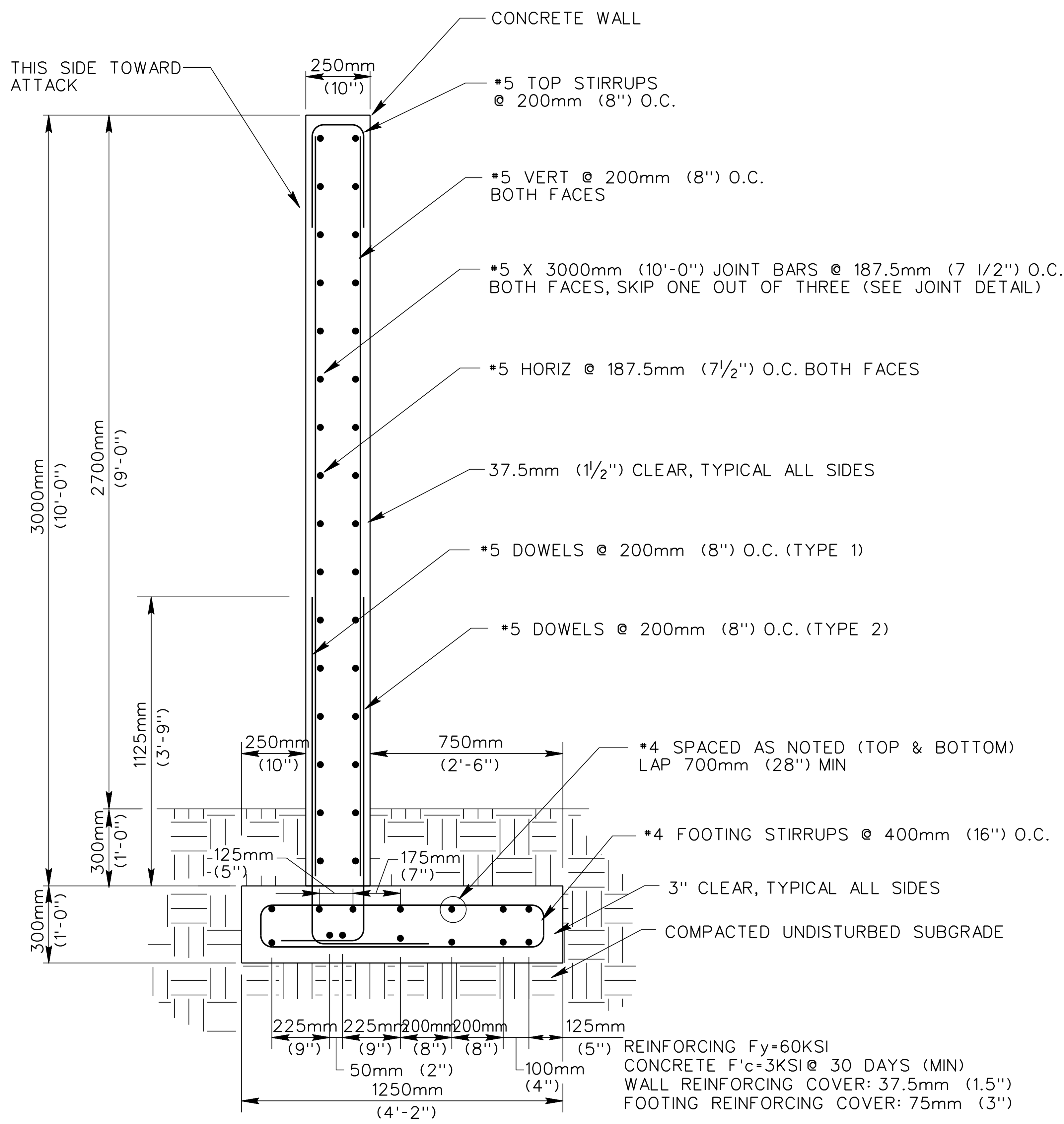

WELD STEEL PLATE WITHIN STEEL PIPE PARALLEL TO VEHICLE TRAVEL DIRECTION. PLATE REQUIRED ONLY FOR SCHEDULE 80 PIPE. (SEE NOTE 2, OPTION 2)

SECTION B-B

NOT TO SCALE

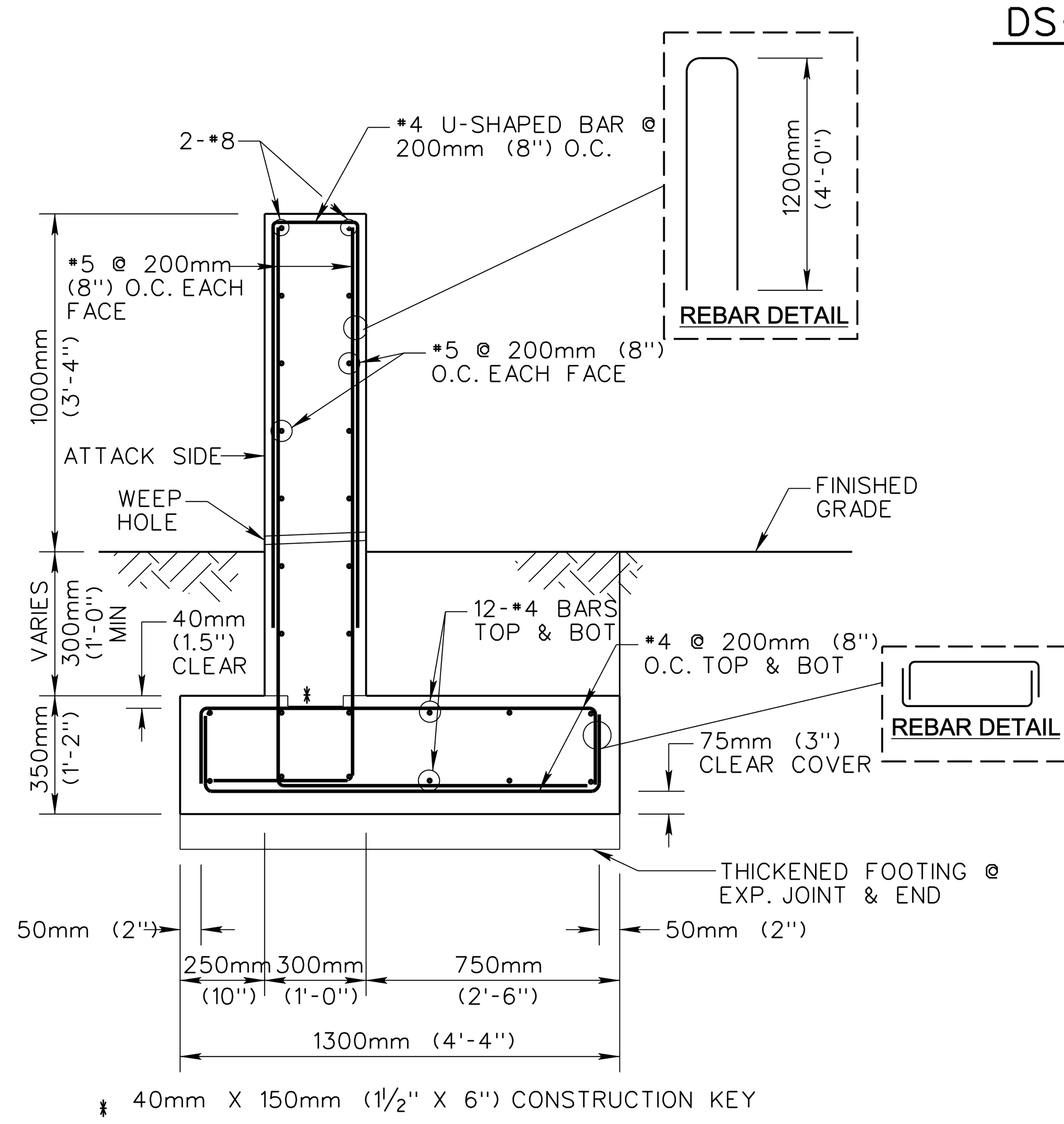
DS-22 BOLLARD; K12 RATING

NOT TO SCALE



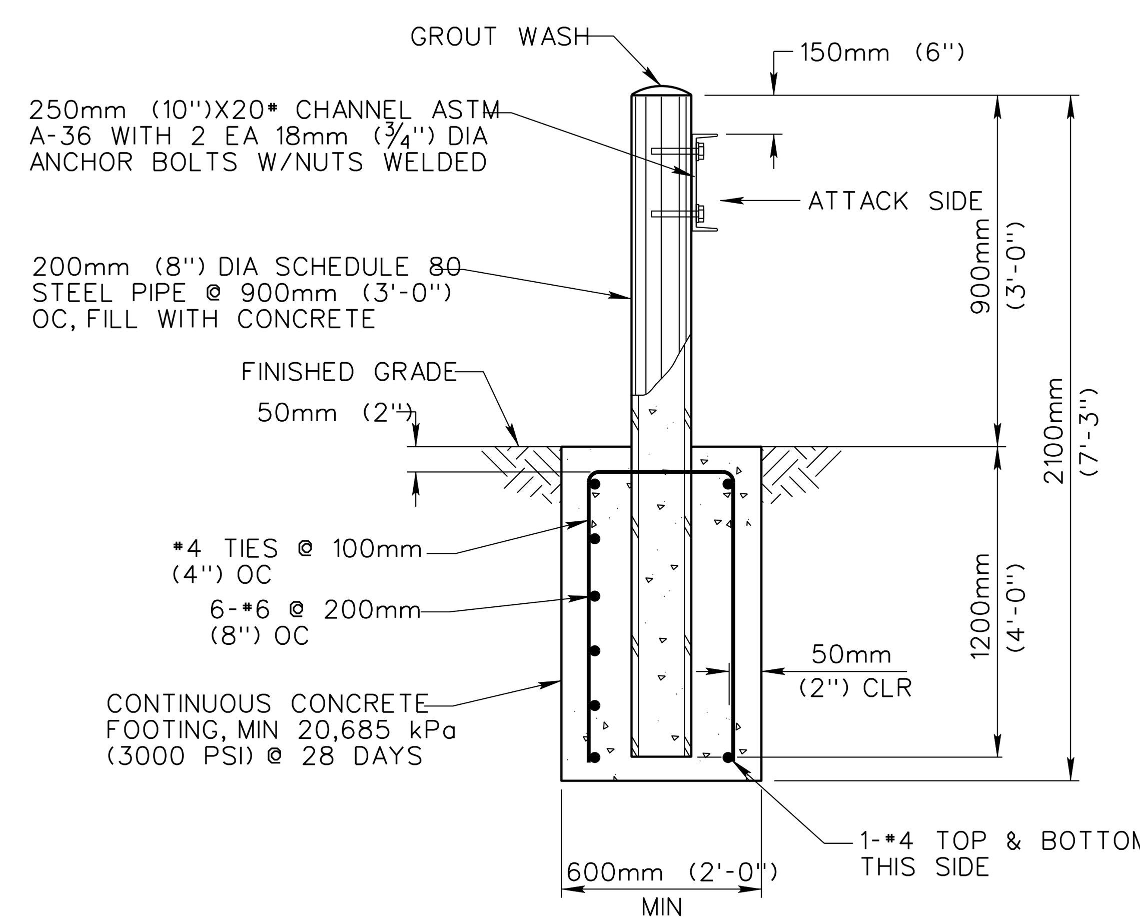

ANTI-RAM WALL; K12 RATING

NOT TO SCALE




DS-50 1 METER ANTI-RAM KNEE WALL, K12 RATING

NOT TO SCALE




DS-3 BOLLARD W/C CHANNEL RAIL; K12 RATING

NOT TO SCALE

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE, ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

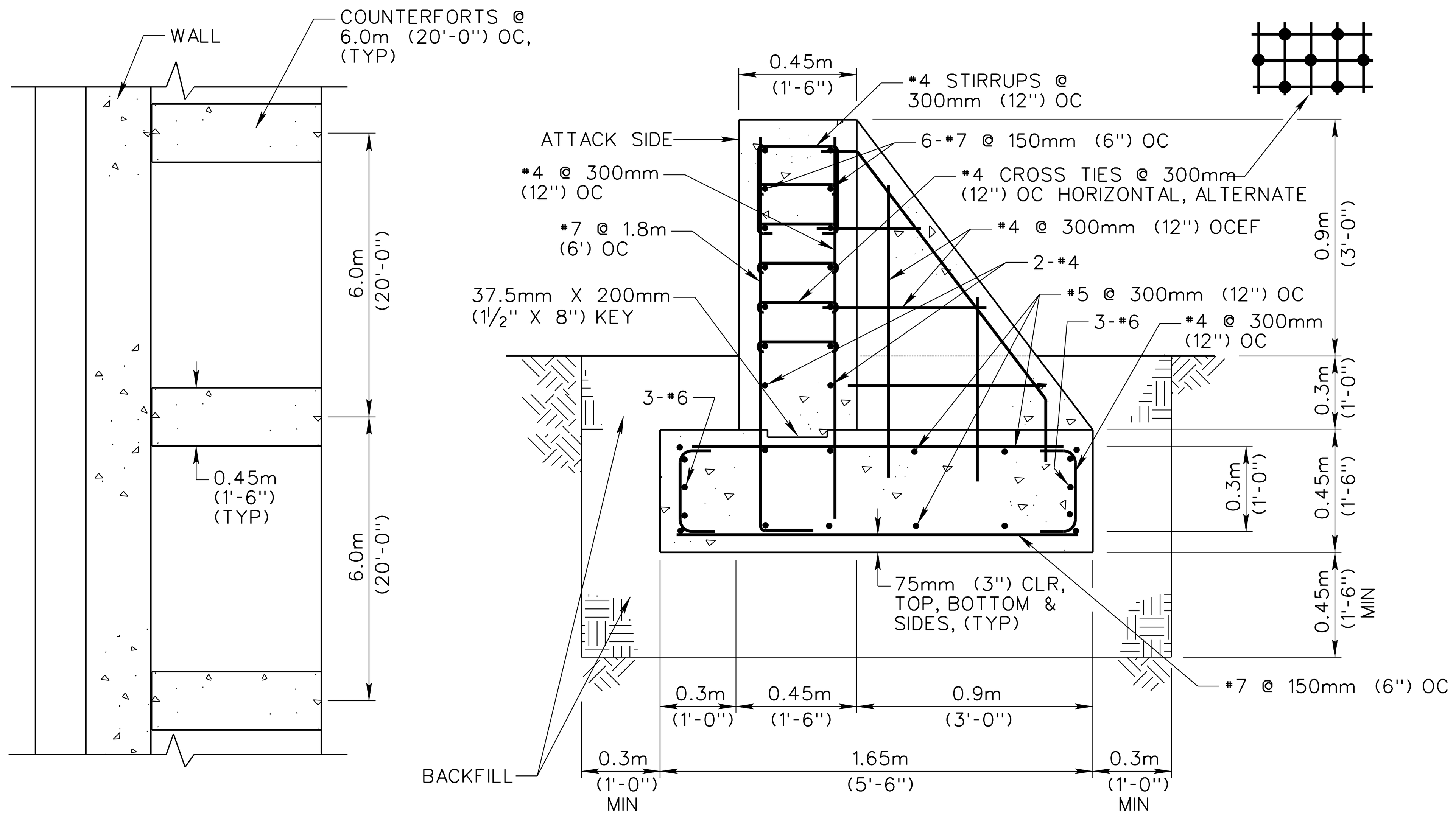
| | |
|---|---|
| DESIGNED BY: X.X.X | DATE: NOV 2007 |
| DWN BY: X.X.X | CKD BY: X.X.X |
| SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X |
| SUBMITTED BY: X | CATEGORY CODE: X |
| FILE NAME: X | PLOT SCALE: 1:1 |
| SIZE: ANSI D | PLOT DATE: |

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

BARRIERS
PASSIVE VEHICLE BARRIERS

SHEET REFERENCE NUMBER
C9.07

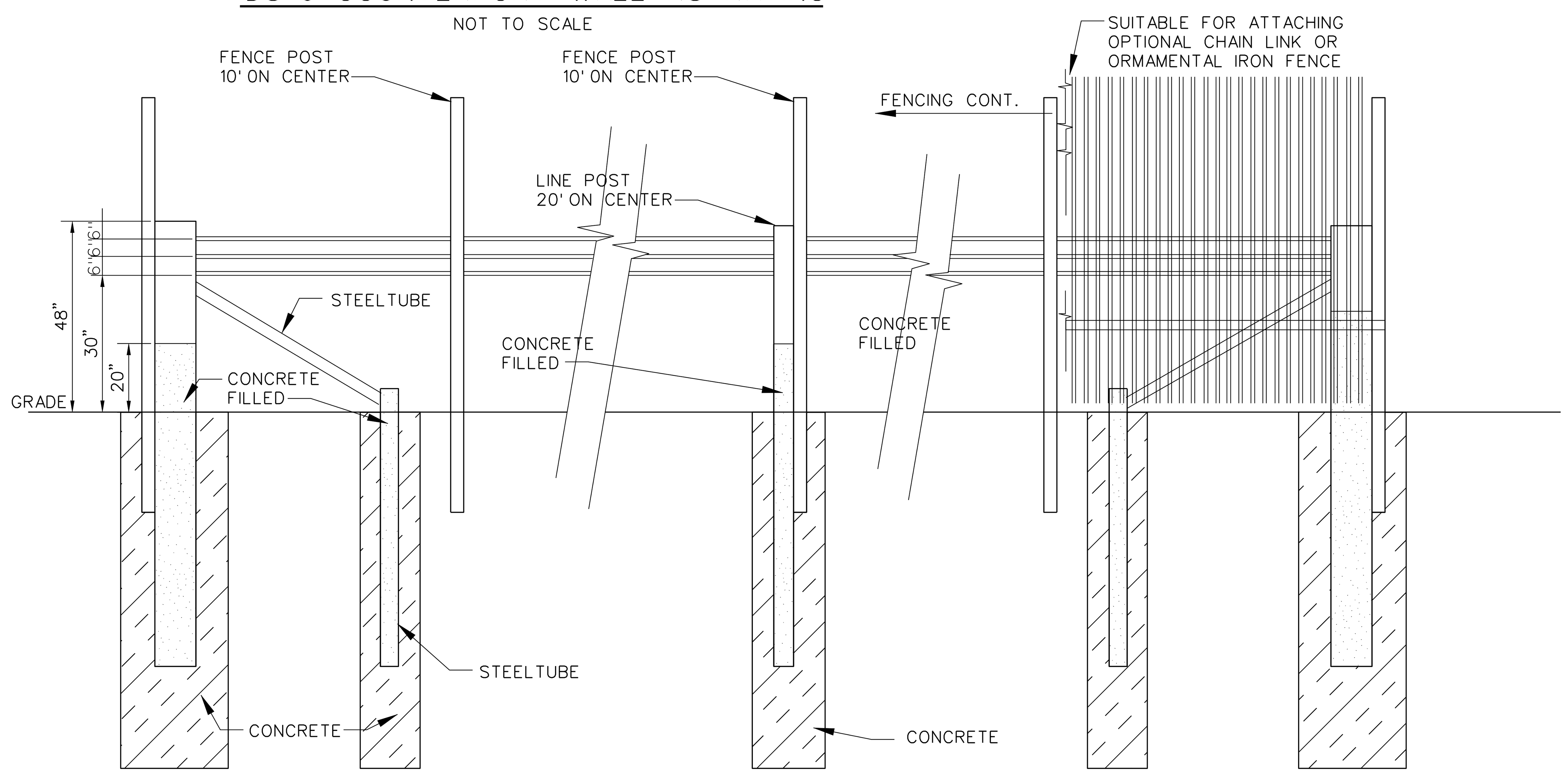



PLAN

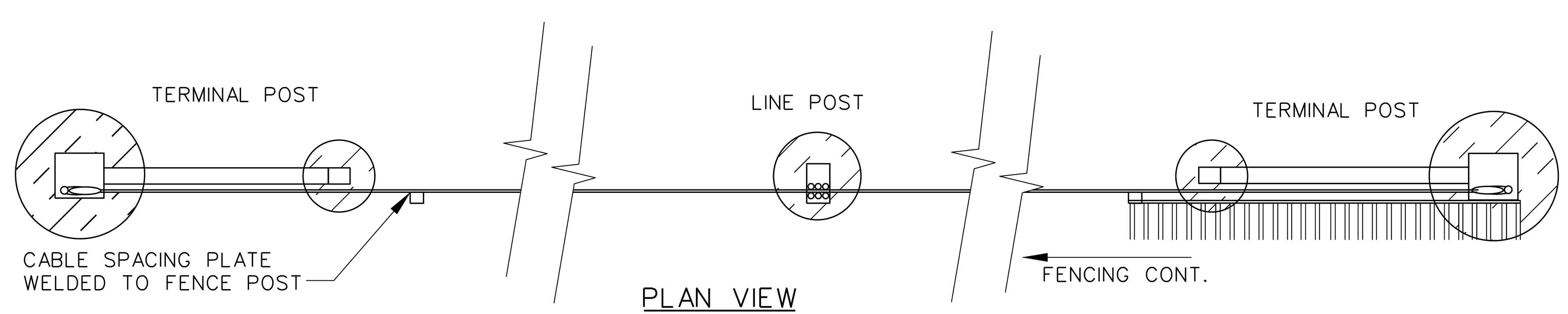
SECTION

## DS-6 COUNTERFORT WALL; K8 RATING

NOT TO SCALE




ELEVATION VIEW




PLAN VIEW

## CABLE BARRIER: K12, P1 RATING

ALSO AVAILABLE IN K4 AND K8 CONFIGURATIONS WITH P2 PENETRATION RATINGS PER ASTM F2656-07

NOTES:

1. FOR ADDITIONAL INFORMATION ON ANY BARRIER SHOWN ON THESE DRAWINGS, CONTACT THE PROTECTIVE DESIGN CENTER (PDC).

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X | DWN BY: X.X.X | CKD BY: X.X.X | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

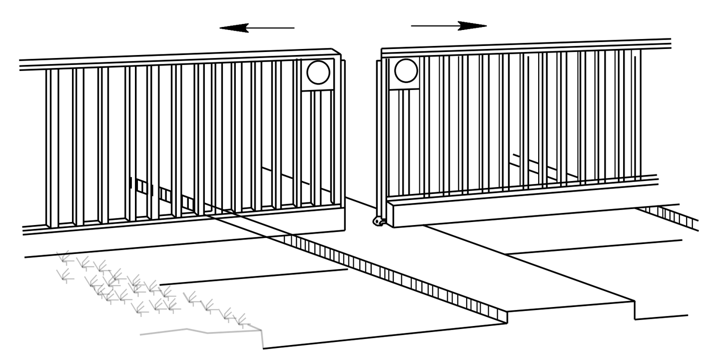
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

BARRIERS
PASSIVE VEHICLE BARRIERS

SHEET REFERENCE NUMBER C9.08

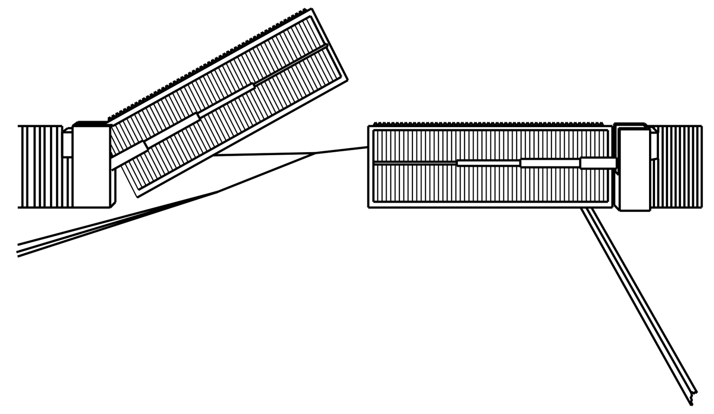


$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$



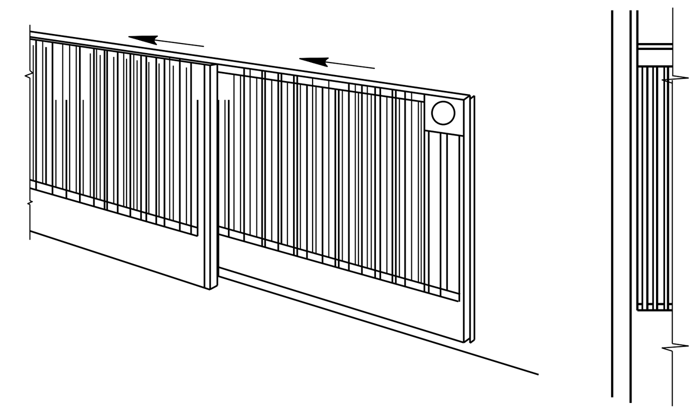
OPERATION: GATE SLIDES HORIZONTALLY, MANUALLY OR MOTOR OPERATED

## SLIDING GATE
NOT TO SCALE



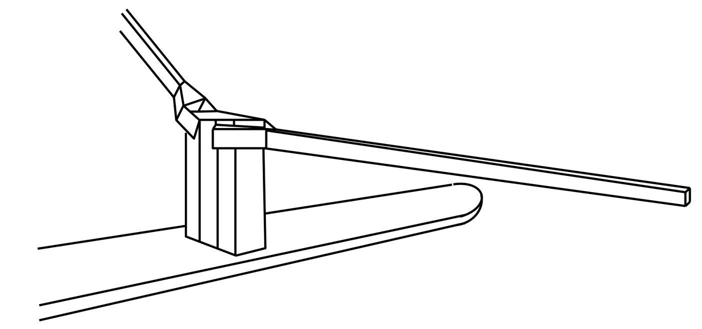
OPERATION: ARM AND GATE OPEN VERTICALLY, MOTORIZED.

## VERTICAL PIVOT GATE
NOT TO SCALE



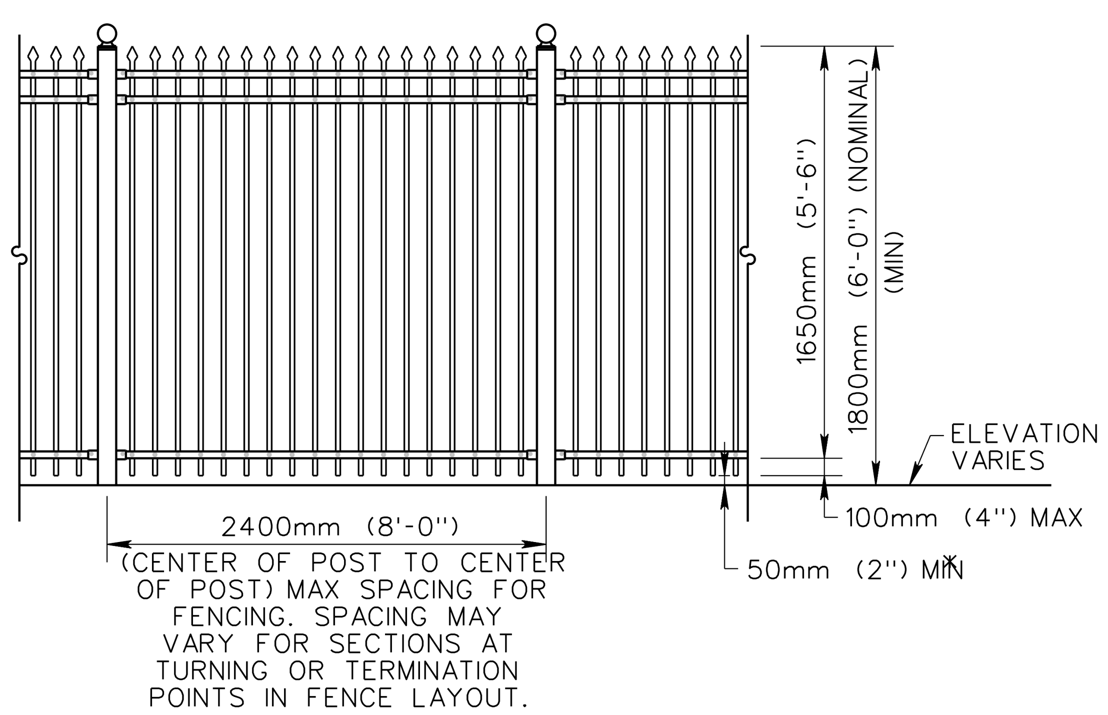
OPERATION: MULTIPLE SECTIONS MOVE HORIZONTALLY, MANUALLY OR MOTOR OPERATED.

## TELESCOPING GATE
NOT TO SCALE



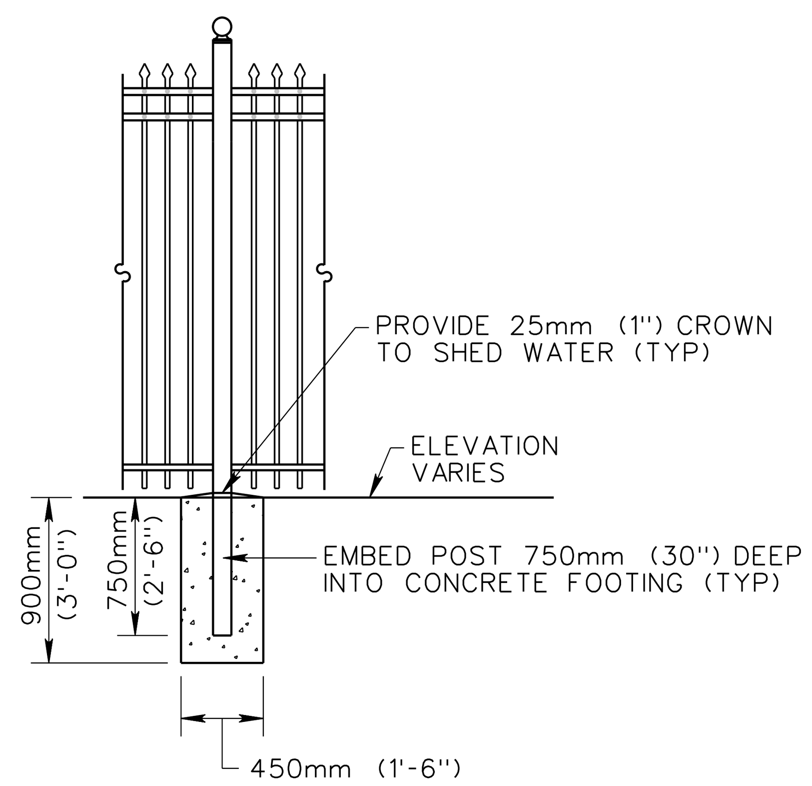
OPERATION: BEAMED RAISED TO ALLOW TRAFFIC TO PASS.

## TRAFFIC ARM
NOT TO SCALE

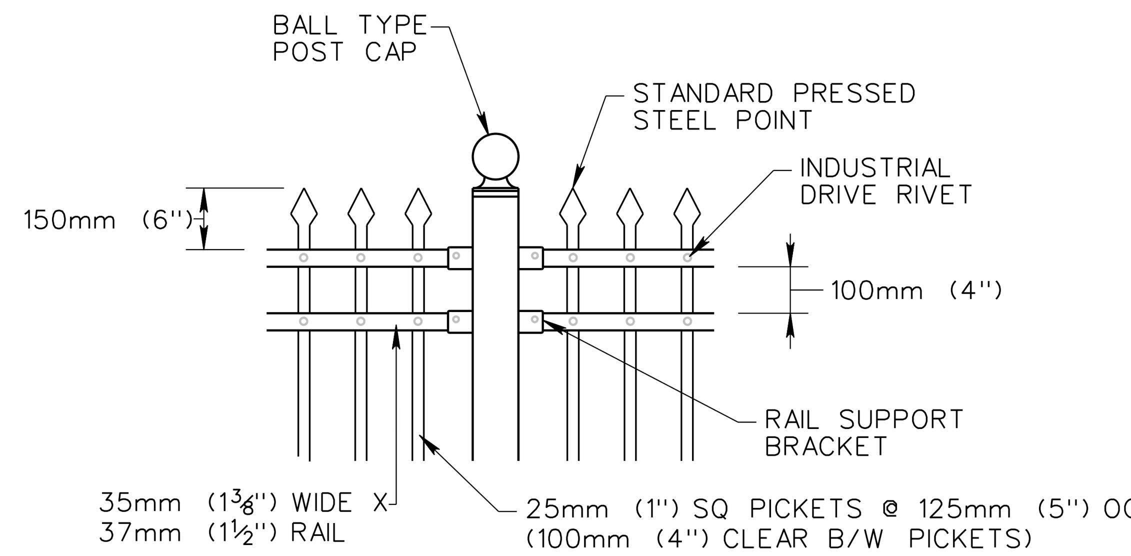



## FENCING ELEVATION DETAIL
NOT TO SCALE

* CLEARANCE BETWEEN FENCE AND GROUND SHALL BE BETWEEN 50mm (2") MIN AND 100mm (4") MAX.

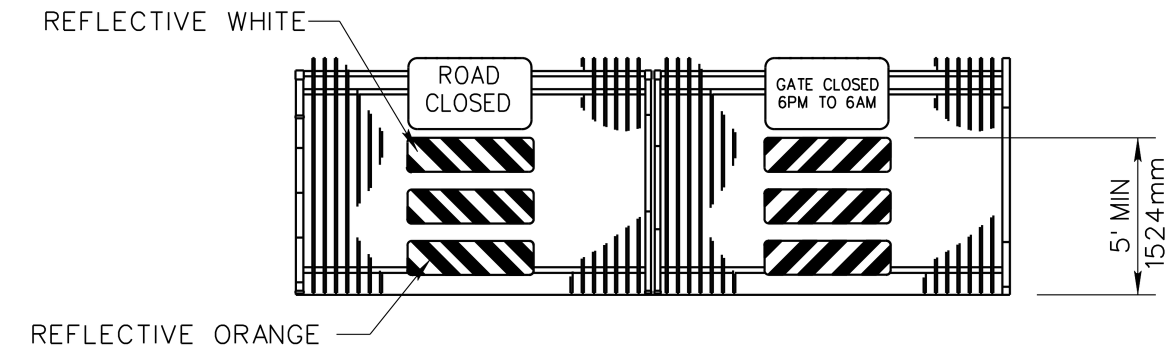



## FENCE POST DETAIL
NOT TO SCALE




## RAIL/POST DETAIL
NOT TO SCALE

SIGNAGE POSTED AT GATES ARE R11-2 SIZED TO 48x30

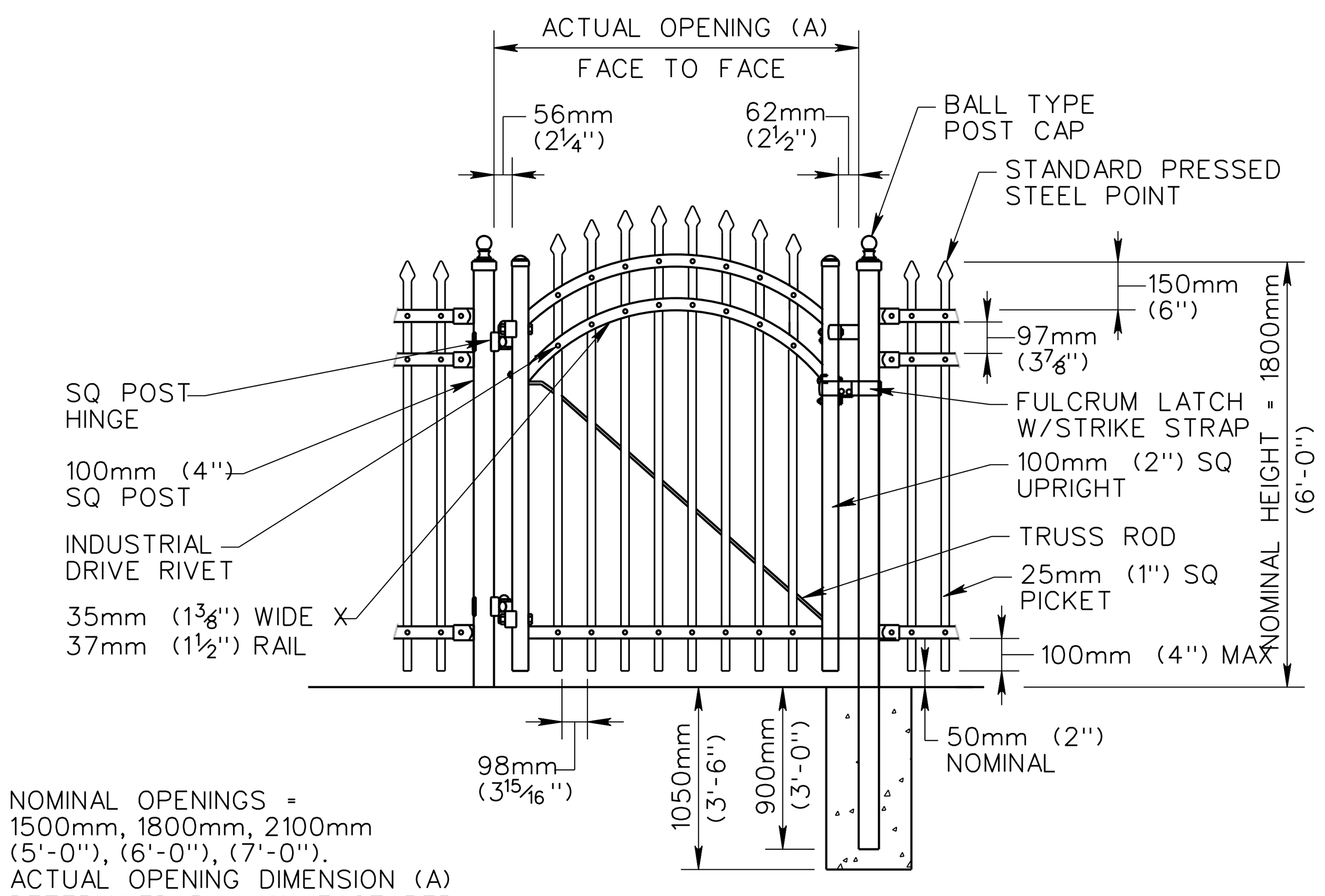



TYPE III BARRICADES

- TYPE III BARRICADES SHOULD BE USED DURING THE TIMES WHEN THE ACP IS CLOSED TO TRAFFIC
- A "GATE CLOSED" SIGN LISTING THE HOURS OF OPERATION SHOULD BE INSTALLED PRIOR TO THE BARRICADE, AND AT THE BARRICADE AS WELL.

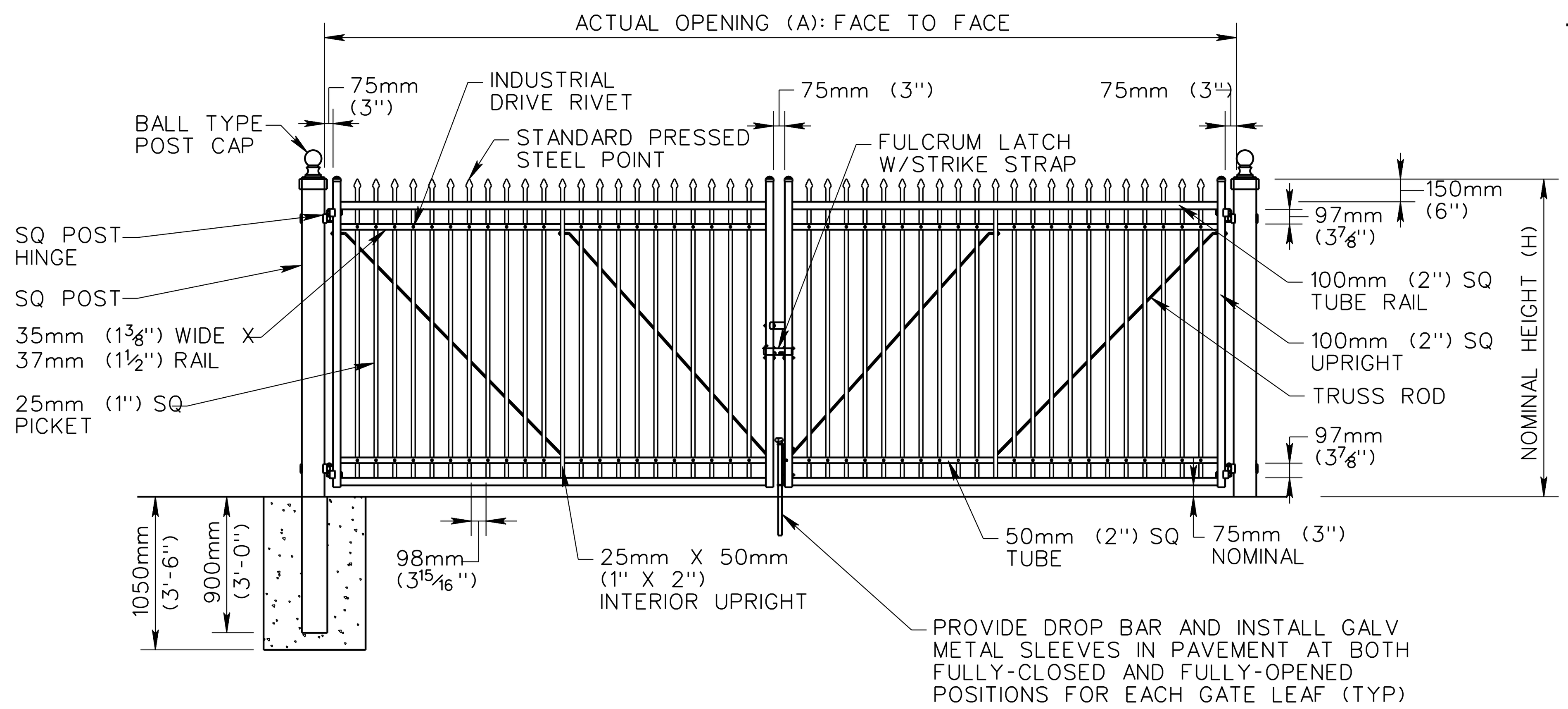
FOR ACPs THAT HAVE FIXED HOURS AND ARE MORE THAN ONE MILE AWAY FROM THE PRIMARY ROADWAY, INSTALL SIGNS SHOWING THE HOURS OF ACP OPERATION IN ADVANCE OF THE ACP.

## SIGNAGE DETAIL FOR ENTRY GATE
NOT TO SCALE




NOMINAL OPENINGS = 1500mm, 1800mm, 2100mm (5'-0"), (6'-0"), (7'-0"). ACTUAL OPENING DIMENSION (A) DETERMINED BY MANUFACTURER.

## PERSONNEL SWING GATE DETAIL
NOT TO SCALE




## ORNAMENTAL METAL FENCE DOUBLE SWING GATE ELEVATION DETAIL
NOT TO SCALE

NOTE: ITEMS SHOWN ON THIS PAGE ARE NOT VEHICLE IMPACT RESISTANT

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US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
| --- | --- | --- | --- |

DESIGNED BY: X.X.X. | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204
DWN BY: X.X.X. | CKD BY: X.X.X. | CONTRACT NO.: X
SUBMITTED BY: X | CATEGORY CODE: X
FILE NAME: X | PLOT SCALE: 1:1 | PLOT DATE:
SIZE: ANSI D

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

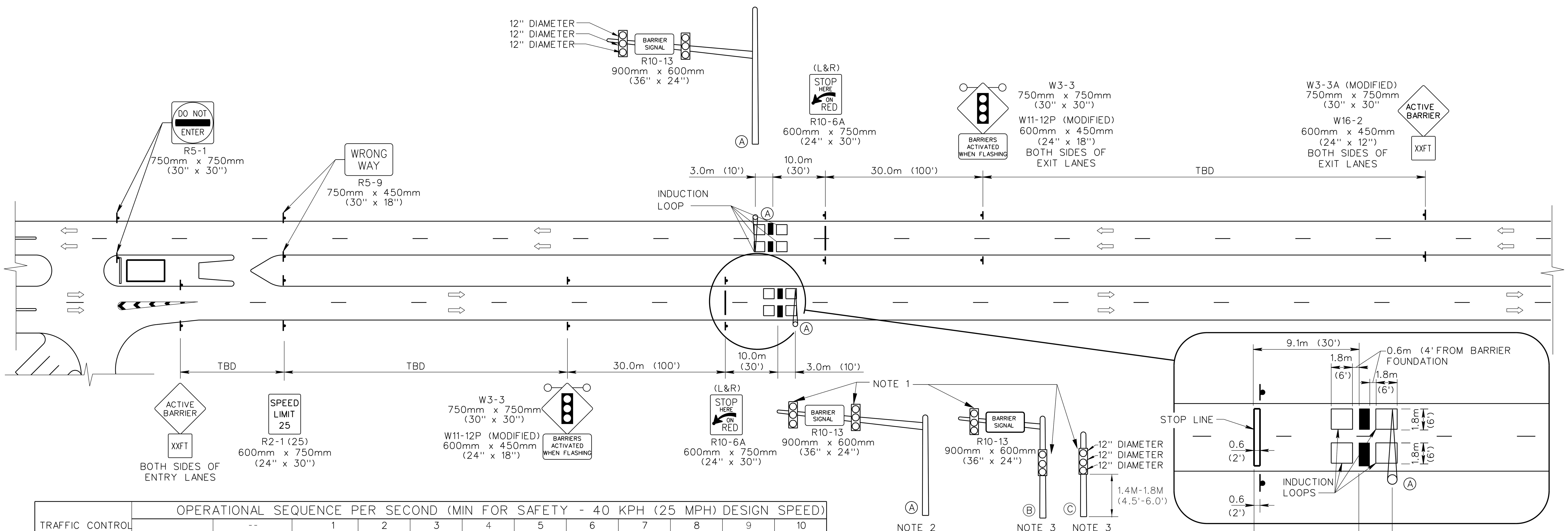
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

GATES AND FENCES

SHEET REFERENCE NUMBER
C9.09



$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$




| TRAFFIC CONTROL AND SAFETY AT ACTIVE BARRIERS | | OPERATIONAL SEQUENCE PER SECOND (MIN FOR SAFETY - 40 KPH (25 MPH) DESIGN SPEED) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -- | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | TRAFFIC CONTROL | NORMAL OPS | GUARD PERCEPTION AND REACTION TIME TO THREAT (BUTTON) | | | YELLOW CLEARANCE (MUTCD MINIMUM) | | | ALL RED | DEPLOYING BARRIER | | THREAT CONTAINED |
| SIGN AND SIGNAL WARNING SYSTEM | WARNING SIGN WITH BEACONS | BLANK | BLANK | BLANK | BLANK | ALT FY | ALT FY | ALT FY | ALT FY | ALT FY | ALT FY | ALT FY |
| | TRAFFIC SIGNAL | FY OR SOLID GREEN | FY OR G | FY OR G | FY OR G | Y | Y | Y | R | R | R | R |
| | BARRIER LIGHTS | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | FR | FR | FR | FR |
| | ACTIVE BARRIER | DOWN | DOWN | DOWN | DOWN | DOWN | DOWN | DOWN | DOWN | ACTIVATED | ACTIVATED | DEPLOYED |

NOTE:
R = RED
Y = YELLOW
FY = FLASHING YELLOW
G = GREEN

NOTES:

1. ALL TRAFFIC SIGNAL FACES SHALL HAVE THE FOLLOWING SIGNAL INDICATIONS:
   RED – 12" DIAMETER
   YELLOW – 12" DIAMETER
   FLASHING YELLOW OR GREEN – 8" DIAMETER

2. FOR MULTIPLE INBOUND OR MULTIPLE OUTBOUND LANES, USE DETAIL A WITH A SIGNAL FACE OVER EACH LANE.

3. FOR TWO LANE ROADWAYS WITH ONE INBOUND LANE AND ONE OUTBOUND LANE, THE PREFERREDTRAFFIC SIGNALIZATION IS ONE POST AND MAST STRUCTURE WITH SIGNAL FACES ON BOTH THE MAST AND THE POST (DETAIL B) FOR EACH LANE. AN ALTERNATIVE FOR ROADWAYS WITH ONE INBOUND AND ONE OUTBOUND LANE THAT ARE SEPARATED BY A MEDIAN ISLAND OF AT LEAST 5 FOOT WIDE, USE POST MOUNTED SIGNAL FACES (DETAIL C) WITH ONE POST MOUNTED ON THE RIGHT SHOULDER AND ANOTHER POST MOUNTED ON THE LEFT SHOULDER (MEDIAN ISLAND) FOR EACH LANE, THIS ALTERNATIVE REQUIRES A TOTAL OF 4 POSTS WITH SIGNAL FACES.

4. BARRIERS SHALL BE CONTROLLED BY A TRAFFIC CONTROLLER UNIT IN ACCORDANCE WITH UFGS 34 41 26.00 10 "ACCESS CONTROL POINT CONTROL SYSTEM" AND DRAWINGS E1.03 AND E1.04.

## ACTIVE BARRIER SIGNS AND SIGNALS

NOT TO SCALE

LEGEND

- TRAFFIC FLOW PATTERN
- Y/100mm (4") PAINT STRIPE STYLE/WIDTH
- DY DOUBLE YELLOW LINE
- SW SOLID WHITE LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP
- (A) TRAFFIC SIGNAL DETAILS

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
SIZE: ANSI D
PLOT SCALE: 1 : 1
DATE: NOV 2007
SOLICITATION NO.: W912HN-07-X-6204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE: .

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ACTIVE BARRIER SIGNS AND SIGNALS

SHEET REFERENCE NUMBER
C9.10
SHEET 32 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## Notes:

### General

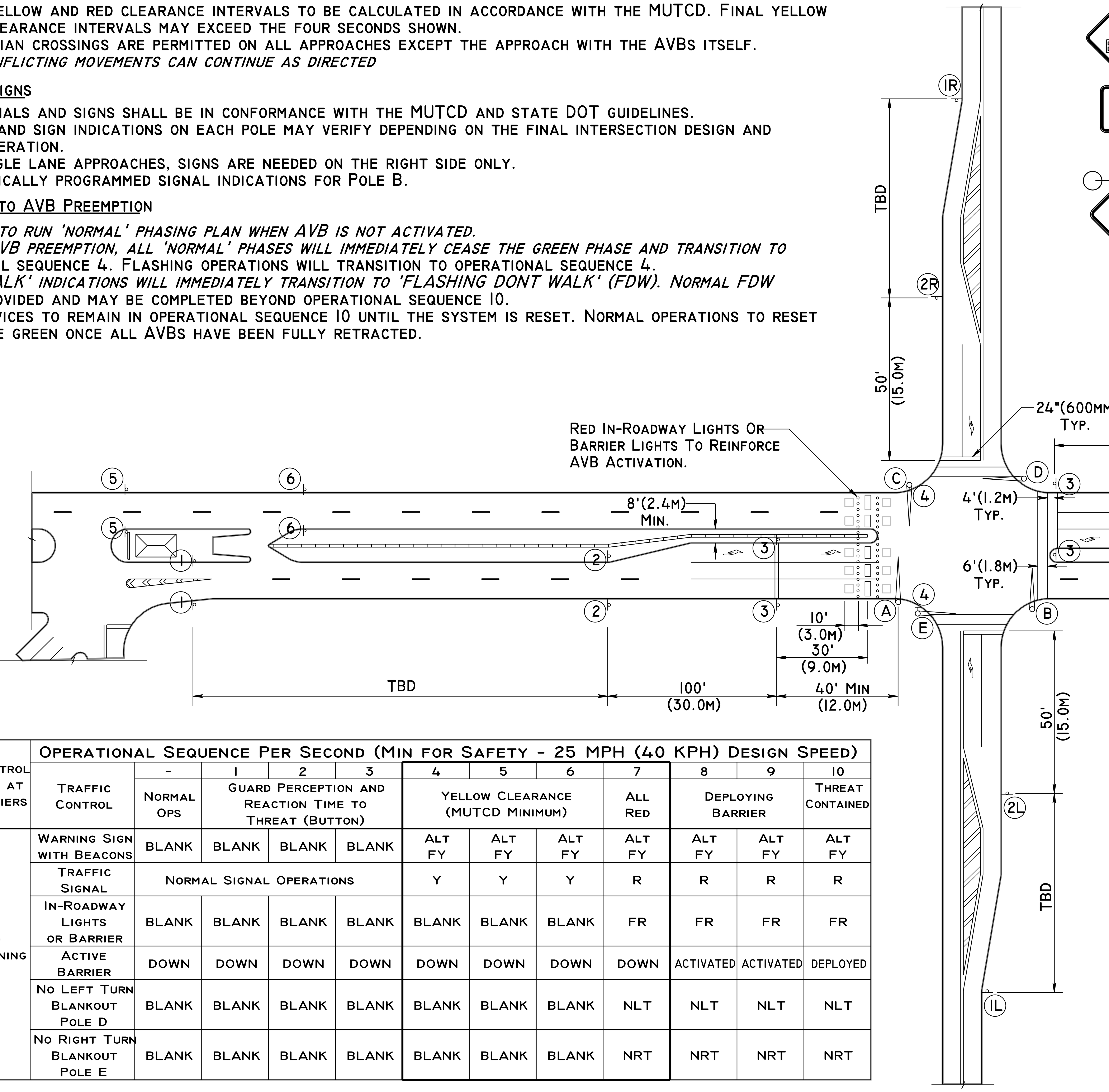
1. Final design and operational analyses in accordance with the MUTCD and to be performed by a qualified traffic engineer. Plans for AVB systems at signalized intersections shall be reviewed by SDDCTEA.
2. Final yellow and red clearance intervals to be calculated in accordance with the MUTCD. Final yellow and red clearance intervals may exceed the four seconds shown.
3. Pedestrian crossings are permitted on all approaches except the approach with the AVBs itself.
4. *Non-conflicting movements can continue as directed*

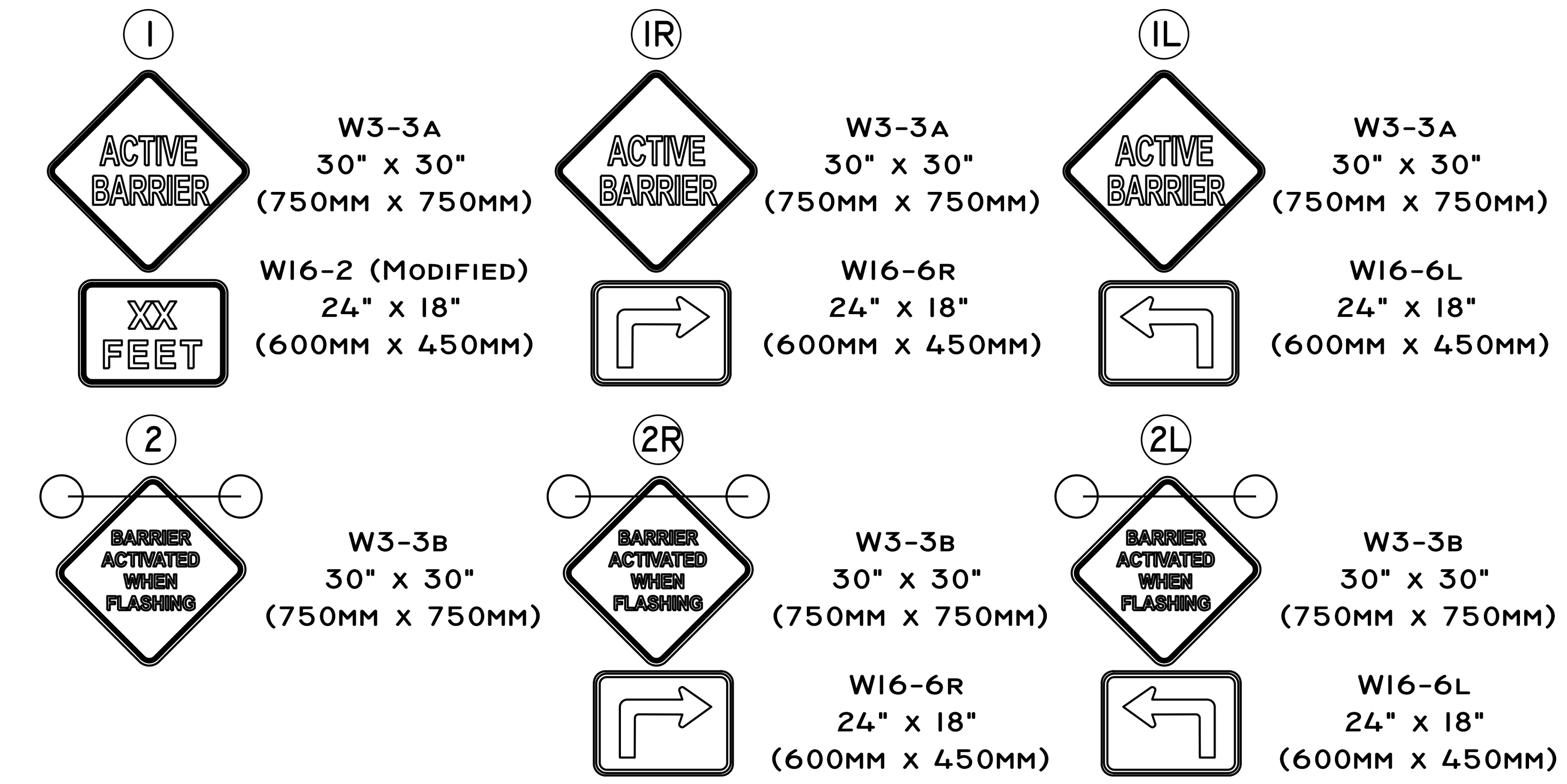
### Signals and Signs

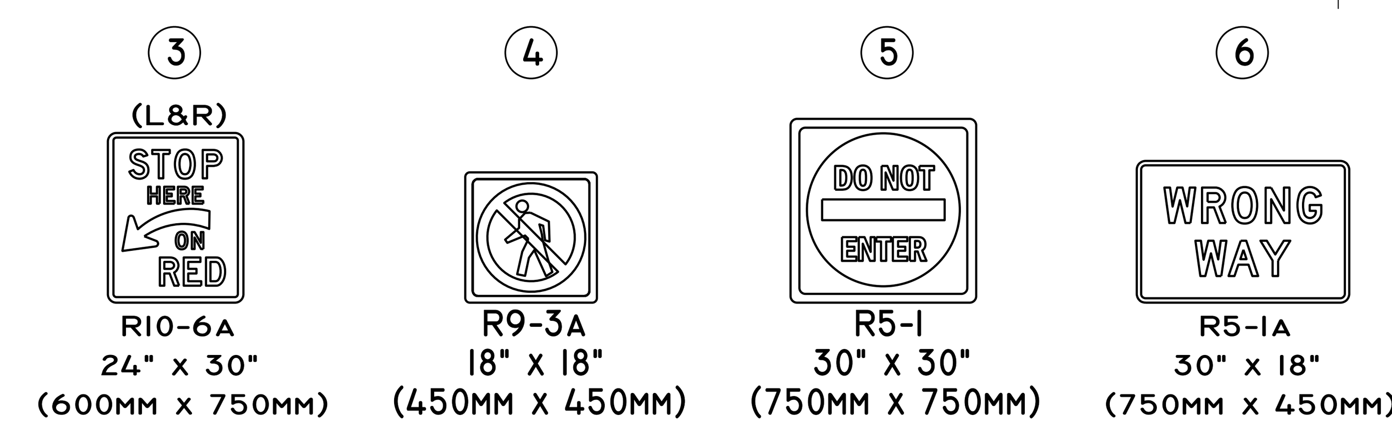
5. All signals and signs shall be in conformance with the MUTCD and state DOT guidelines.
6. Signal and sign indications on each pole may verify depending on the final intersection design and phasing operation.
7. For single lane approaches, signs are needed on the right side only.
8. Use optically programmed signal indications for Pole B.

### Normal Mode to AVB Preemption

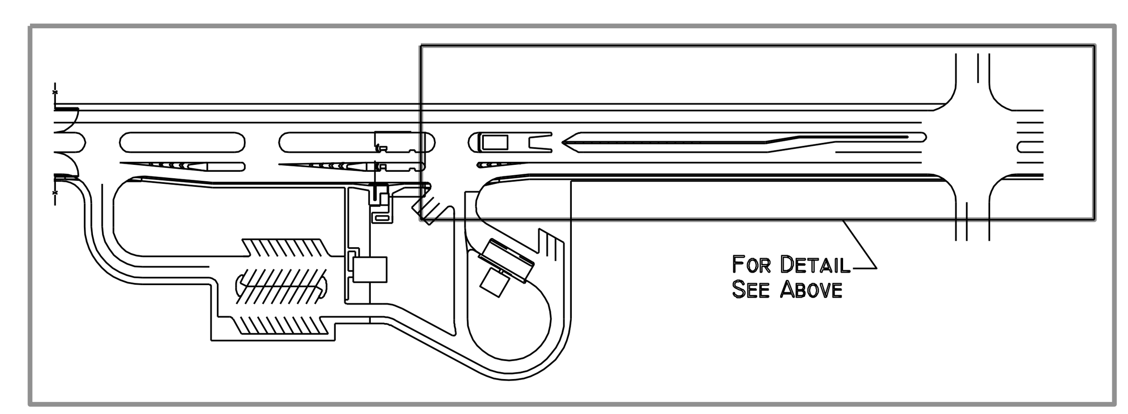
9. *Signal to run 'normal' phasing plan when AVB is not activated.*
10. *Upon AVB preemption, all 'normal' phases will immediately cease the green phase and transition to* operational sequence 4. Flashing operations will transition to operational sequence 4.
11. *All 'WALK' indications will immediately transition to 'FLASHING DONT WALK' (FDW). Normal FDW* will be provided and may be completed beyond operational sequence 10.
12. All devices to remain in operational sequence 10 until the system is reset. Normal operations to reset to mainline green once all AVBs have been fully retracted.




| Traffic Control and Safety at Active Barriers | Operational Sequence Per Second (Min for Safety - 25 MPH (40 KPH) Design Speed) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | - | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | Traffic Control | Normal Ops | Guard Perception and Reaction Time to Threat (Button) | | | Yellow Clearance (MUTCD Minimum) | | | All Red | Deploying Barrier | | Threat Contained |
| Sign and Signal Warning System | Warning Sign with Beacons | BLANK | BLANK | BLANK | BLANK | ALT FY | ALT FY | ALT FY | ALT FY | ALT FY | ALT FY | ALT FY |
| | Traffic Signal | Normal Signal Operations | | | | Y | Y | Y | R | R | R | R |
| | In-Roadway Lights or Barrier | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | FR | FR | FR | FR |
| | Active Barrier | DOWN | DOWN | DOWN | DOWN | DOWN | DOWN | DOWN | DOWN | ACTIVATED | ACTIVATED | DEPLOYED |
| | No Left Turn Blankout Pole D | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | NLT | NLT | NLT | NLT |
| | No Right Turn Blankout Pole E | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | BLANK | NRT | NRT | NRT | NRT |




## Active Barrier Signs and Signal @ An Intersection
## Sheet 1 of 2
Not To Scale

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1

DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

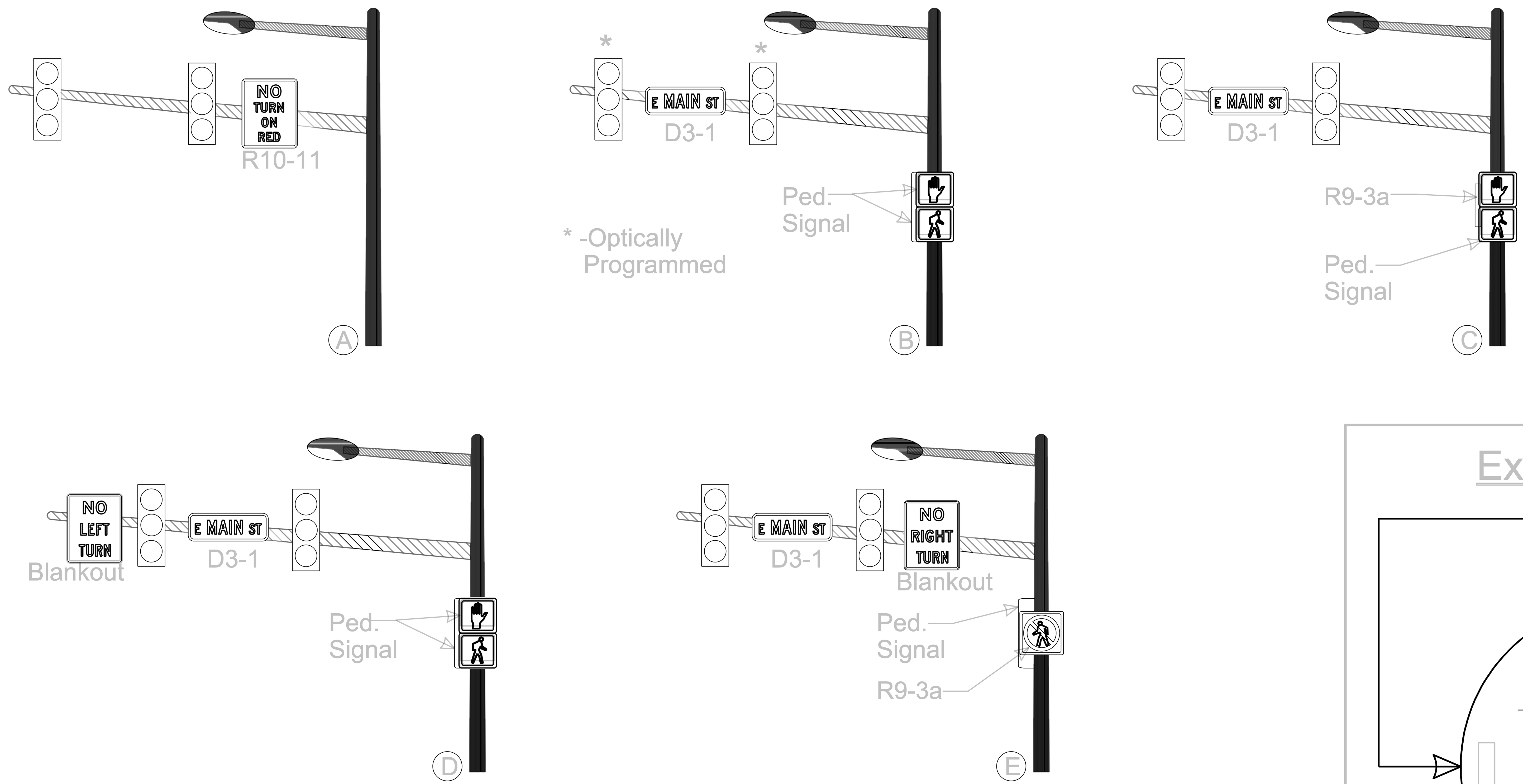
U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ACTIVE BARRIER SIGNS AND SIGNALS AT AN INTERSECTION SHEET 1 OF 2

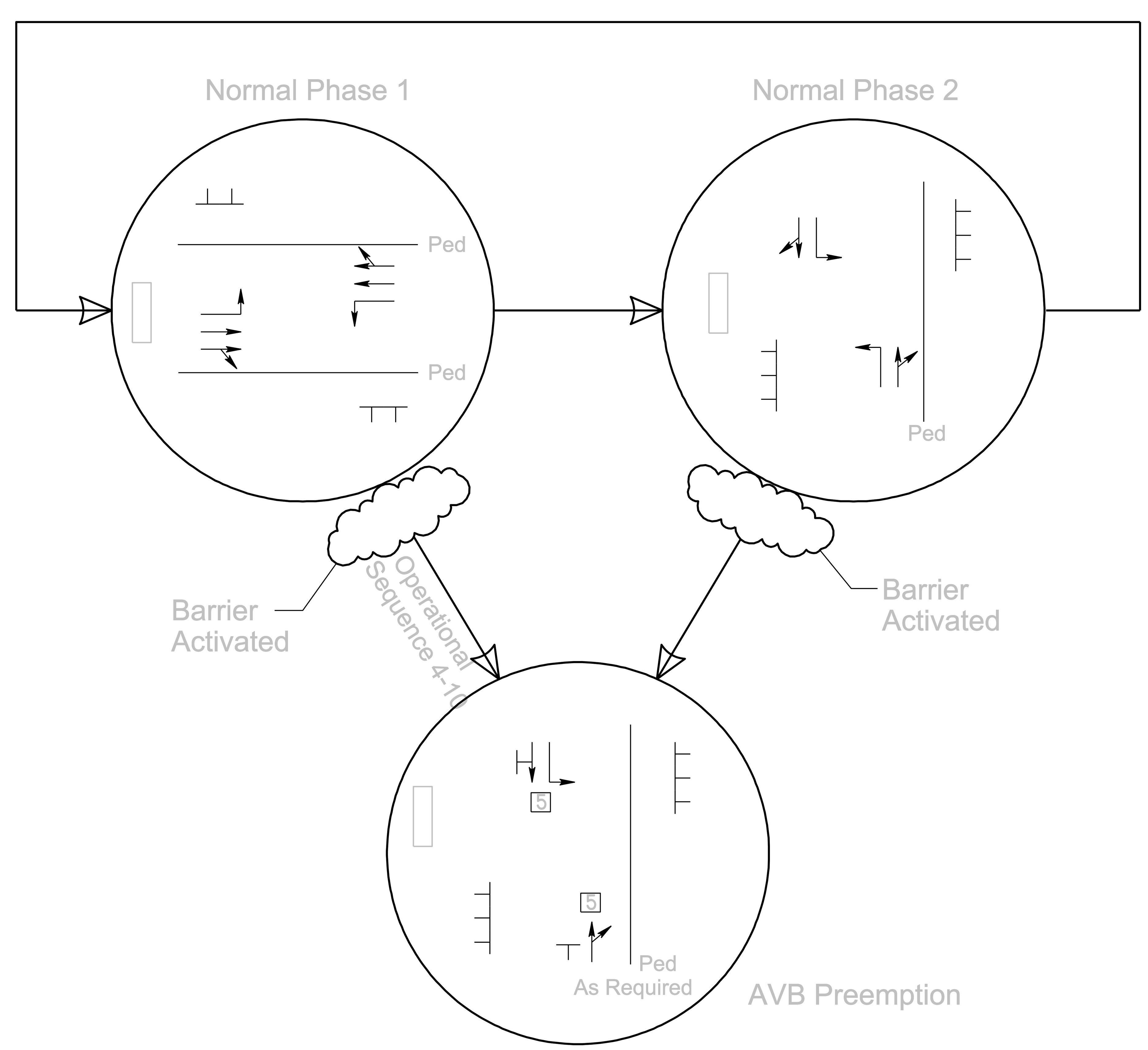
SHEET REFERENCE NUMBER
C9.11
SHEET 33 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## Active Barrier Signs and Signal @ An Intersection
## Sheet 2 of 2
Not To Scale

## Example Two-Phase Operational Sequence




STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
| --- | --- | --- | --- |

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W912HN-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

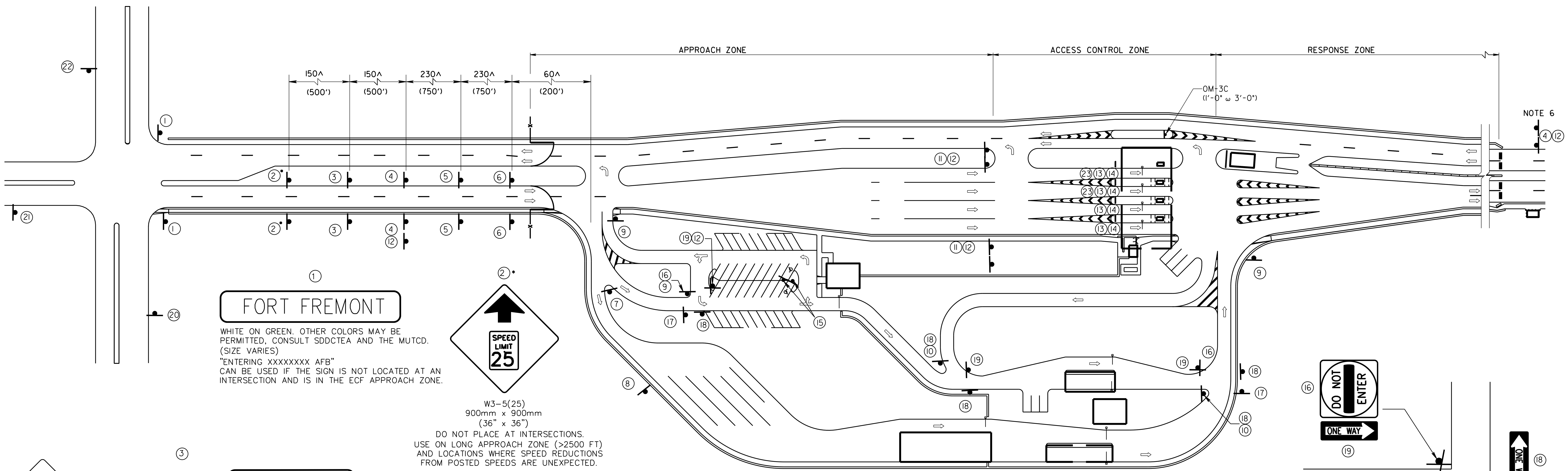
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

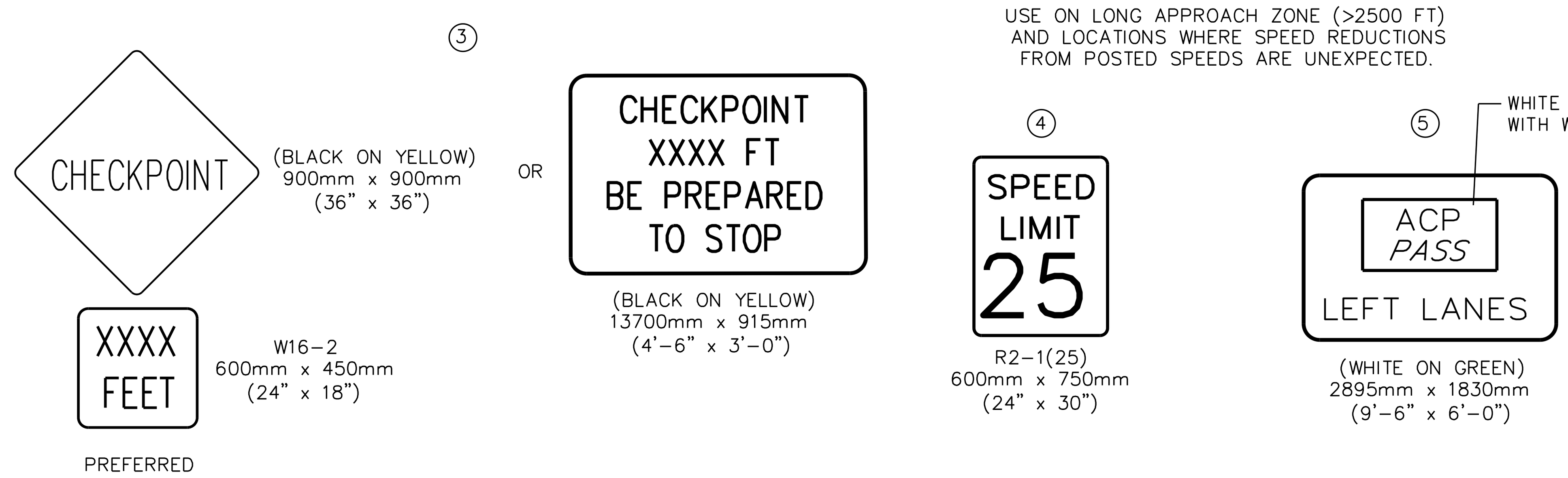
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ACTIVE BARRIER SIGNS AND SIGNALS AT AN INTERSECTION SHEET 2 OF 2

SHEET REFERENCE NUMBER
C9.12

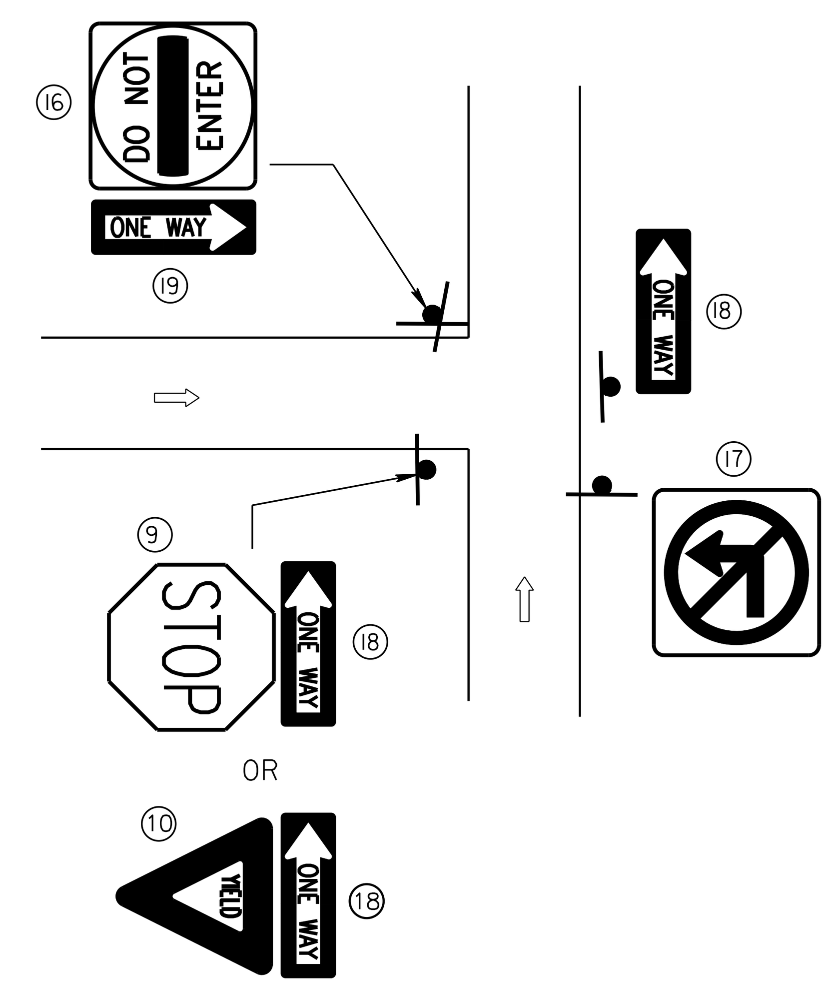

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$



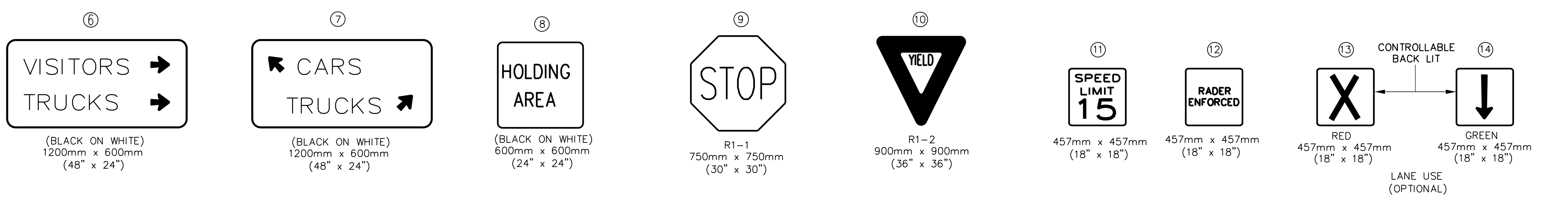

NOTES:

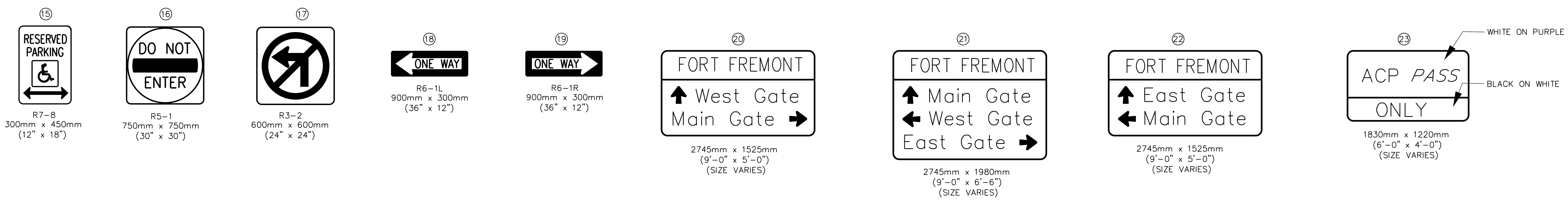
1. FOR SPEEDS GREATER THAN 40 KPH (25 MPH), SEE CURRENT MUTCD FOR SIGN DIMENSIONS.
2. NO CLEARANCE SIGNS ARE REQUIRED FOR CANOPIES 15 FEET IN HEIGHT OR GREATER. FOR CANOPIES LESS THAN 15 FEET CONSULT SDDCTEA AND THE MUTCD.
3. CONSULT SDDCTEA FOR VEHICLE BARRIER SIGNING APPLICATIONS.
4. SIGN PLAN AND DETAILS ARE INTENDED TO PROVIDE GUIDANCE. THE FINAL SIGNING PLAN SHOULD BE DEVELOPED IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
5. LOCATE SIGNS AT INTERSECTIONS PER MUTCD FIG. 2A-2.
6. FOR SIGNING AT ACTIVE VEHICLE BARRIERS, SEE THE FOLLOWING:
   C9.10 FOR SIGNS AND SIGNALS SAFETY SYSTEM
   C3.17 AND 18 FOR PRESENCE DETECTION SAFETY SYSTEM
   C3.08 AND C3.16 FOR BARRIER NORMALLY CLOSED SAFETY SYSTEM




## TYPICAL ONE WAY INTERSECTION SIGNING

NOT TO SCALE

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US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

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DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1 : 1 | DATE: NOV 2007 | SOLICITATION NO.: W912HN-07-X-6204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE: .

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

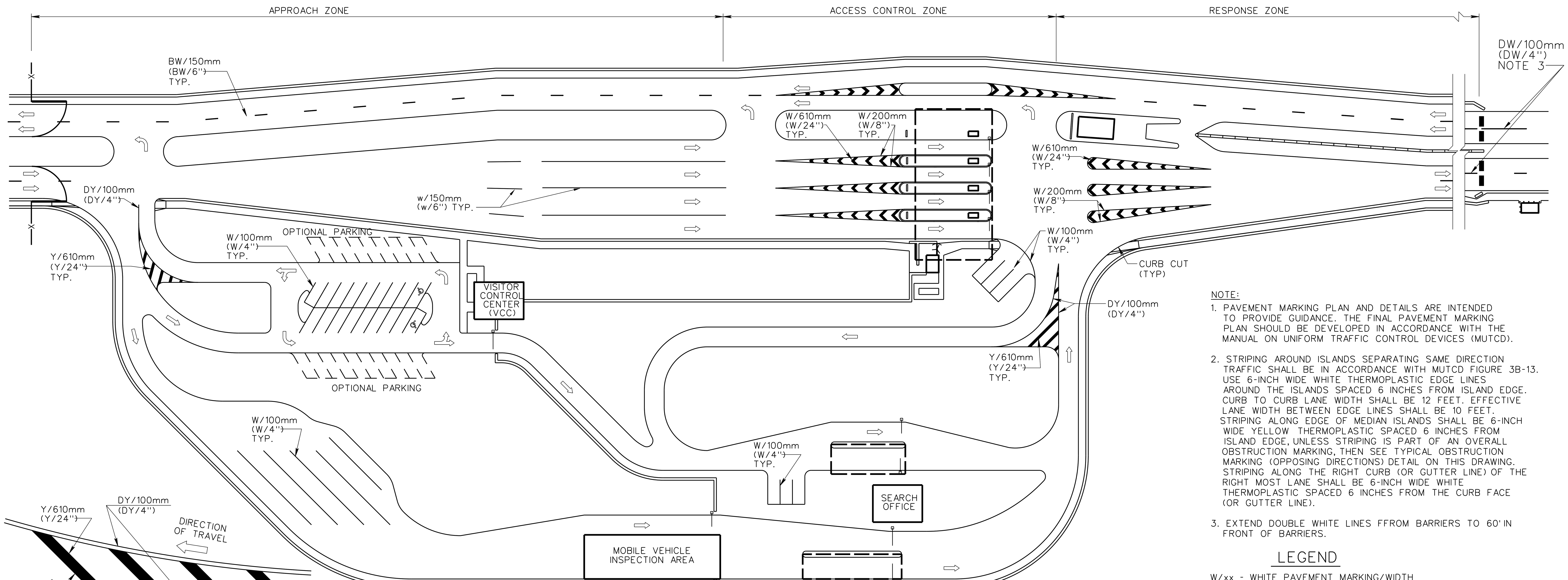
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

SITE PLAN
SIGN DETAILS AND TYPICAL SIGN LAYOUT

SHEET REFERENCE NUMBER
C9.13



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




## TYPICAL ACP PAVEMENT MARKINGS

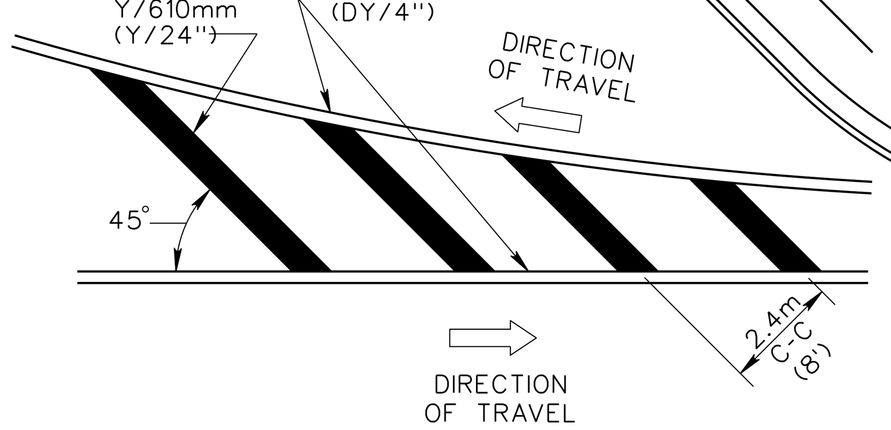
NOT TO SCALE

NOTE:

1. PAVEMENT MARKING PLAN AND DETAILS ARE INTENDED TO PROVIDE GUIDANCE. THE FINAL PAVEMENT MARKING PLAN SHOULD BE DEVELOPED IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
2. STRIPING AROUND ISLANDS SEPARATING SAME DIRECTION TRAFFIC SHALL BE IN ACCORDANCE WITH MUTCD FIGURE 3B-13. USE 6-INCH WIDE WHITE THERMOPLASTIC EDGE LINES AROUND THE ISLANDS SPACED 6 INCHES FROM ISLAND EDGE. CURB TO CURB LANE WIDTH SHALL BE 12 FEET. EFFECTIVE LANE WIDTH BETWEEN EDGE LINES SHALL BE 10 FEET. STRIPING ALONG EDGE OF MEDIAN ISLANDS SHALL BE 6-INCH WIDE YELLOW THERMOPLASTIC SPACED 6 INCHES FROM ISLAND EDGE, UNLESS STRIPING IS PART OF AN OVERALL OBSTRUCTION MARKING, THEN SEE TYPICAL OBSTRUCTION MARKING (OPPOSING DIRECTIONS) DETAIL ON THIS DRAWING. STRIPING ALONG THE RIGHT CURB (OR GUTTER LINE) OF THE RIGHT MOST LANE SHALL BE 6-INCH WIDE WHITE THERMOPLASTIC SPACED 6 INCHES FROM THE CURB FACE (OR GUTTER LINE).
3. EXTEND DOUBLE WHITE LINES FFROM BARRIERS TO 60' IN FRONT OF BARRIERS.

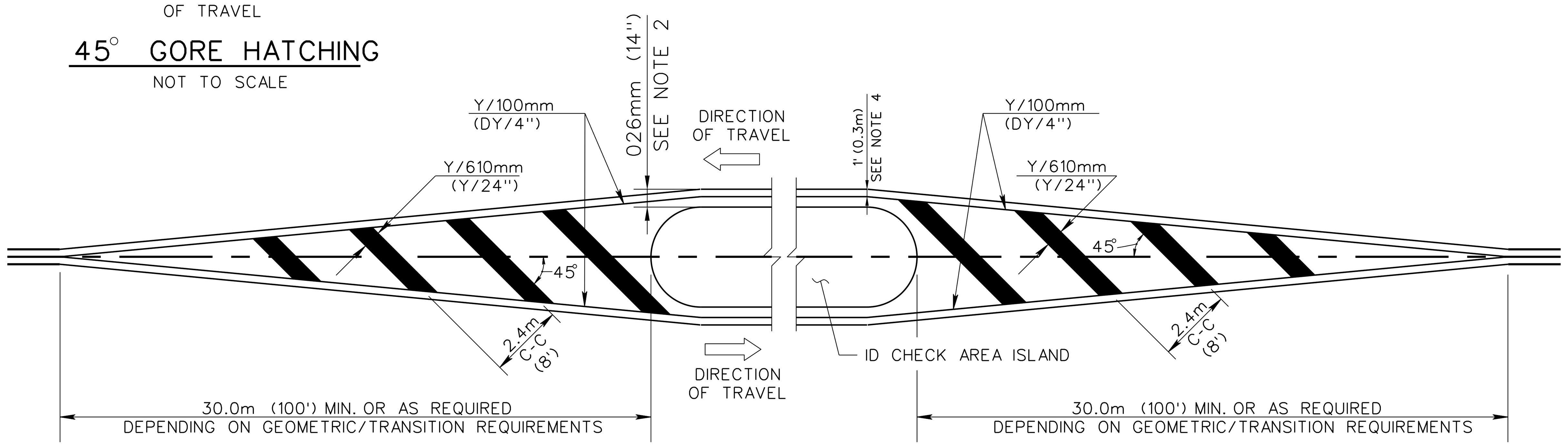
### LEGEND

W/xx - WHITE PAVEMENT MARKING/WIDTH
Y/xx - YELLOW PAVEMENT MARKING/WIDTH
BW/xx - BROKEN WHITE PAVEMENT MARKING/WIDTH
DY/xx - DOUBLE YELLOW PAVEMENT MARKING/WIDTH



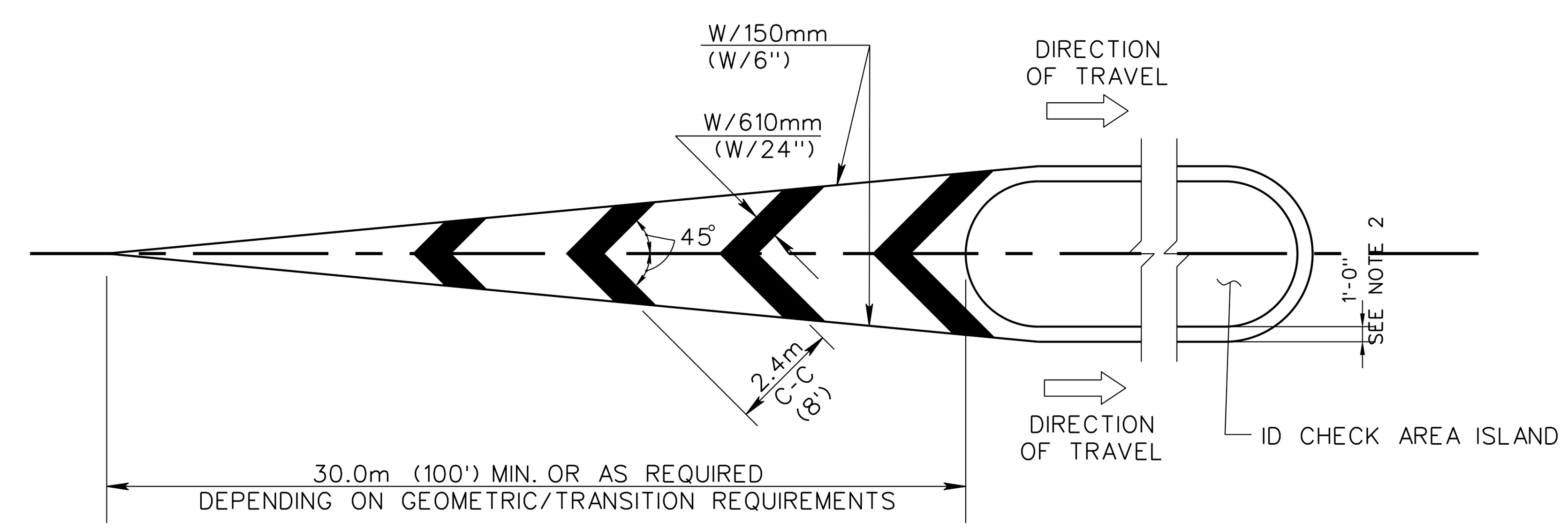

## 45° GORE HATCHING

NOT TO SCALE



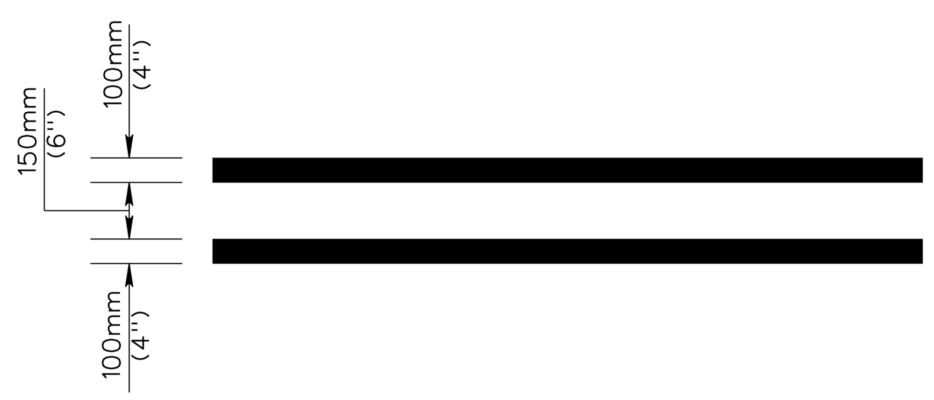

## TYPICAL OBSTRUCTION MARKINGS (OPPOSING DIRECTIONS)

NOT TO SCALE



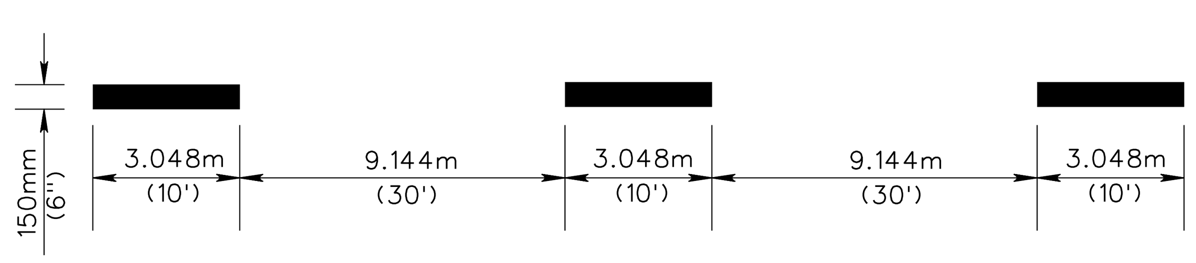

## TYPICAL OBSTRUCTION MARKINGS (SAME DIRECTION)

NOT TO SCALE



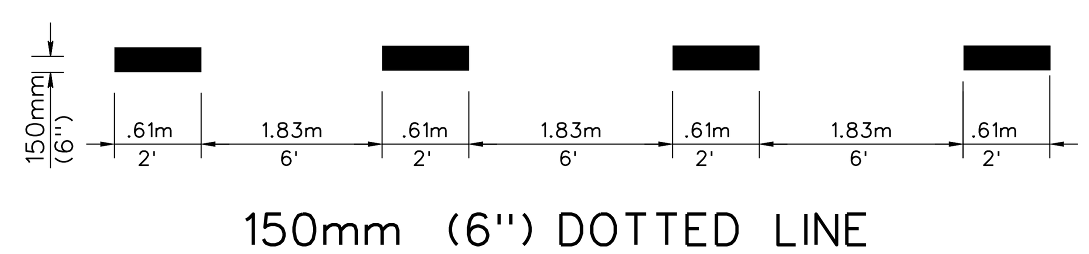

## 100mm (4") DOUBLE YELLOW/WHITE LINE

NOT TO SCALE




## 150mm (6") BROKEN LANE LINE

NOT TO SCALE




## 150mm (6") DOTTED LINE

NOT TO SCALE

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$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

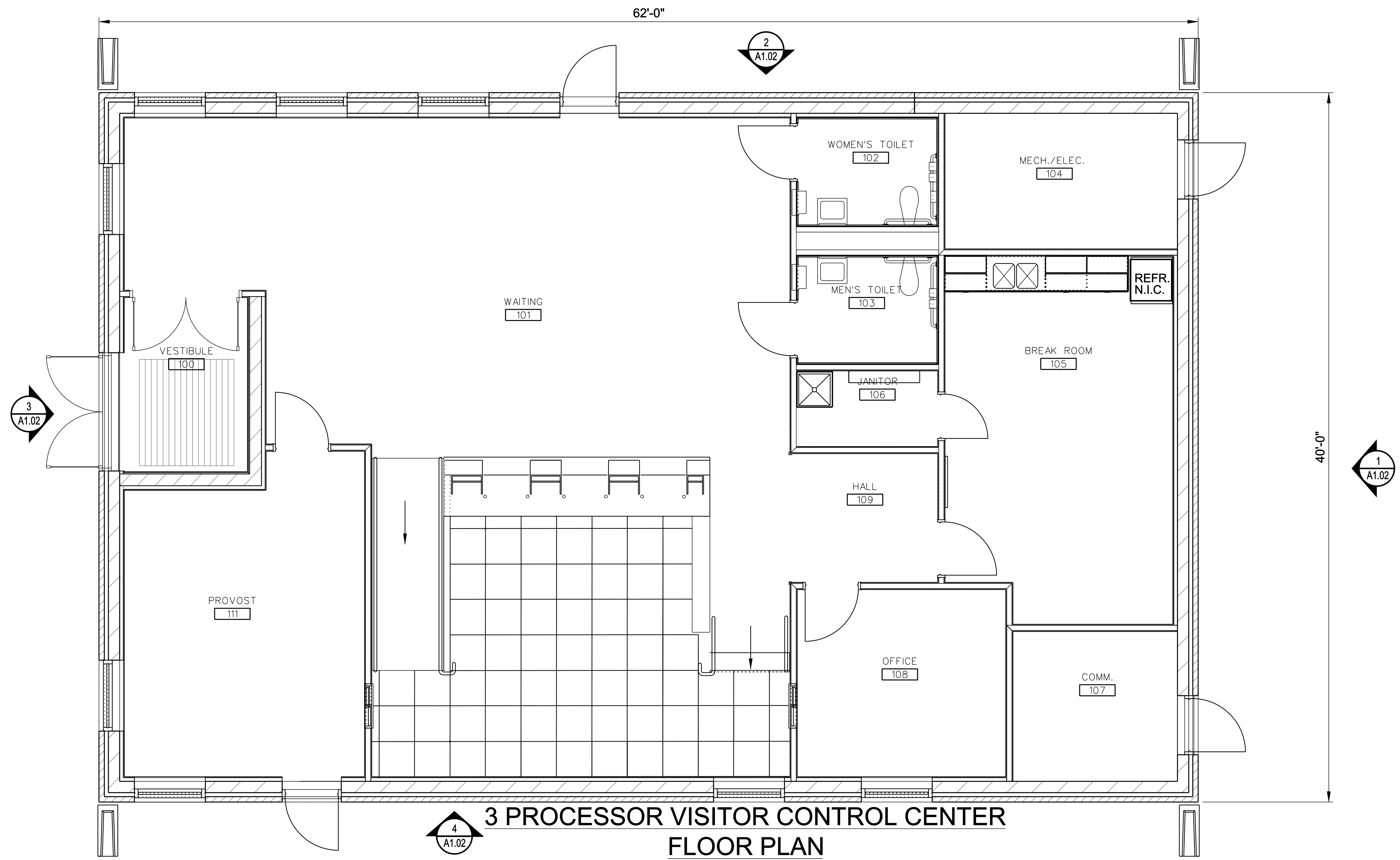
DESIGNED BY: X.X.X. | DATE: NOV 2007 | DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | CATEGORY CODE: X | SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

PAVEMENT MARKING DETAILS

SHEET REFERENCE NUMBER
C9.14
SHEET 36 OF 60




# 3 PROCESSOR VISITOR CONTROL CENTER FLOOR PLAN

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

GENERAL NOTES:

1. See BIM drawings for construction details. BIM drawings for Access Control Points are maintained by the Center of Standardization for Access Control Points (COS for ACPs) located in the Omaha District.

2. The VCC is the only building at the ACP that must meet the requirements of UFC 4-010-01 "DOD Minimum Antiterrorist Standards for Buildings". VCC's that are projected to have 11 or more people in them on a routine basis are considered to be Inhabited Buildings within an uncontrolled perimeter for the purposes of UFC 4-010-01. The COS for ACPs maintains designs for the following two types of VCC (note the following standoff distances apply only if the VCC will be routinely inhabited by 11 or more people):
   a. VCC using conventional construction, which requires a standoff distance per UFC 4-010-01 of 82 feet from parking areas and roadways.
   b. VCC using hardened construction, which requires a standoff distance of 50 feet from parking areas and roadways.

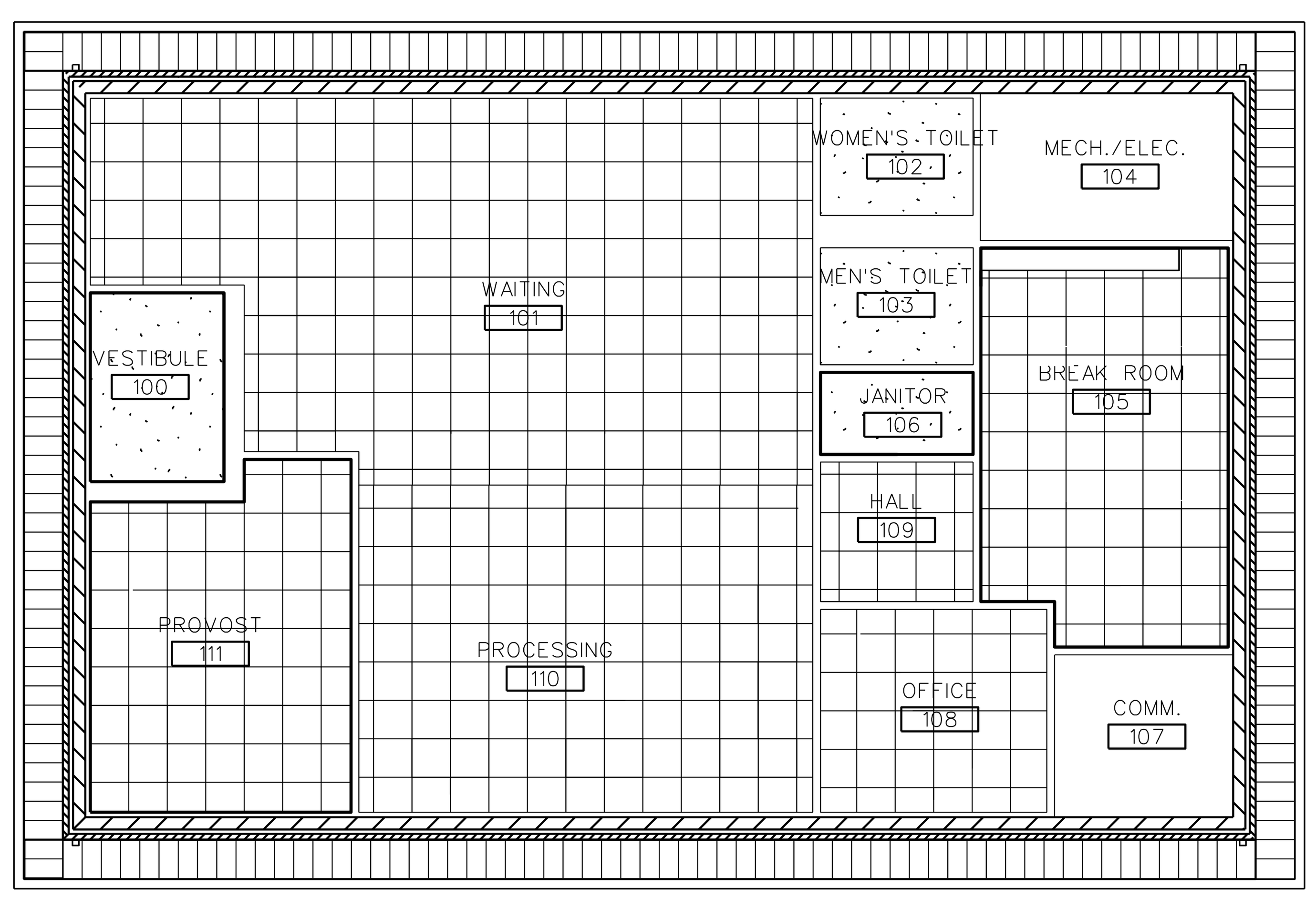
3. The VCC shown on this drawing includes spaces for 3 visitor processing stations. The COS for ACPs maintains VCC designs for 6 and 9 processing stations also. VCC dimensions are as follows:
   a. VCC with 3 visitor processing stations - 62' x 40'
   b. VCC with 6 visitor processing stations - 74' x 40'
   c. VCC with 9 visitor processing stations - 86' x 40'

4. The VCC must be Americans with Disabilities Act (ADA) compliant.

5. Exterior masonry patterning and coursing to be determined during design.

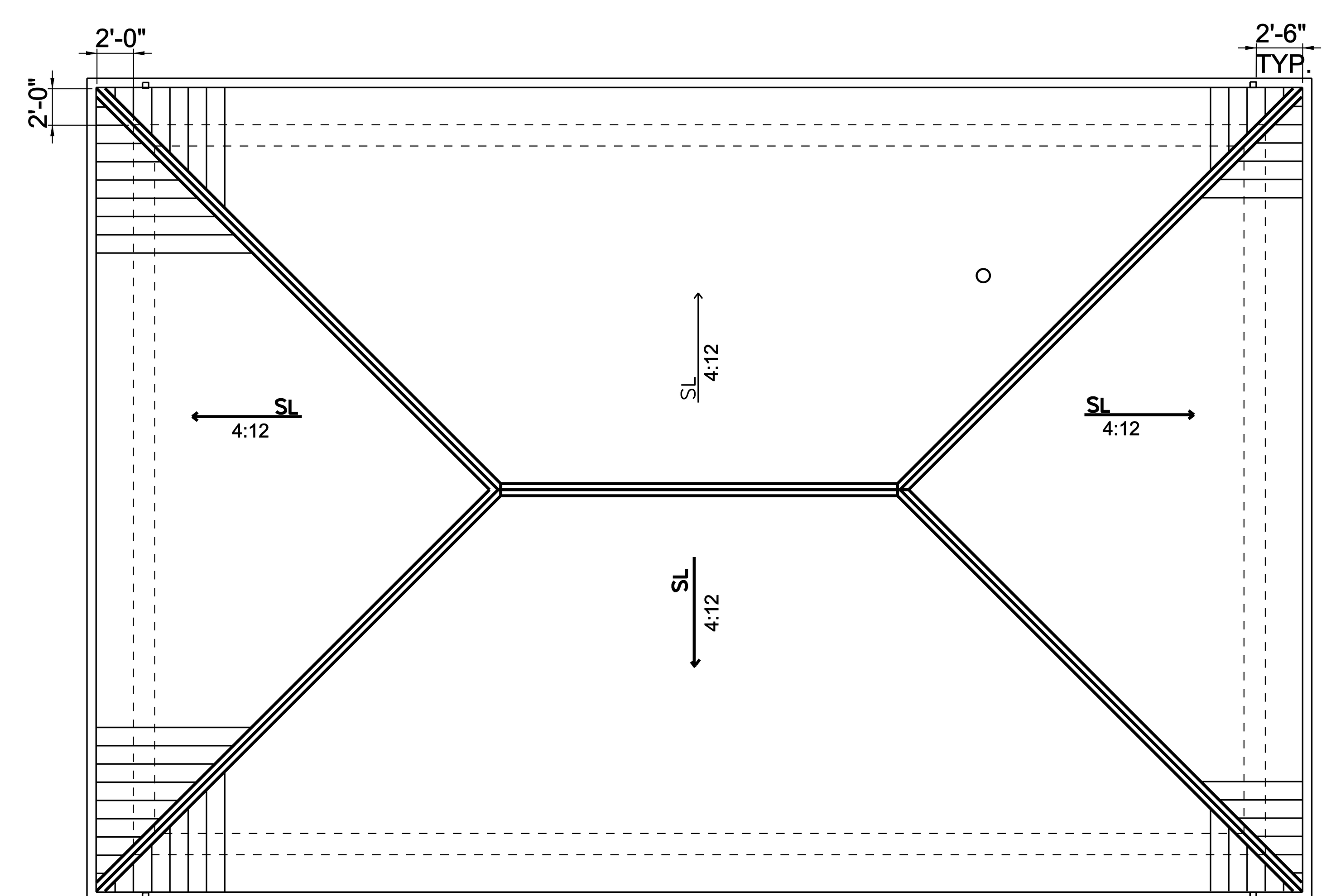
6. Luminaire and diffuser types and locations to be determined during design.

7. All windows should be tinted.




REFLECTED CEILING PLAN

SCALE: 1/8" = 1'-0"




ROOF PLAN

SCALE: 1/8" = 1'-0"

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W912HN-07-X-6204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1 : 1 | PLOT DATE: .

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

VISITOR CONTROL CENTER (VCC)
3 PROCESSOR VERSION
FLOOR PLAN

SHEET REFERENCE NUMBER
A1.01
SHEET 37 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$


US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
SIZE: ANSI D
PLOT SCALE: 1 : 1
DATE: NOV 2007
SOLICITATION NO.: W912HN-07-X-6204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE: .

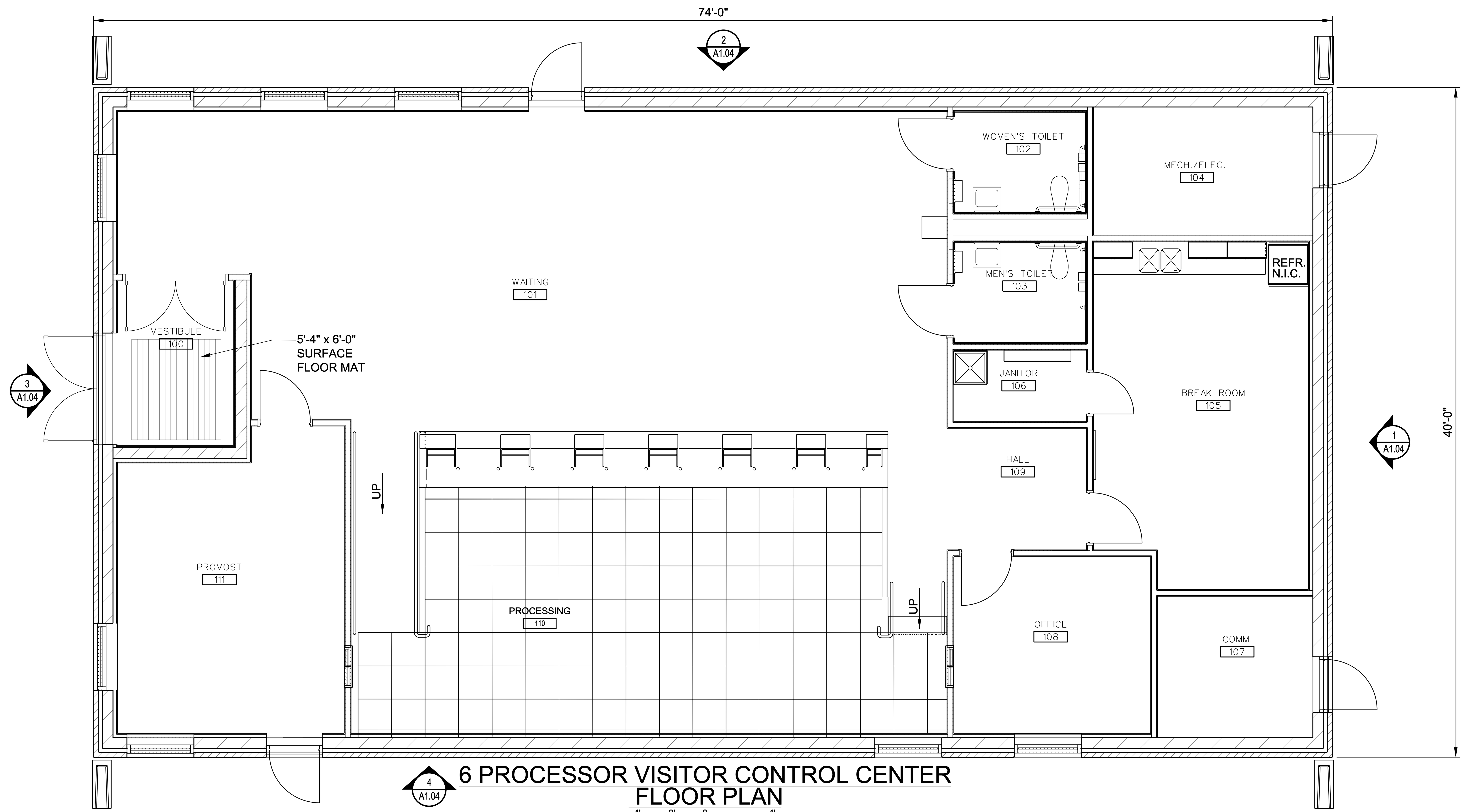
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

VISITOR CONTROL CENTER (VCC)
3 PROCESSOR VERSION
BUILDING ELEVATIONS

SHEET REFERENCE NUMBER
A1.02
SHEET 38 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




4 A1.04 **6 PROCESSOR VISITOR CONTROL CENTER FLOOR PLAN**

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

GENERAL NOTES:

1. See BIM drawings for construction details. BIM drawings for Access Control Points are maintained by the Center of Standardization for Access Control Points (COS for ACPs) located in the Omaha District.

2. The VCC is the only building at the ACP that must meet the requirements of UFC 4-010-01 "DOD Minimum Antiterrorist Standards for Buildings". VCC's that are projected to have 11 or more people in them on a routine basis are considered to be Inhabited Buildings within an uncontrolled perimeter for the purposes of UFC 4-010-01. The COS for ACPs maintains designs for the following two types of VCC (note the following standoff distances apply only if the VCC will be routinely inhabited by 11 or more people):
   a. VCC using conventional construction, which requires a standoff distance per UFC 4-010-01 of 82 feet from parking areas and roadways.
   b. VCC using hardened construction, which requires a standoff distance of 50 feet from parking areas and roadways.

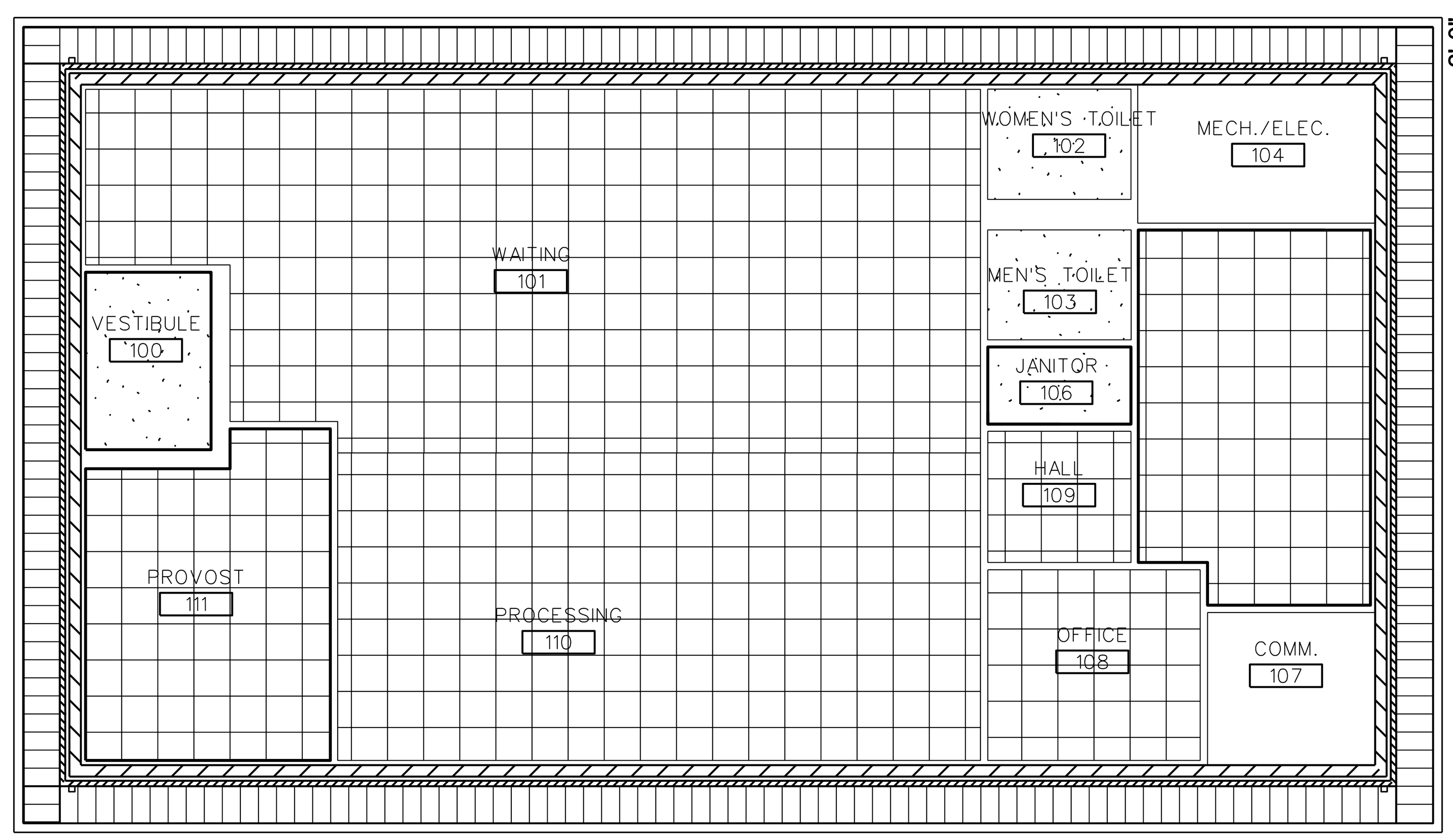
3. The VCC shown on this drawing includes spaces for 3 visitor processing stations. The COS for ACPs maintains VCC designs for 6 and 9 processing stations also. VCC dimensions are as follows:
   a. VCC with 3 visitor processing stations - 62' x 40'
   b. VCC with 6 visitor processing stations - 74' x 40'
   c. VCC with 9 visitor processing stations - 86' x 40'

4. The VCC must be Americans with Disabilities Act (ADA) compliant.

5. Exterior masonry patterning and coursing to be determined during design.

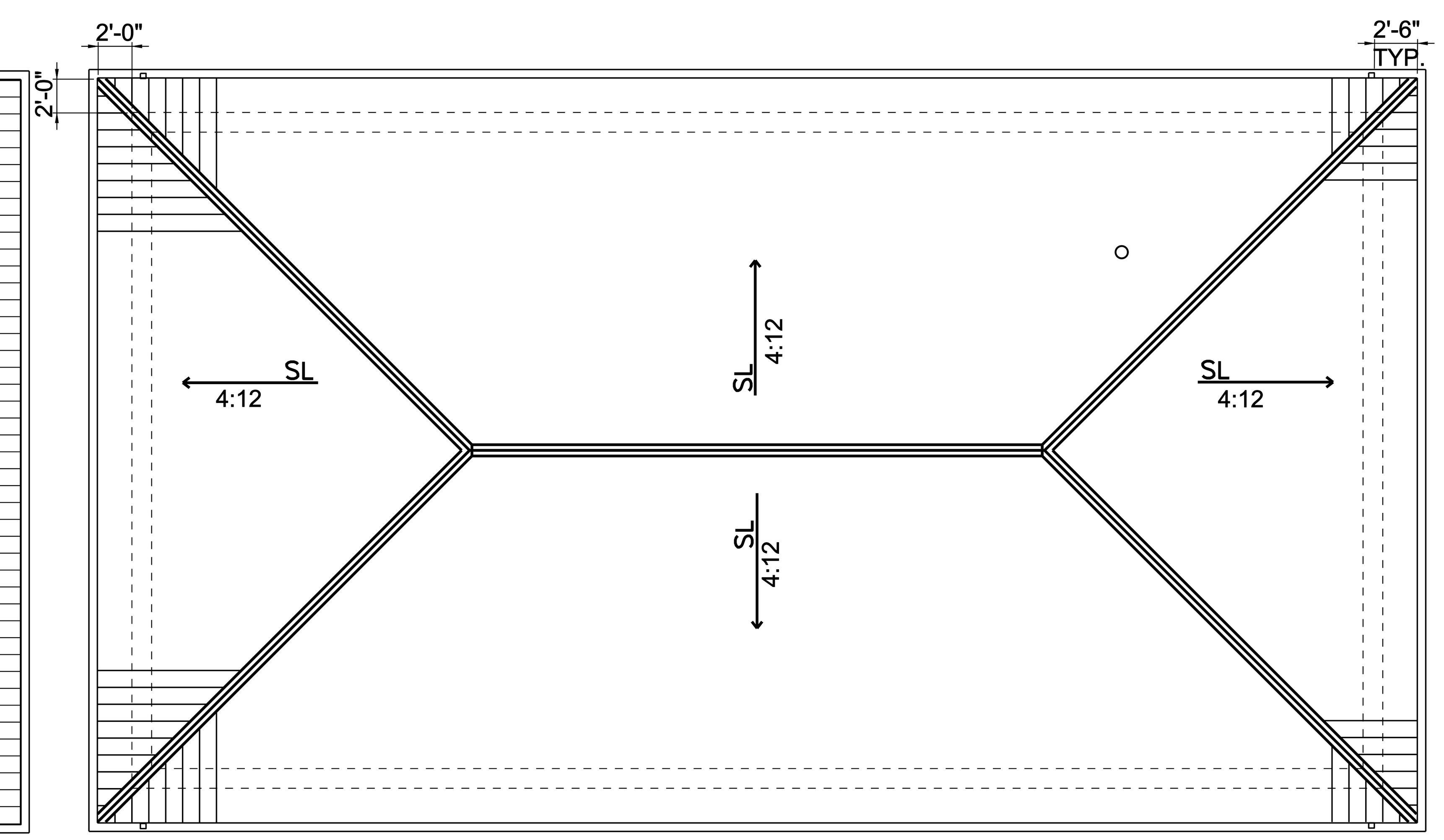
6. Luminaire and diffuser types and locations to be determined during design.

7. All windows should be tinted.




**REFLECTED CEILING PLAN**

SCALE: 1/8" = 1'-0"




**ROOF PLAN**

SCALE: 1/8" = 1'-0"

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
| --- | --- | --- | --- |

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

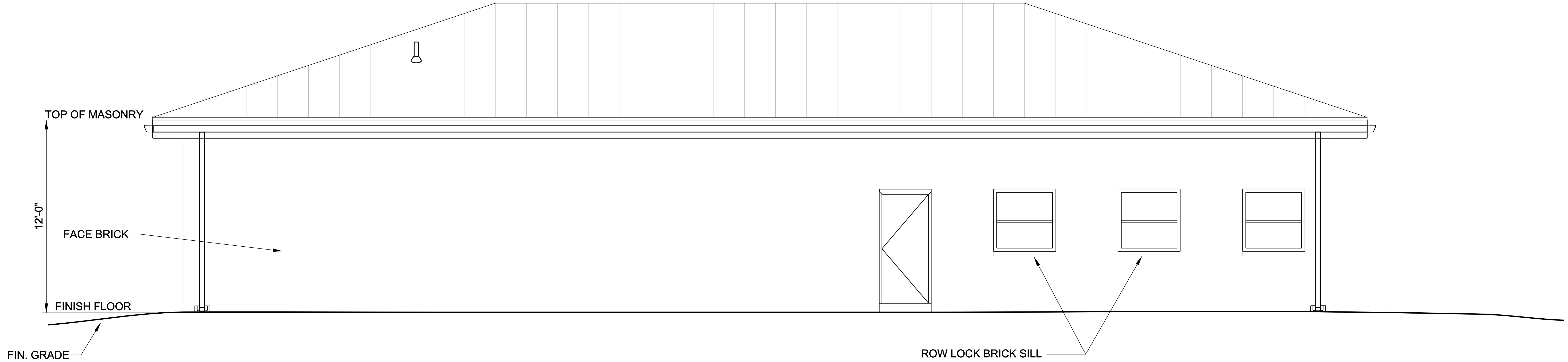
FACILITIES STANDARDIZATION PROGRAM ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

VISITOR CONTROL CENTER (VCC) 6 PROCESSOR VERSION FLOOR PLAN

SHEET REFERENCE NUMBER A1.03

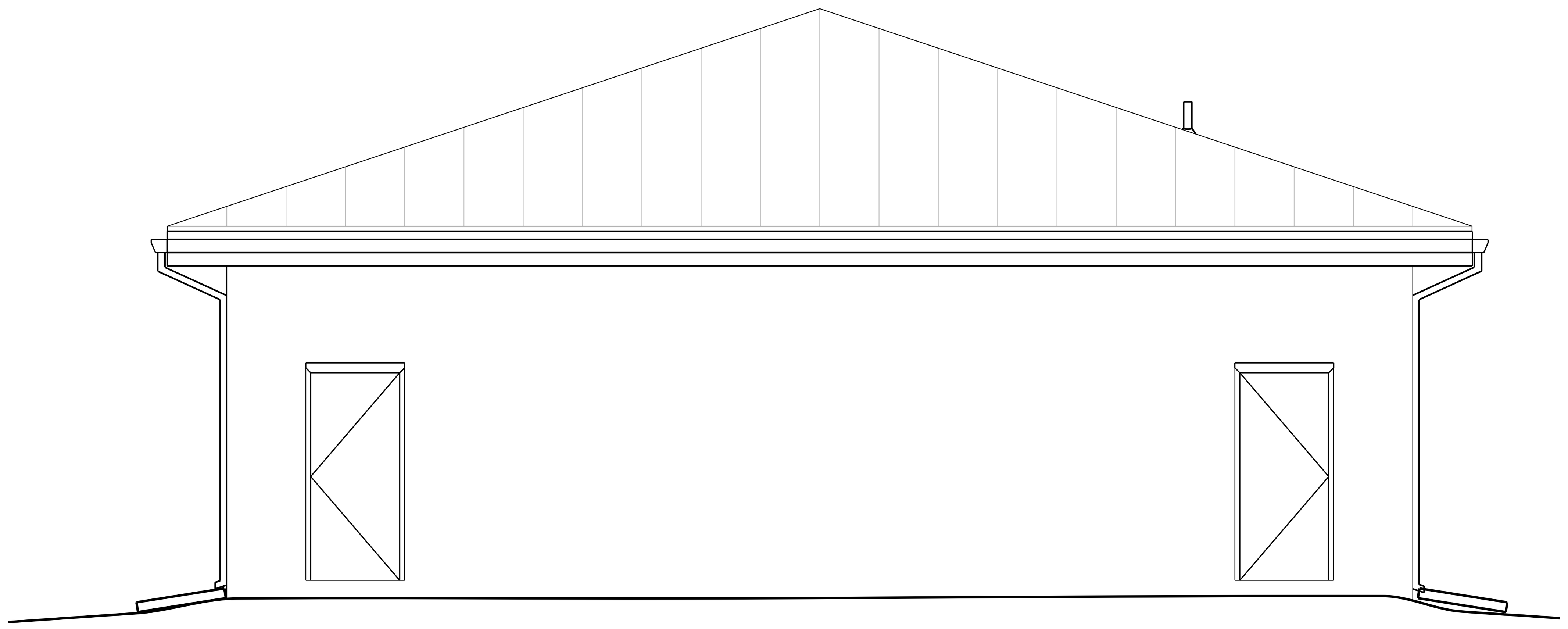
SHEET 39 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$



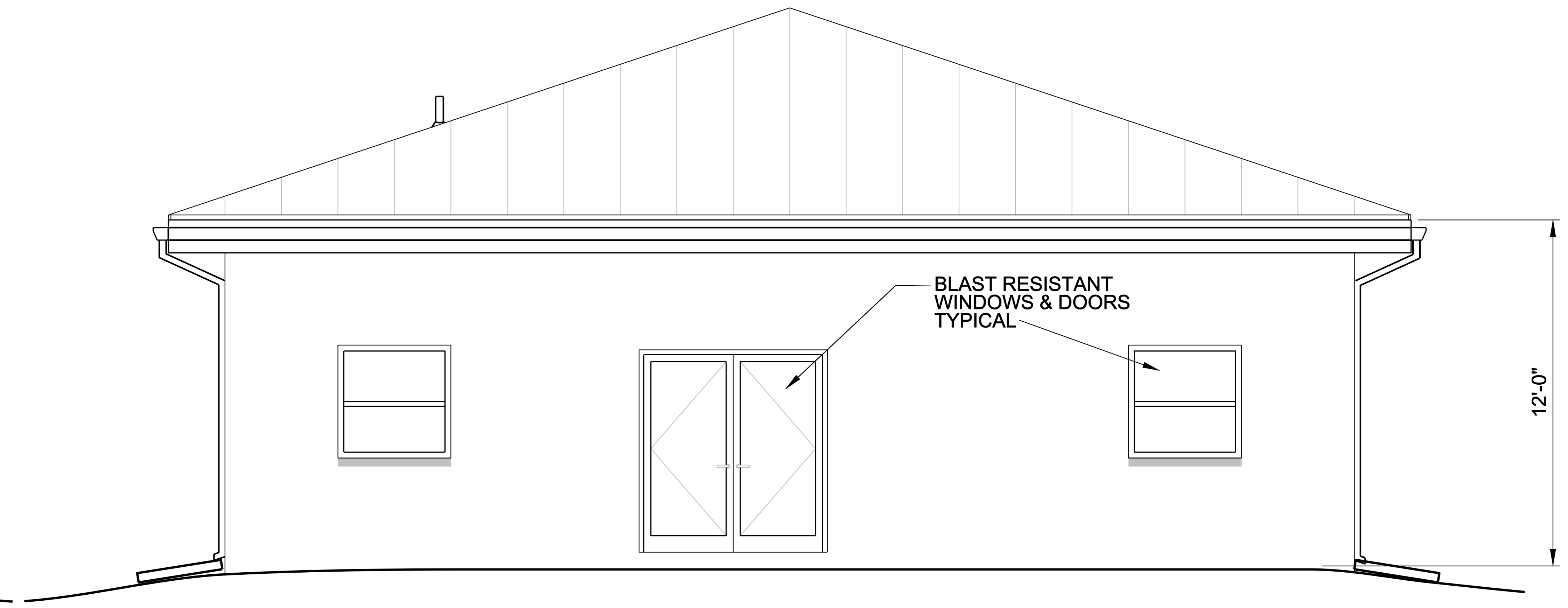

## VCC ELEVATION
2 / A1.03

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



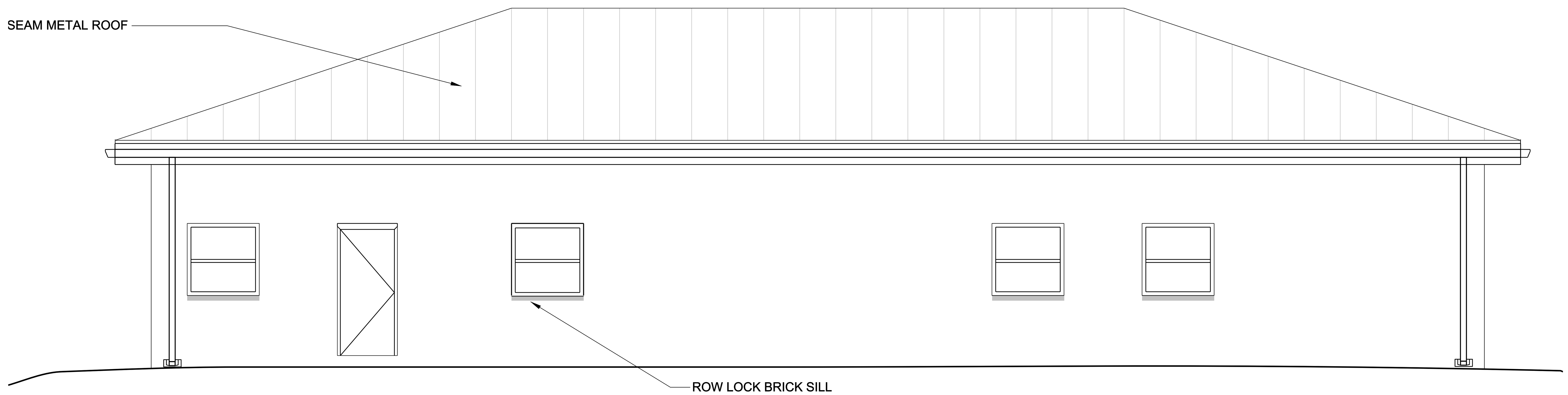
## VCC ELEVATION
1 / A1.03

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




## VCC ELEVATION
3 / A1.03

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




## VCC ELEVATION
4 / A1.03

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

4' 2' 0 4'

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

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
PLOT SCALE: 1 : 1
SIZE: ANSI D
DATE: NOV 2007
SOLICITATION NO.: W912HN-07-X-6204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE: .

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS
VISITOR CONTROL CENTER (VCC)
6 PROCESSOR VERSION
BUILDING ELEVATIONS

SHEET
REFERENCE
NUMBER
A1.04
SHEET 40 OF 60

$$DGNSPEC$$
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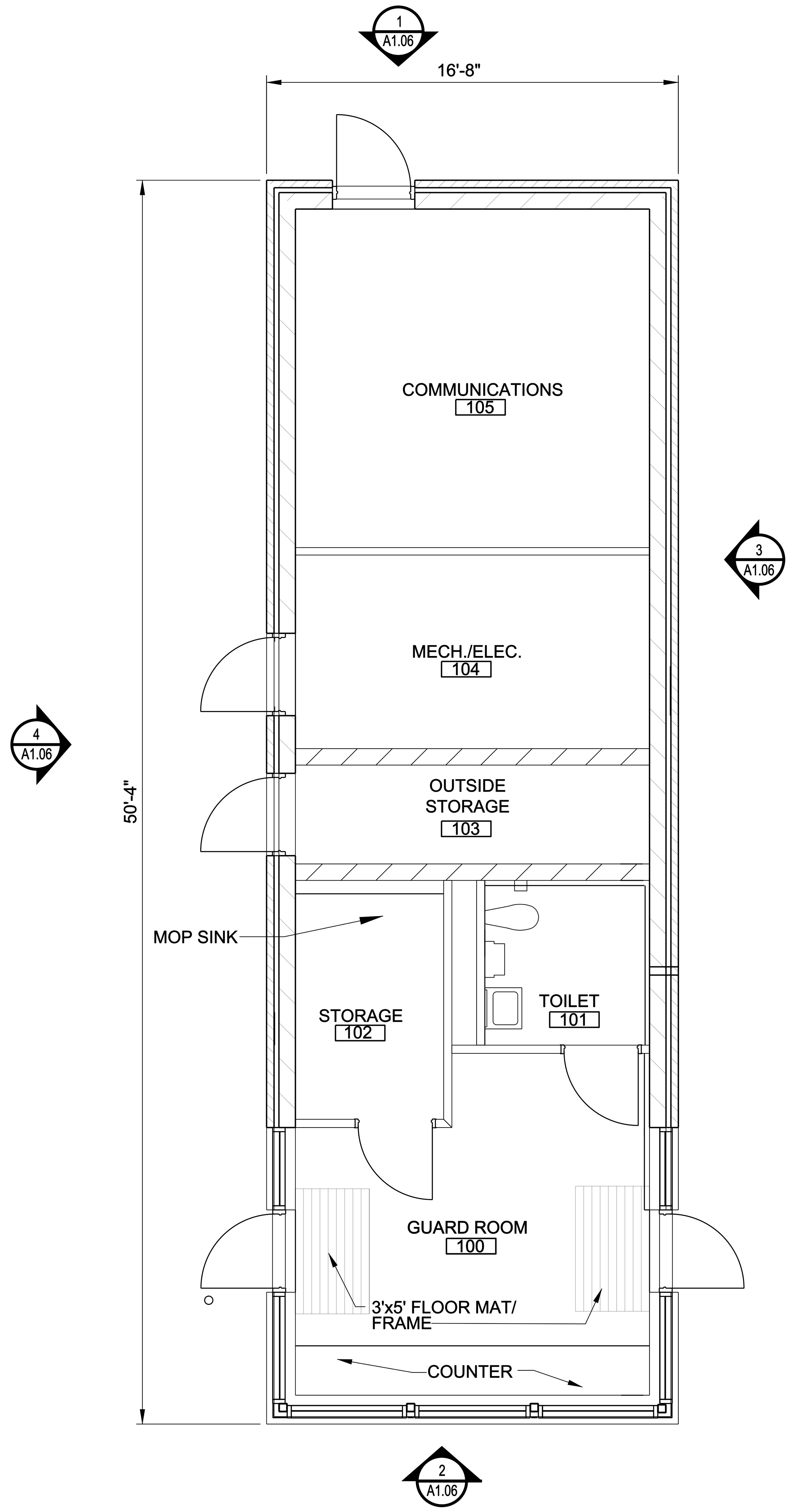
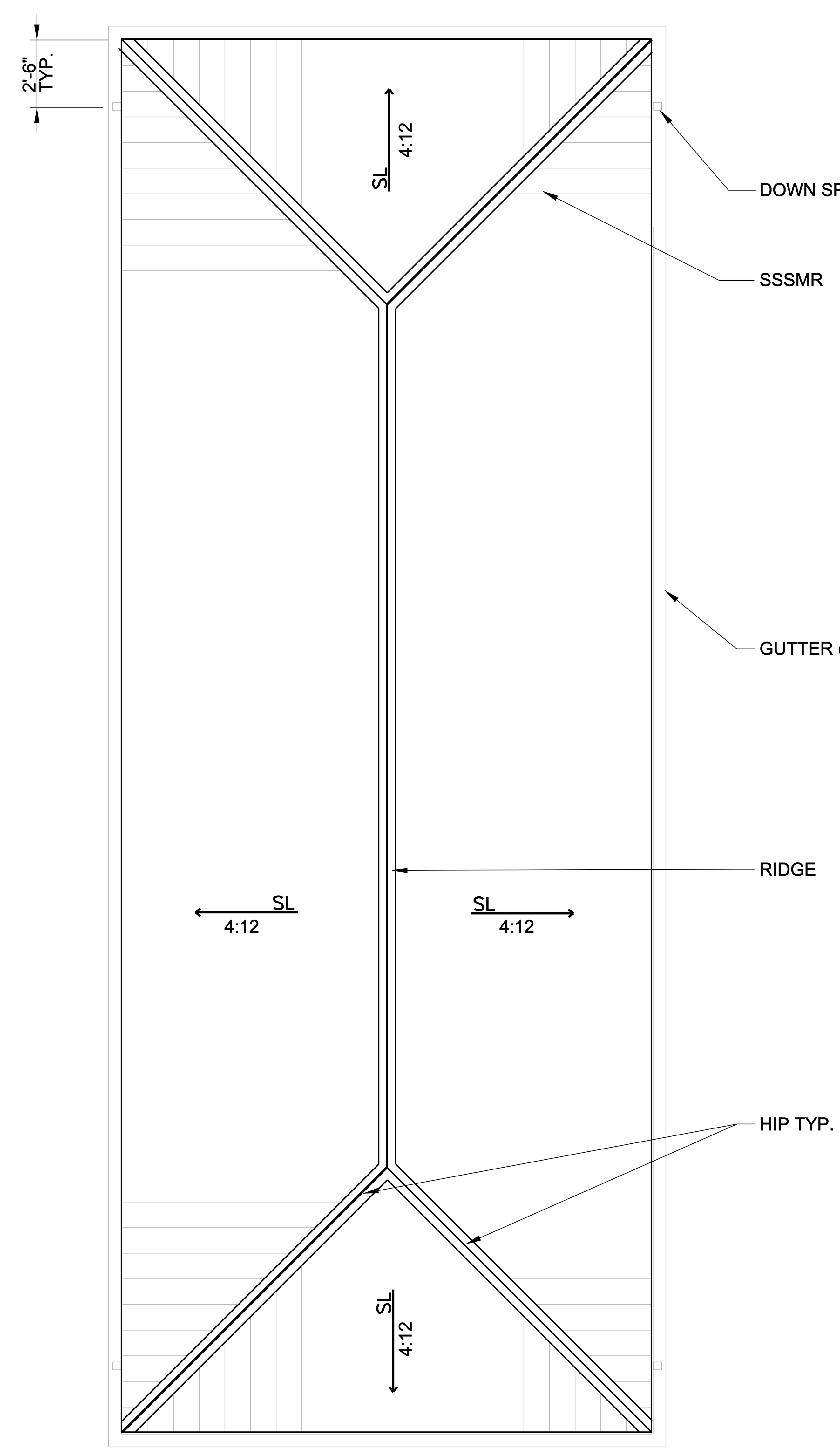


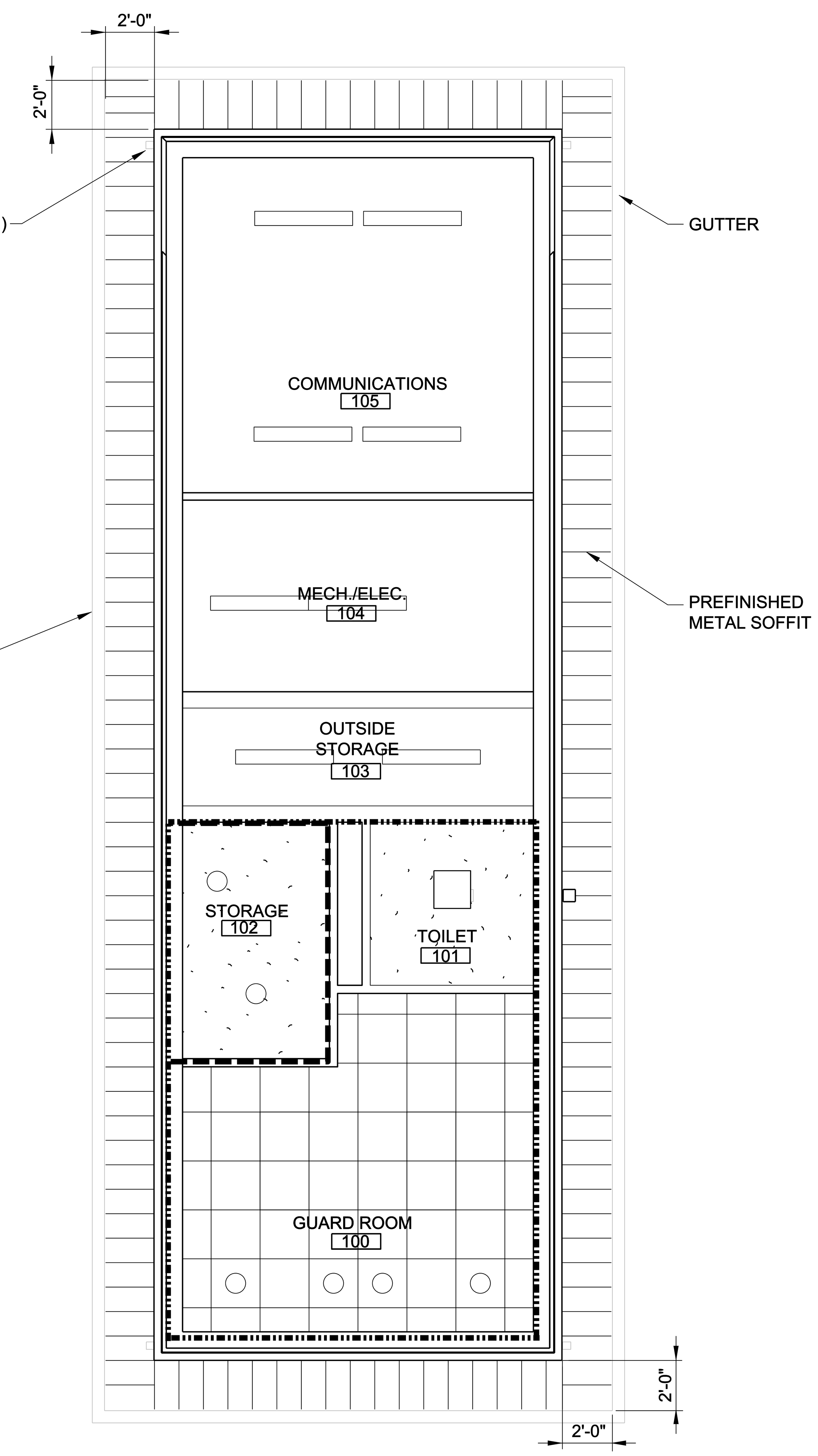

# FLOOR PLAN

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




# ROOF PLAN

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




# REFLECTED CEILING PLAN

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

## GENERAL NOTES:

1. See BIM drawings for construction details. BIM drawings for Access Control Points are maintained by the Center of Standardization for Access Control Points (COS for ACPs) located in the Omaha District.
2. The building, doors, widows, and frames around the guard areas shall meet Level 3 Ballistics Standard UL-752 as a minimum.
3. Exterior masonry patterning and coursing to be determined during design.
4. Luminaire and diffuser types and locations to be determined during design.
5. All windows should be tinted. Interior surfaces in the Gatehouse should be dark in color.

## LEGEND:

- GWB CEILING
- 2 X 2 ACOUSTICAL CEILING TILE
- ONE-HOUR FIRE RATED WALL & CEILING
- BULLET RESISTANT WALL

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

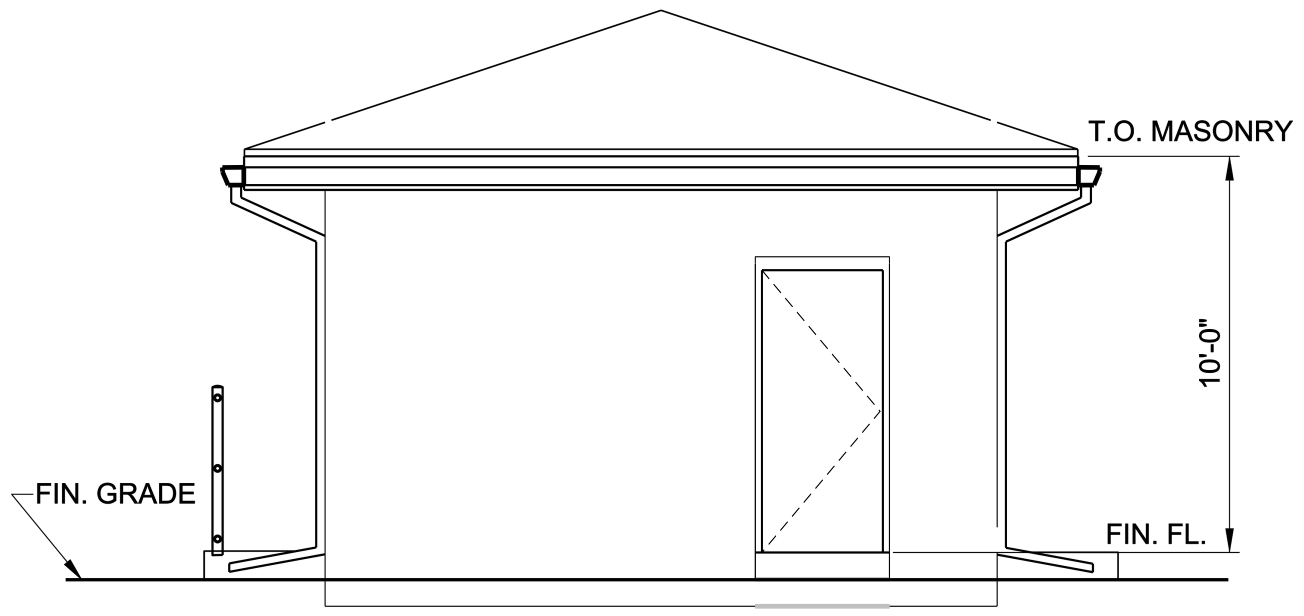
DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: 8001A105.dgn | SIZE: ANSI D | PLOT SCALE: | DATE: NOV 2008 | SOLICITATION NO.: W912HN-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE: 3/11/2009

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

GATEHOUSE
FLOOR PLAN, REFLECTED CEILING PLAN & ROOF PLAN

SHEET REFERENCE NUMBER
A1.05
SHEET 41 OF 60

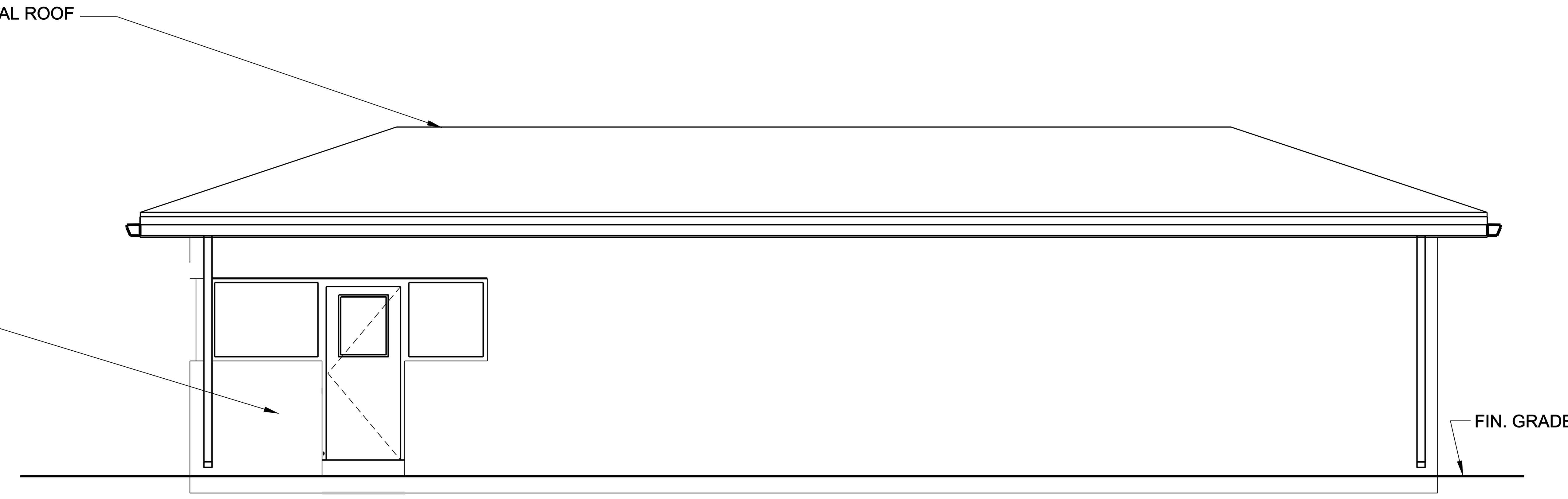
$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




BUILDING ELEVATION 1 / A1.05

4' 2' 0 4'

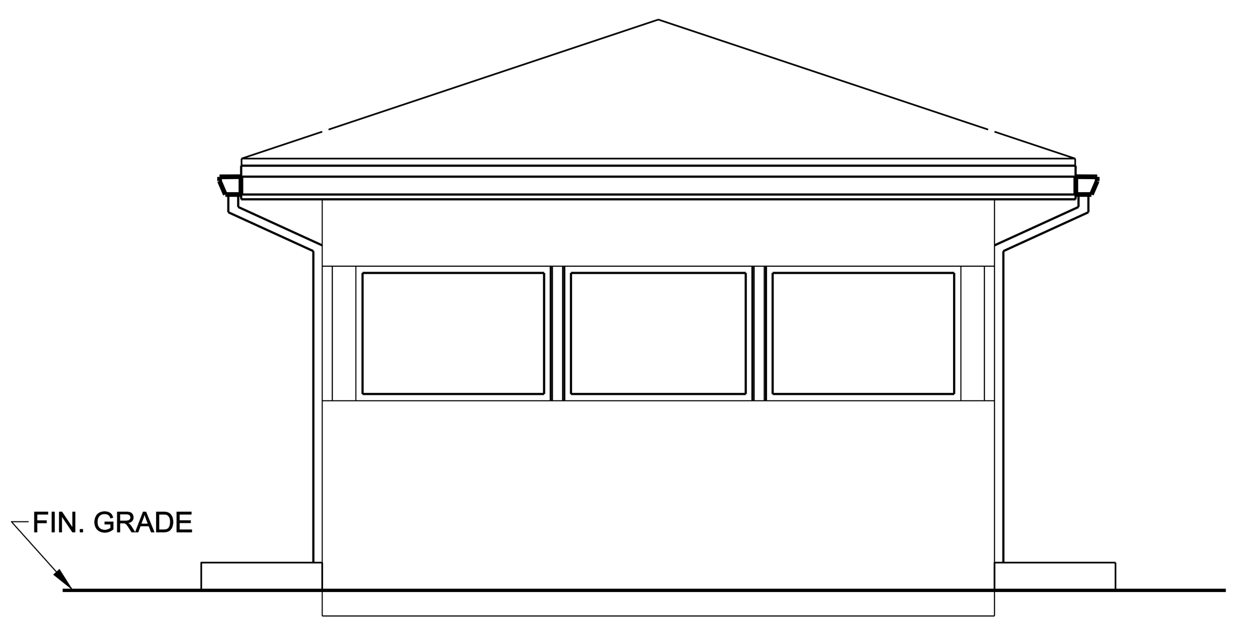
SCALE: 1/4" = 1'-0"




BUILDING ELEVATION 3 / A1.05

4' 2' 0 4'

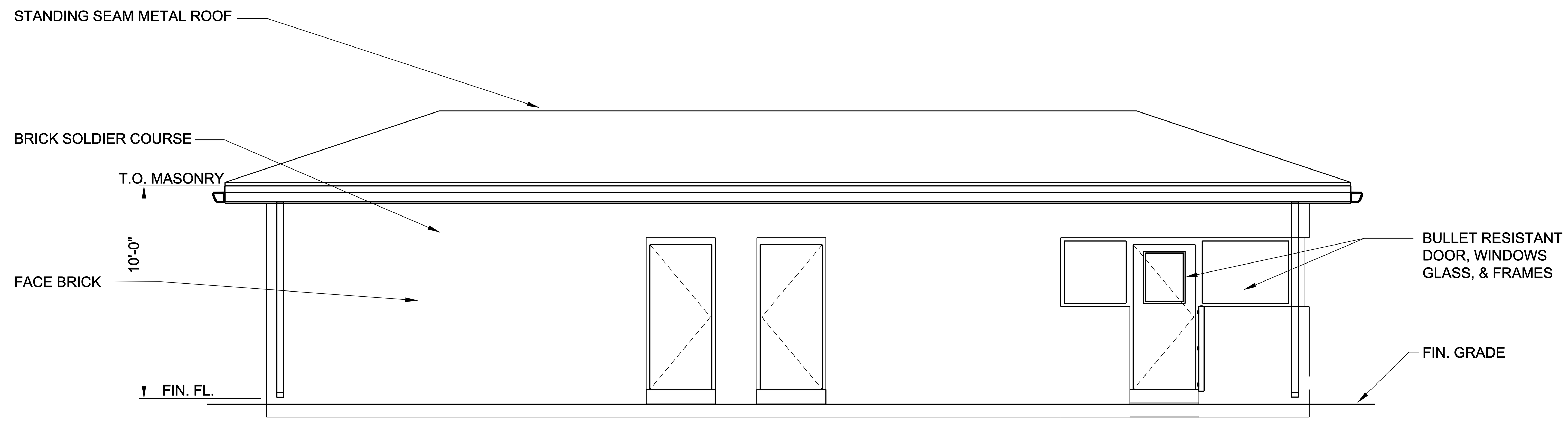
SCALE: 1/4" = 1'-0"




BUILDING ELEVATION 2 / A1.05

4' 2' 0 4'

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




BUILDING ELEVATION 4 / A1.05

4' 2' 0 4'

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

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
SIZE: ANSI D
PLOT SCALE: 1:1
DATE: NOV 2007
SOLICITATION NO.: W9128F-07-X-0204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

GATEHOUSE
BUILDING ELEVATIONS

SHEET REFERENCE NUMBER
A1.06
SHEET 42 OF 60

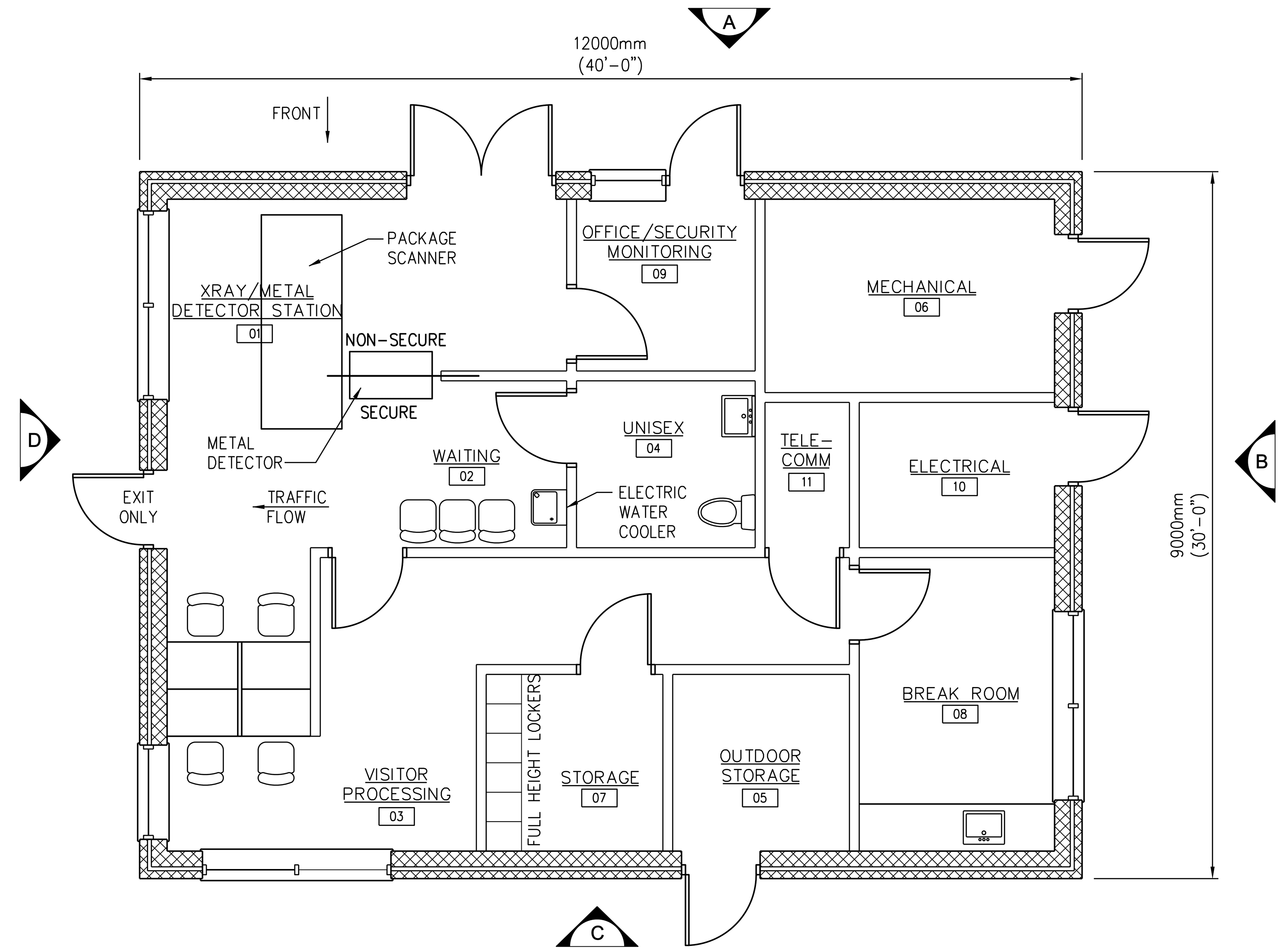
M:\Design_Standards\ACP Standards, Criteria and Drawings\Final Standard ACP Drawings_ March 2007\STANDARDS - SEPT 2008\DGN\0001A106.dgn

g6edxasg

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## GENERAL NOTES

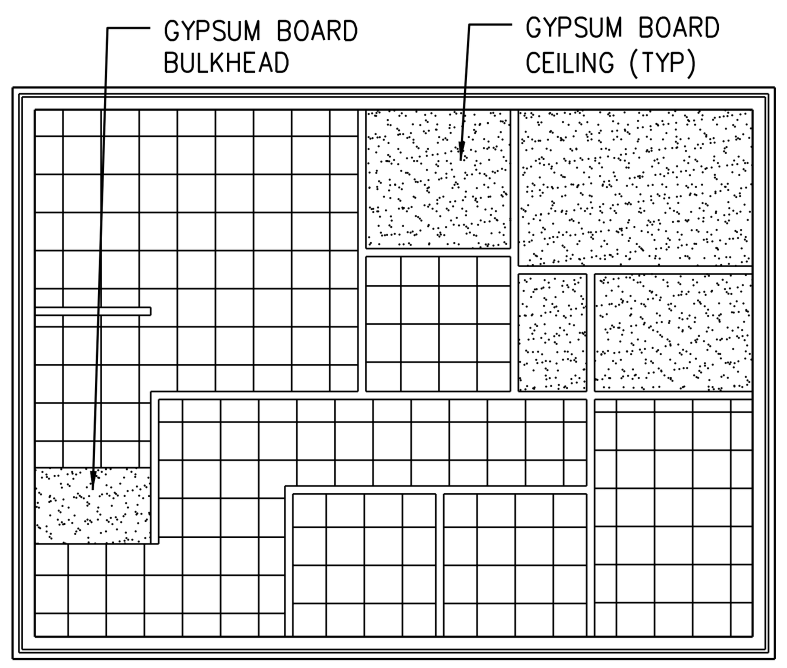
1. LINEAR DIMENSION REFERENCES ARE BASED ON THE RECOGNIZED BUILDING DESIGN MODULE OF 100mm = 4".
2. LOCATE INTERIOR DOOR FRAMES 4" FROM THE OUTSIDE FACE OF THE DOOR FRAME TO THE NEAREST INSIDE WALL CORNER UNLESS NOTED OTHERWISE.
3. LIGHTS AND DIFFUSERS ARE NOT SHOWN ON THE REFLECTED CEILING PLAN. QUANTITY AND LOCATIONS TO BE DETERMINED DURING DESIGN.
4. EXTERIOR MASONRY PATTERNING AND COURSING TO BE DETERMINED DURING DESIGN.
5. THE SEARCH OFFICE WILL INCLUDE A CONTROL CONSOLE WITH CCTV MONITORS, AN ANNUNCIATION PANEL, AND COMMUNICATIONS TO THE INSTALLATION'S CENTRAL SECURITY MONITORING STATION.
6. SIZE WAITING AREA FOR EXPECTED NUMBER OF SEARCHED VEHICLES.




SEARCH OFFICE WITH PACKAGE SCANNER AND METAL DETECTOR FLOOR PLAN

4' 2' 0 4'

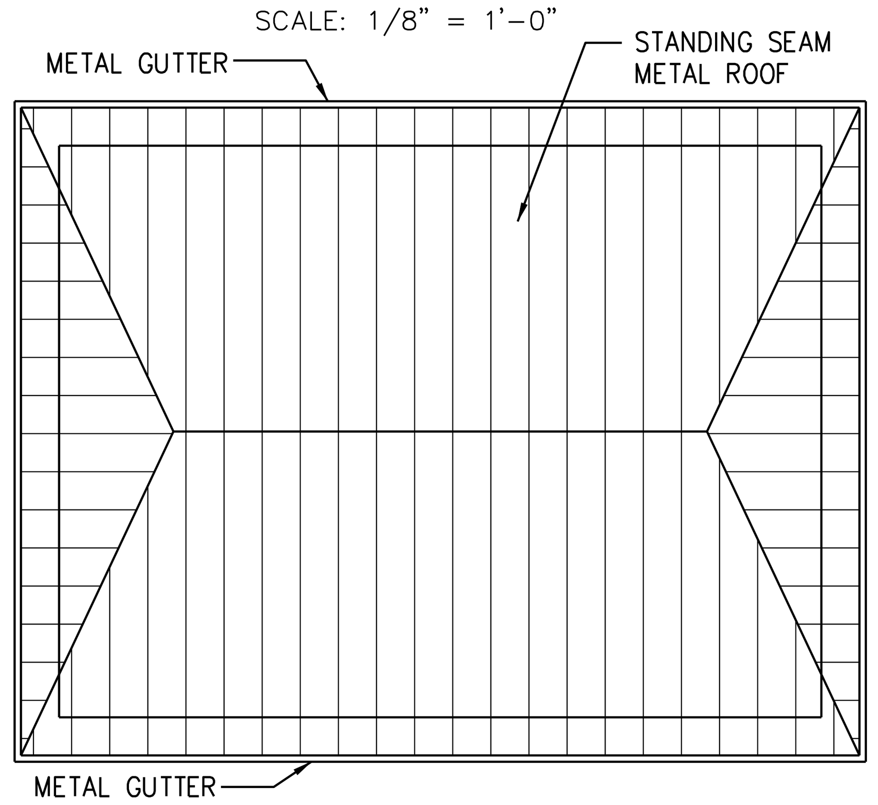
SCALE: 1/4" = 1'-0"




SEARCH OFFICE WITH PACKAGE SCANNER AND METAL DETECTOR REFLECTED CEILING PLAN

8' 4' 0 8'

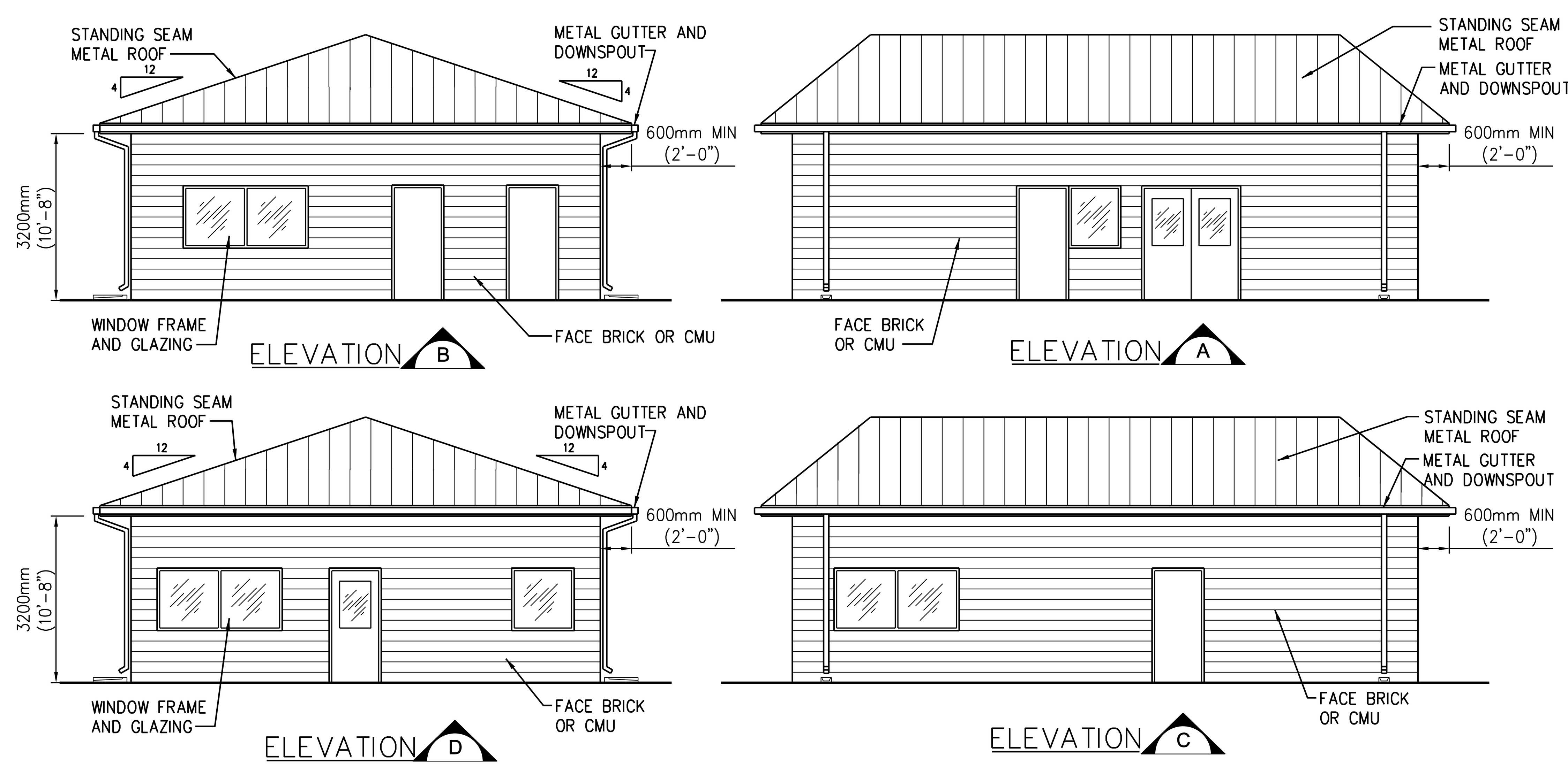
SCALE: 1/8" = 1'-0"




SEARCH OFFICE WITH PACKAGE SCANNER AND METAL DETECTOR ROOF PLAN

8' 4' 0 8'

SCALE: 1/8" = 1'-0"




SEARCH OFFICE WITH PACKAGE SCANNER AND METAL DETECTOR ELEVATIONS

8' 4' 0 8'

SCALE: 1/8" = 1'-0"

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | PLOT SCALE: 1:1 | SIZE: ANSI D

DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

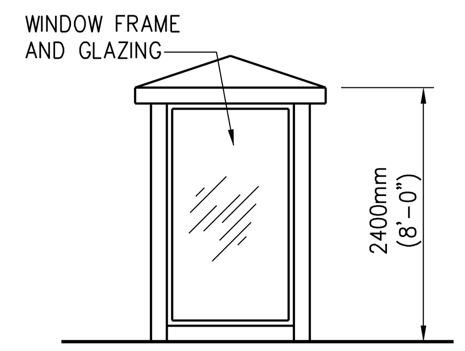
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ARCHITECTURAL
SEARCH OFFICE WITH PACKAGE SCANNER AND METAL DETECTOR

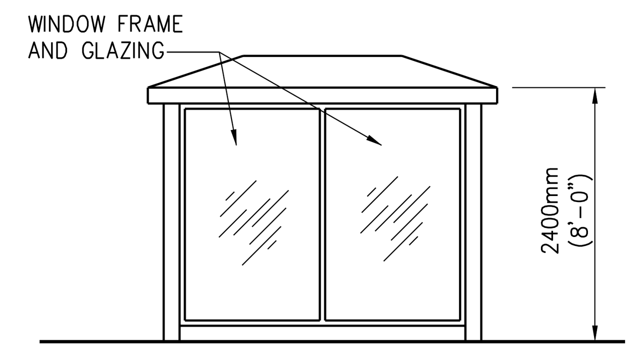
SHEET REFERENCE NUMBER
A1.07

## GENERAL NOTES

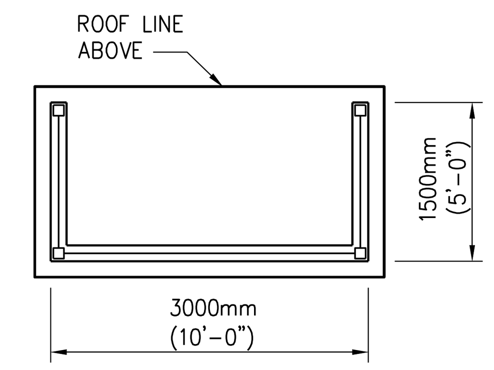
1. EXTERIOR MASONRY PATTERNING AND COURSING TO BE DETERMINED DURING DESIGN.
2. LUMINAIRE AND DIFFUER TYPES AND LOCATIONS TO BE DETERMINED DURING DESIGN.
3. SIZE WAITING ROOM FOR EXPECTED NUMBER OF VEHICLES TO BE SEARCHED.
4. FOR ACP's NOT REQUIRING A SEARCH OFFICE, A SEARCH AREA SHELTER MUST BE PROVIDED NEAR THE SEARCH LANE(S) TO SHELTER VEHICLE OCCUPANTS WHILE THEIR VEHICLE IS BEING SEARCHED. THE SHELTER MAY BE SIMILIAR TO BUS TYPE SHELTERS WITH SEE-THROUGH WALLS TO ALLOW SECURITY PERSONNEL TO OBSERVE VEHICLE OCCUPANTS DURING THE SEARCH.




SIDE ELEVATION



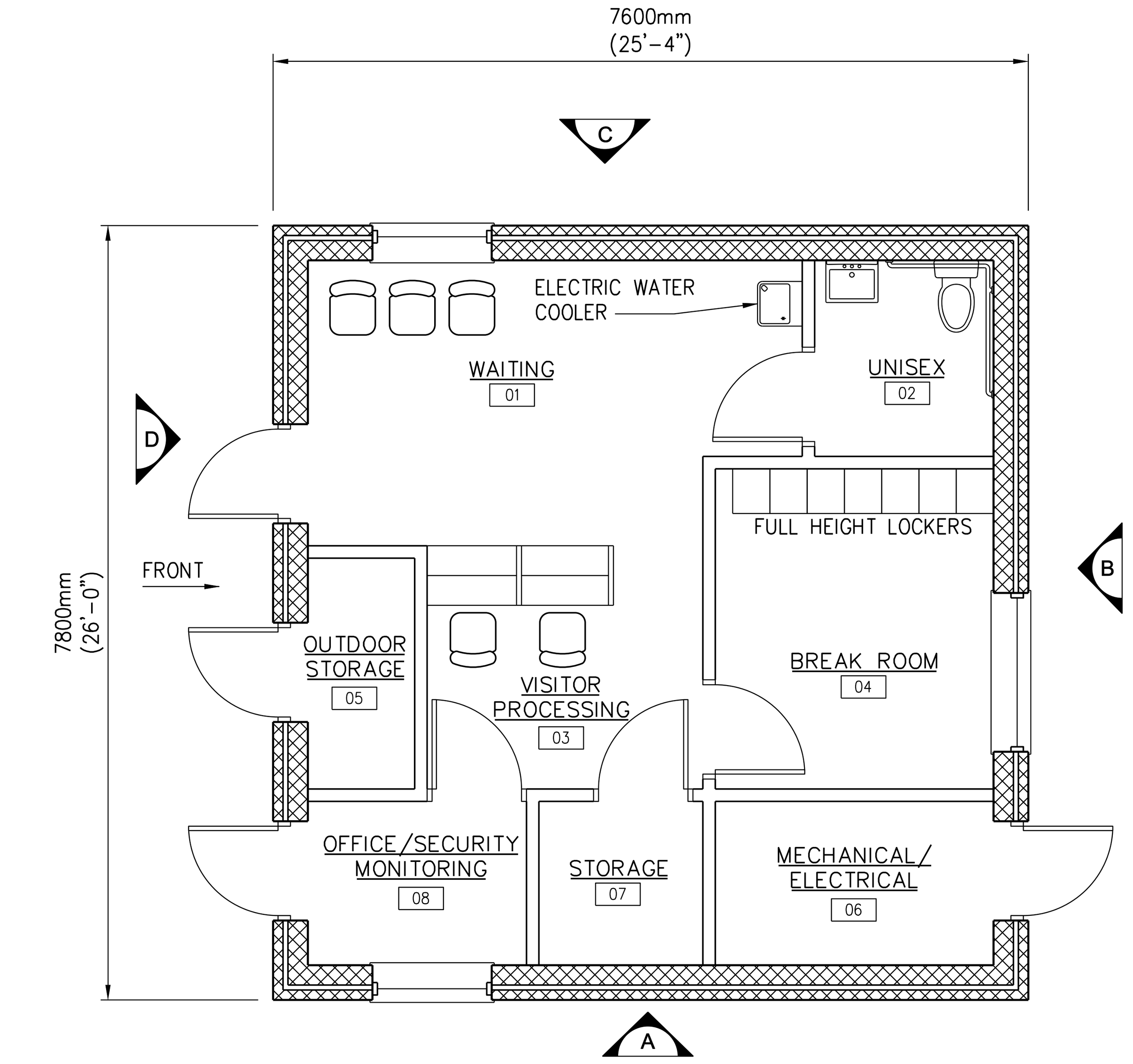

FRONT ELEVATION




FLOOR PLAN

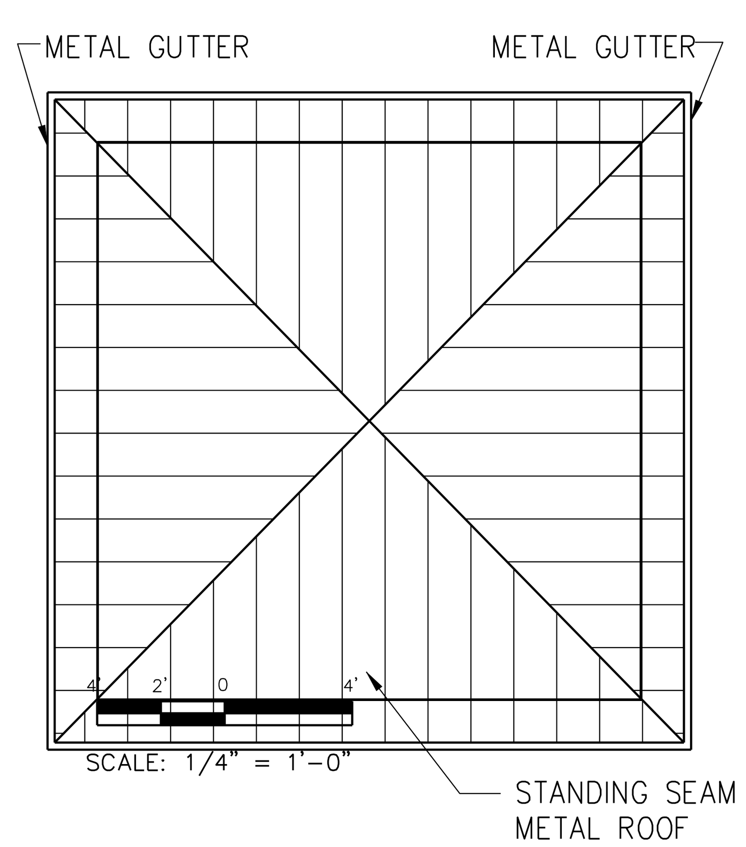
SEARCH AREA SHELTER (NOTE 5)

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



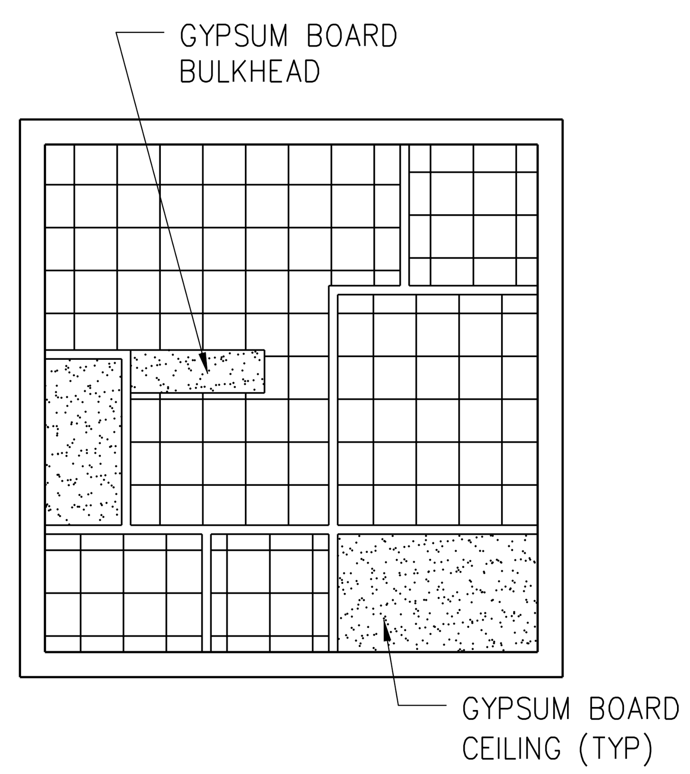

SEARCH OFFICE W/O PACKAGE SCANNER AND METAL DETECTOR FLOOR PLAN

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



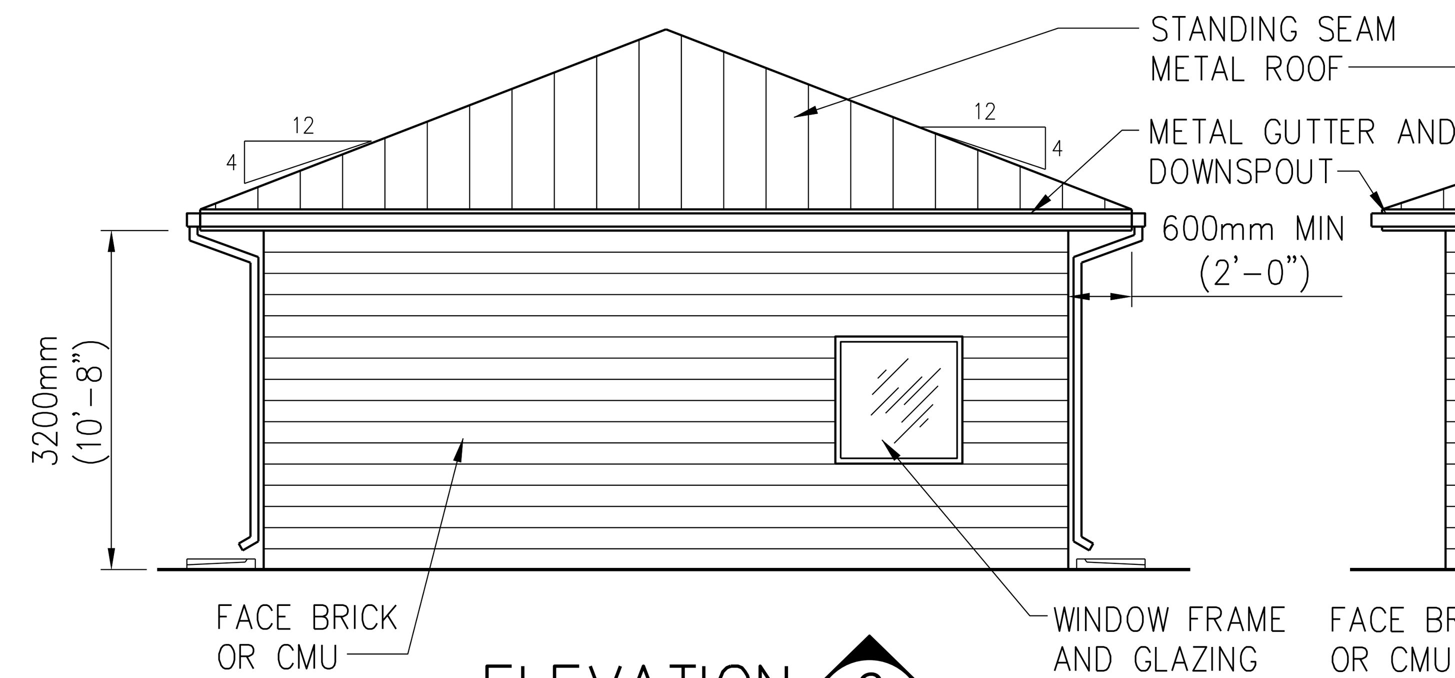

SEARCH OFFICE W/O PACKAGE SCANNER AND METAL DETECTOR ROOF PLAN

SCALE: 1/8" = 1'-0"

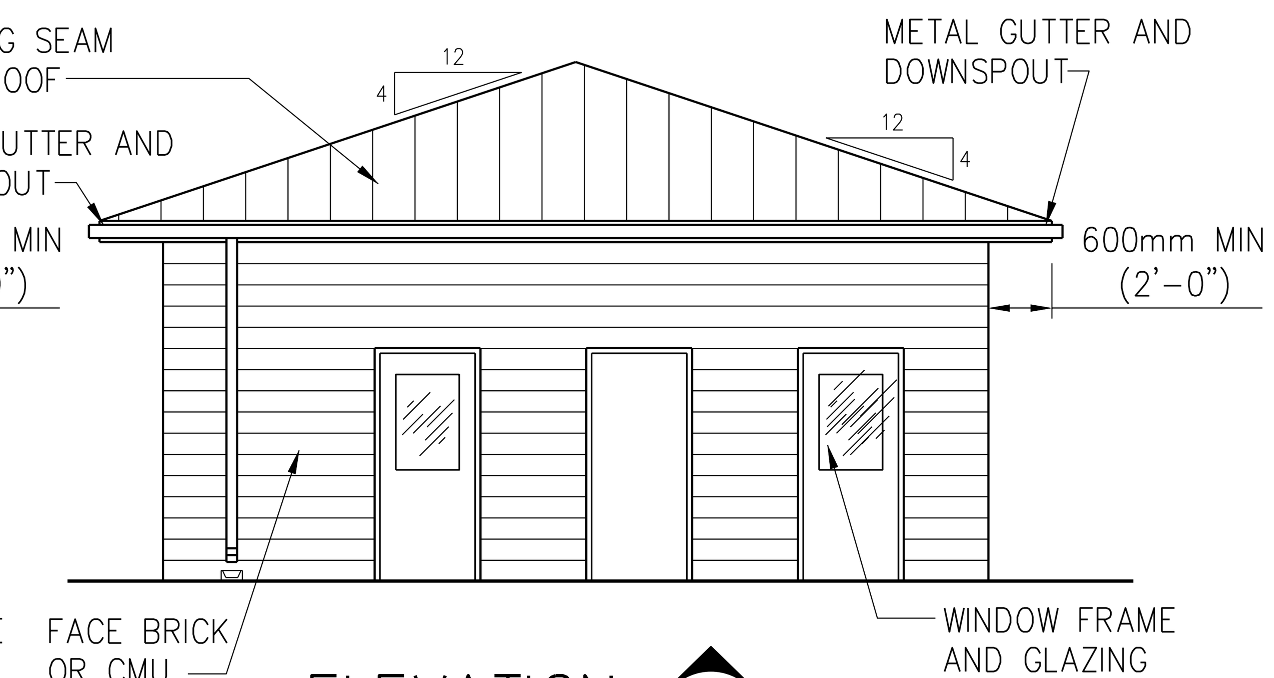



SEARCH OFFICE W/O PACKAGE SCANNER AND METAL DETECTOR REFLECTED CEILING PLAN

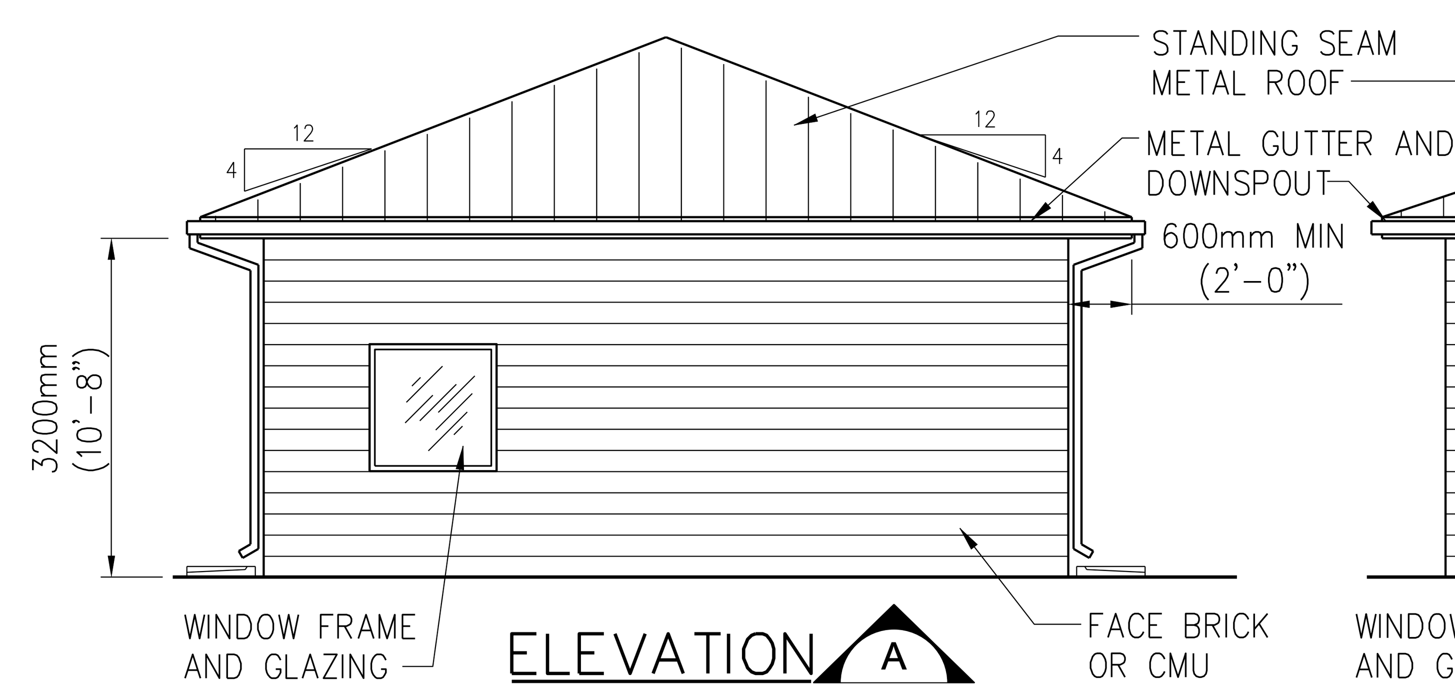
SCALE: 1/8" = 1'-0"



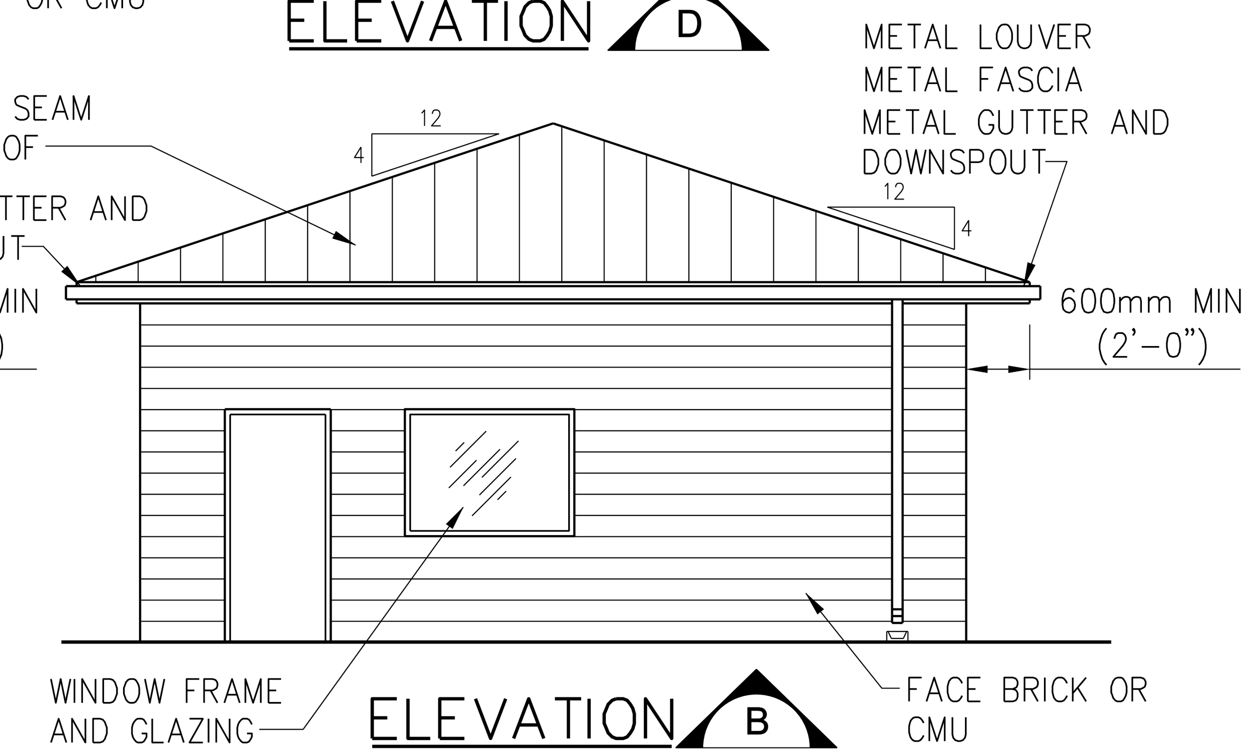

ELEVATION C




ELEVATION D




ELEVATION A




ELEVATION B

SEARCH OFFICE W/O PACKAGE SCANNER AND METAL DETECTOR ELEVATIONS

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

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

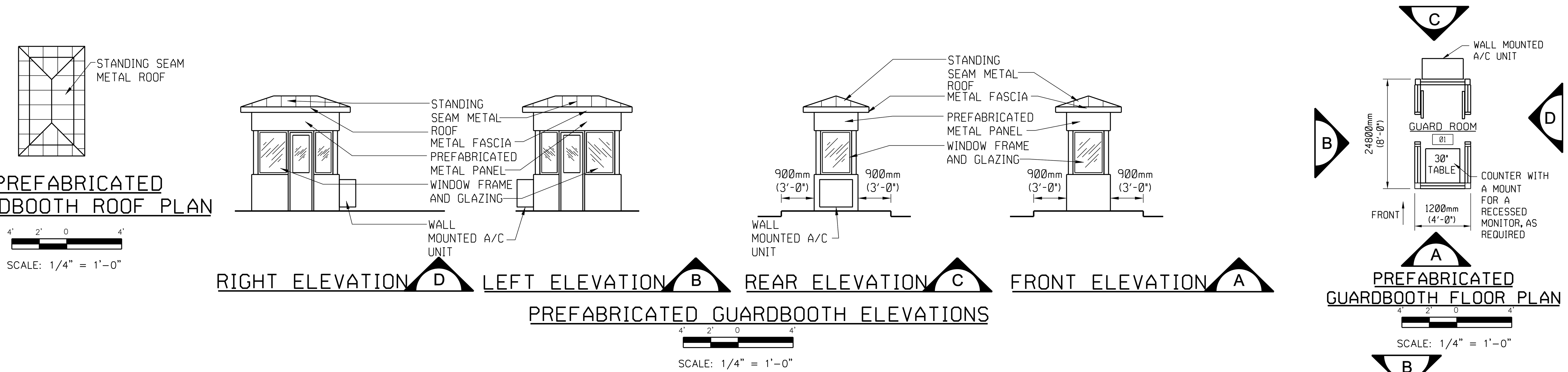
ARCHITECTURAL
SEARCH OFFICE W/O PACKAGE SCANNER AND METAL DETECTOR

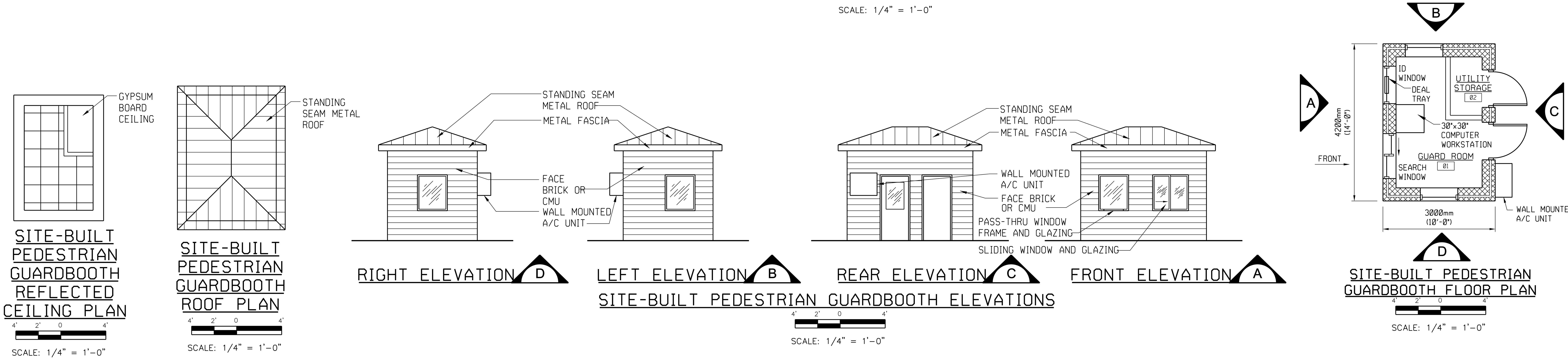
SHEET REFERENCE NUMBER
A1.08
SHEET 44 OF 60

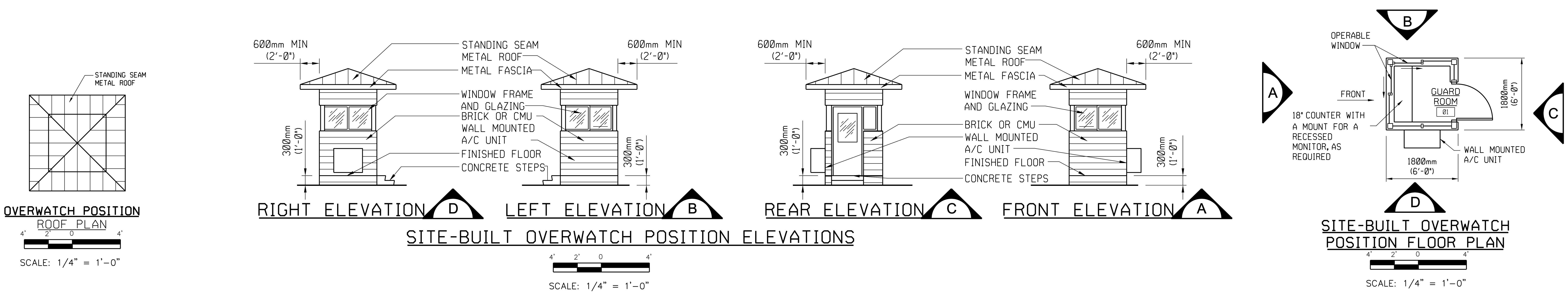
$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## GENERAL NOTES

1. LIGHTS AND DIFFUSERS ARE NOT SHOWN ON THE REFLECTED CEILING PLAN. QUANTITY AND LOCATIONS TO BE DETERMINED DURING DESIGN OR PROCUREMENT.
2. EXTERIOR FIISH MATCHING INSTALLATION ARCHITECTURAL THEME TO BE SELECTED DURING DESIGN AND OR PROCUREMENT.
3. OVERWATCH POSITION, GUARD BOOTH, AND PEDESTRIAN GUARD BOOTH DOORS, WINDOWS, AND FRAMES SHALL MEET LEVEL 3 BALLISTIC STANDARDS LL-752 AS A MINIMUM.
4. EXTERIOR MASONRY PATTERNING AND COURSING TO BE DETERMINED DURING DESIGN.
5. ALL WINDOWS SHOULD BE TINTED, INTERIOR SURFACES SHOULD BE DARK IN COLOR.
6. RECOMMEND ANTI-FATIGUE MATS BE PROVIDED FOR EACH GUARD BOOTH.
7. GUARD BOOTHS AND PEDESTRIAN GUARD BOOTHS NOT COVERED BY A CANOPY WILL HAVE 2 FOOT SIFFITS ON ALL SIDES WITH GUTTERS AND DOWNSPOUTS.




US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204
DWN BY: X.X.X. | CKD BY: X.X.X. | CONTRACT NO.: X
SUBMITTED BY: X | CATEGORY CODE: X
FILE NAME: X | PLOT SCALE: 1:1 | PLOT DATE:
SIZE: ANSI D

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

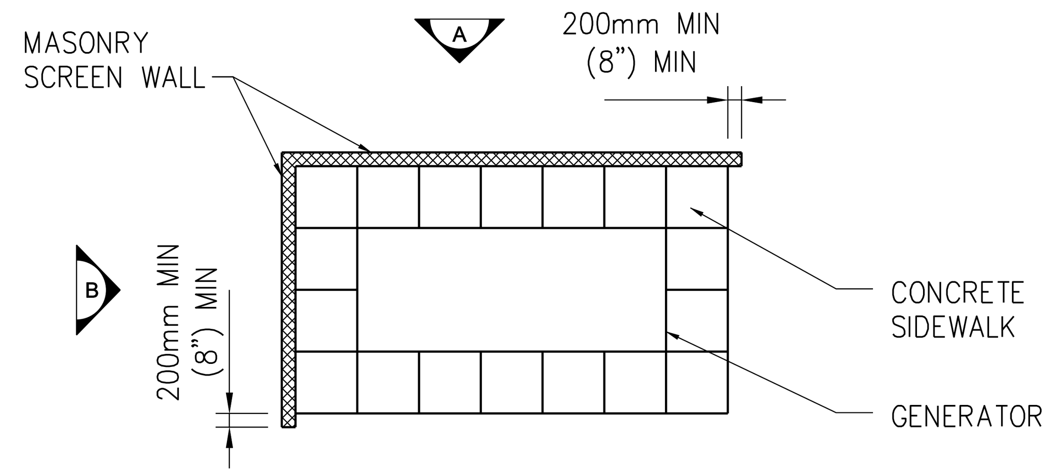
ARCHITECTURAL
GUARDBOOTH, PEDESTRIAN GUARDBOOTH, AND OVERWATCH POSITION

SHEET REFERENCE NUMBER
A1.09
SHEET 45 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## GENERAL NOTES

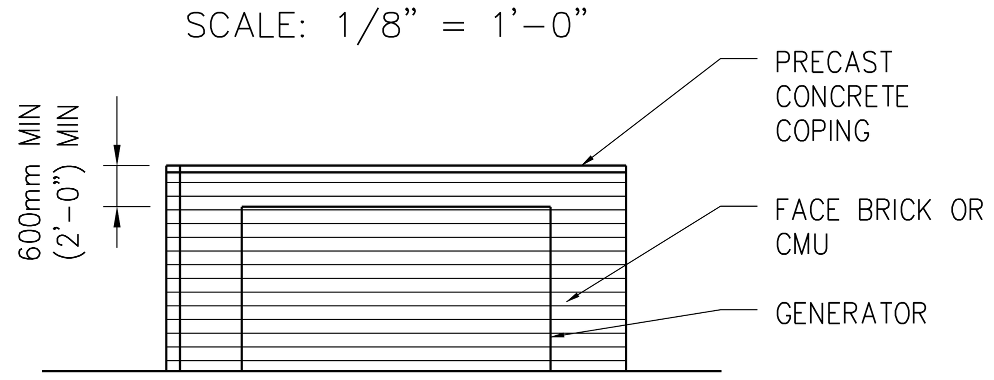
1. LIGHTS AND DIFFUSERS ARE NOT SHOWN ON THE SOFFIT PLAN. QUANTITY AND LOCATIONS TO BE DETERMINED DURING DESIGN.
2. CANOPIES MUST PROVIDE 15'-0" VERTICAL CLEARANCE ABOVE FINISHED ROADWAY SURFACE. IF A LARGE NUMBER OF OVERHEIGHT VEHICLES ARE EXPECTED, PROVIDE 17'-0" VERTICAL CLEARANCE A BOVE ROADWAY SURFACE.
3. BOLLARDS OR OTHER COLUMN PROTECTION MEASURES SHOULD BE PLACED AS REQUIRED.
4. CANOPY COLUMNS TO BE PLACED 5'-0" FROM THE EDGE OF THE CURB.
5. CANOPY WIDTH DETERMINED BY ADDING THE LANES, COLUMN SETBACKS, AND CANOPY OVERHANG.
6. CANOPIES WILL BE CONSTRUCTED SO COLUMNS DO NOT OBSTRUCT GUARD'S LINE OF SIGHT.




NOTE: DIMENSIONS OF SCREEN WALL TO BE DETERMINED BASED ON SELECTED GENERATOR

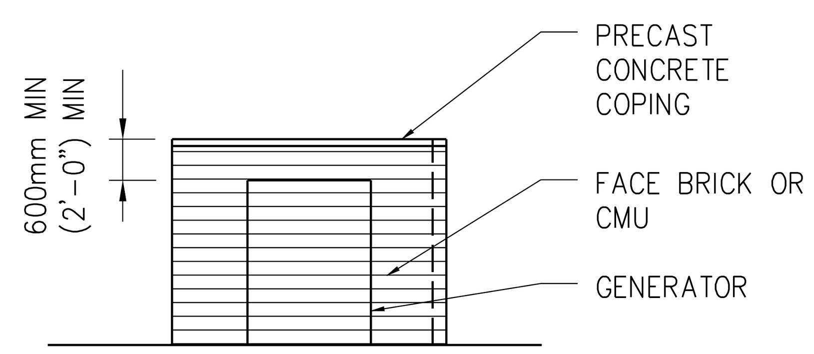
GENERATOR SCREEN WALL PLAN

SCALE: 1/8" = 1'-0"




ELEVATION A

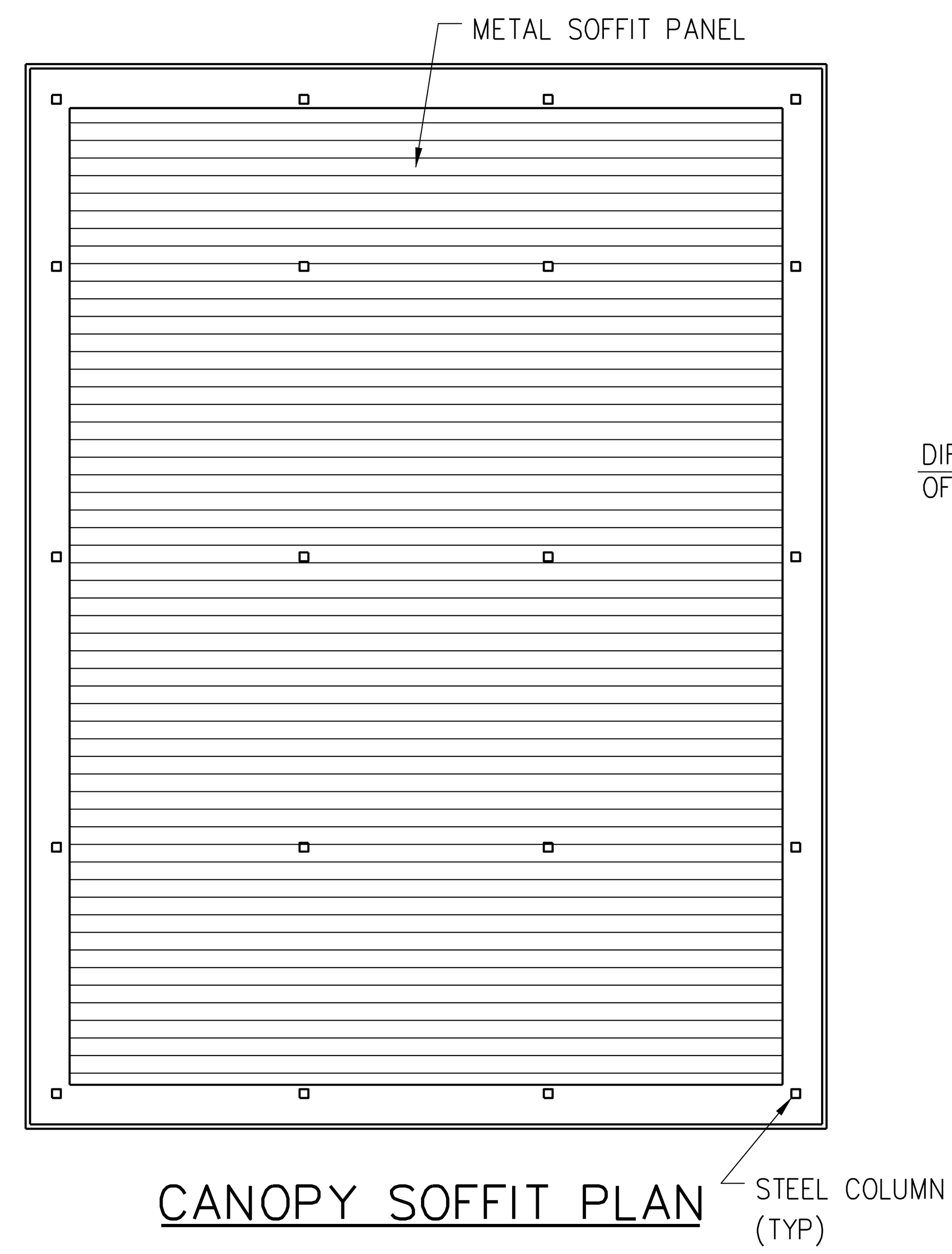
SCALE: 1/8" = 1'-0"




ELEVATION B

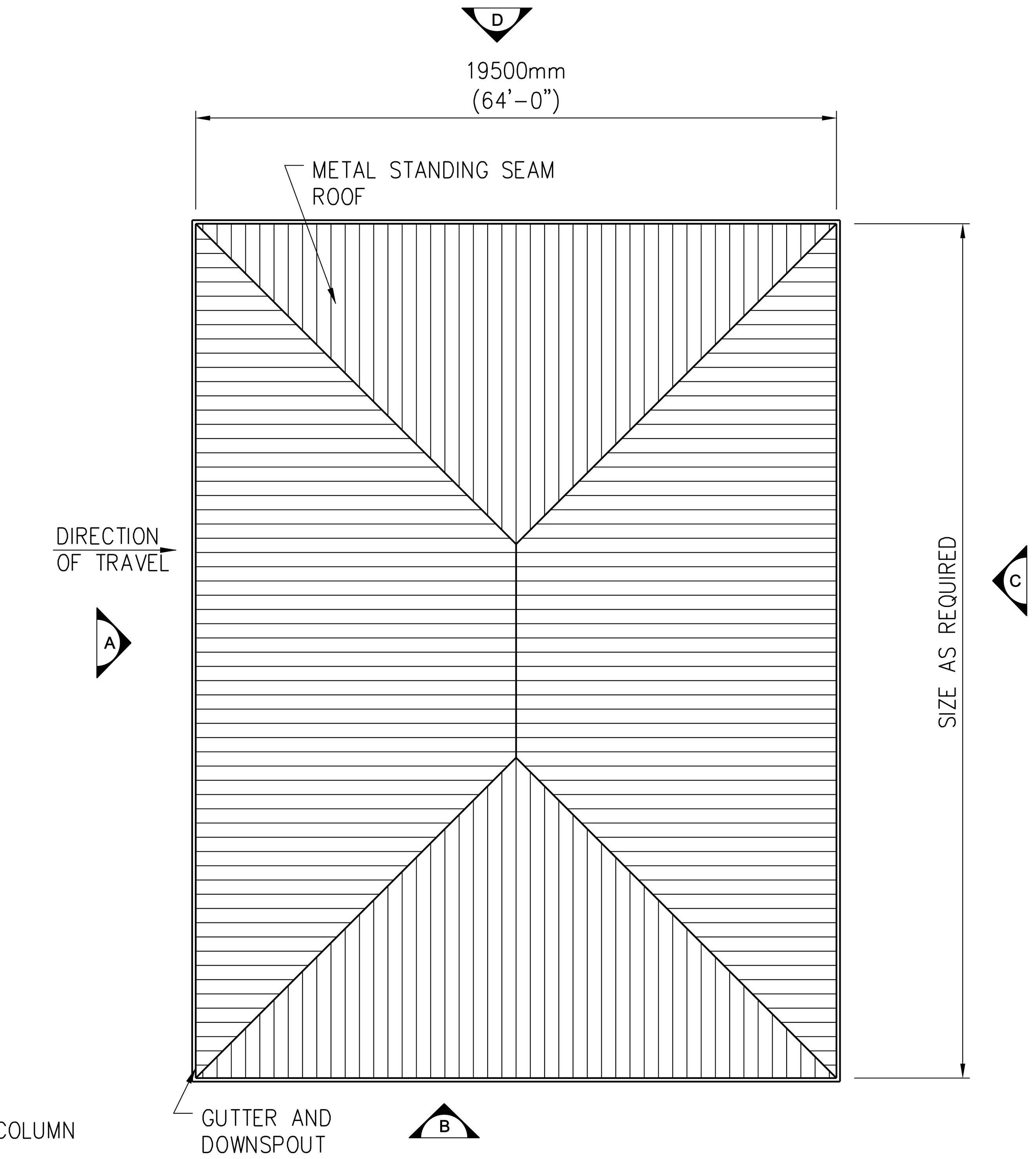
GENERATOR SCREEN WALL ELEVATIONS

SCALE: 1/8" = 1'-0"

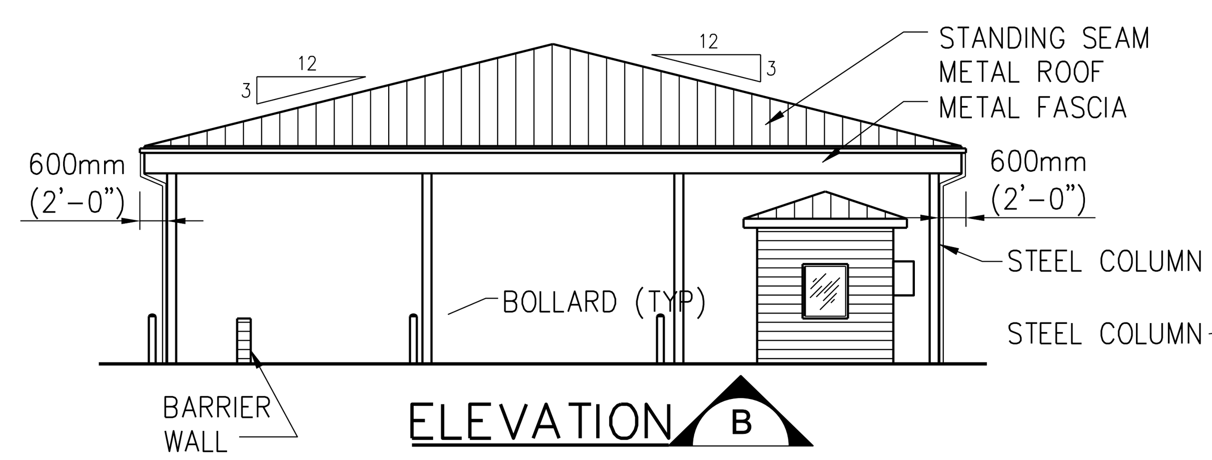



CANOPY SOFFIT PLAN

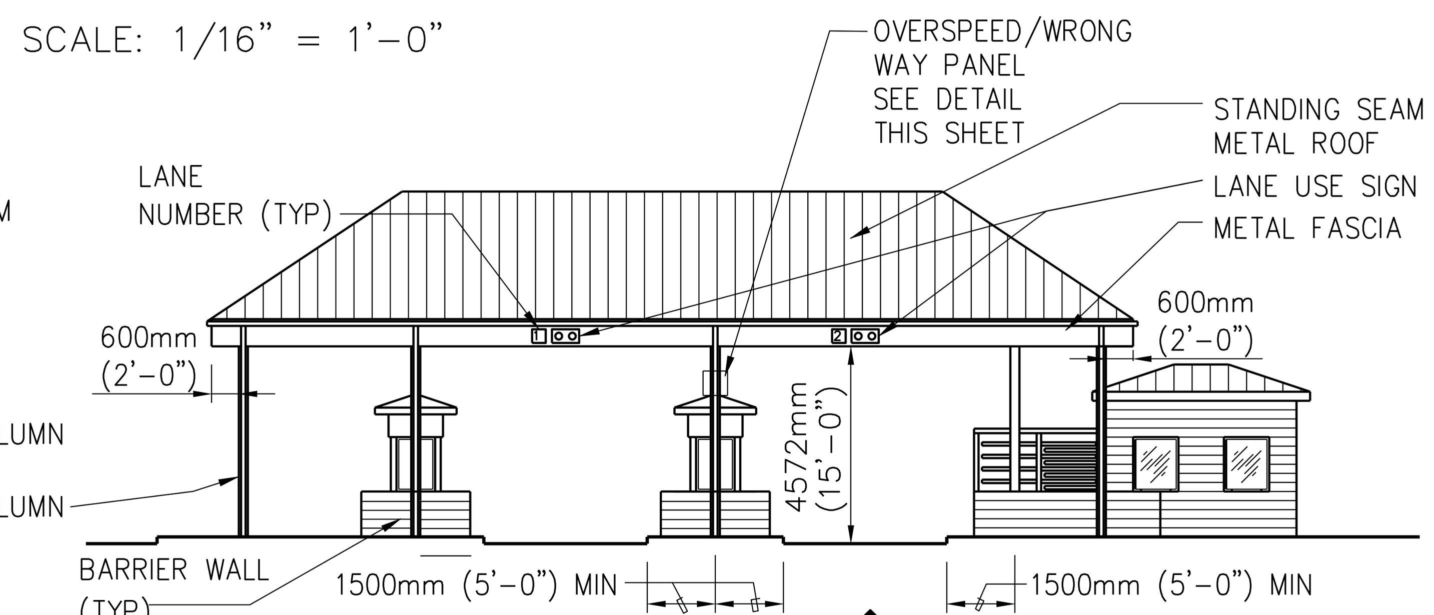
SCALE: 1/16" = 1'-0"



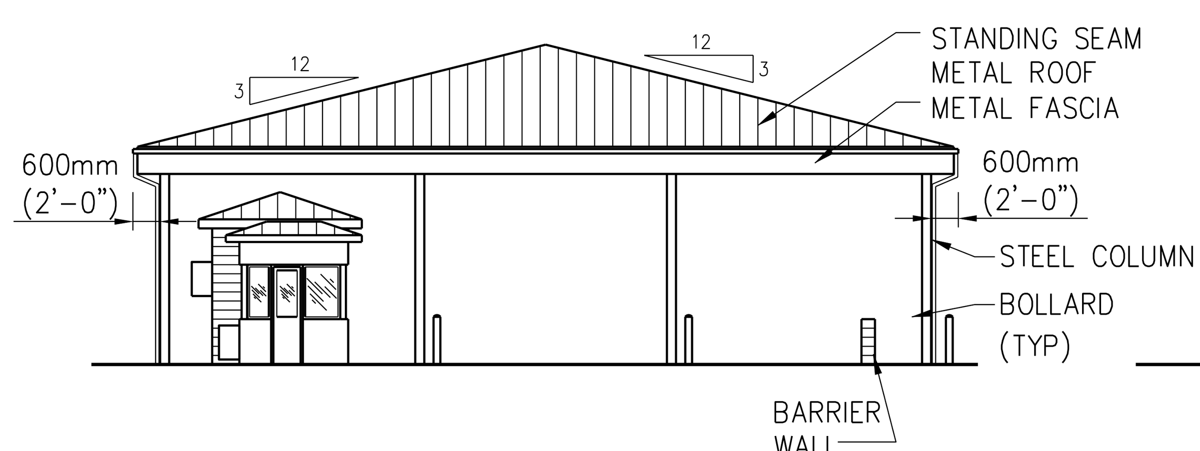

CANOPY ROOF PLAN



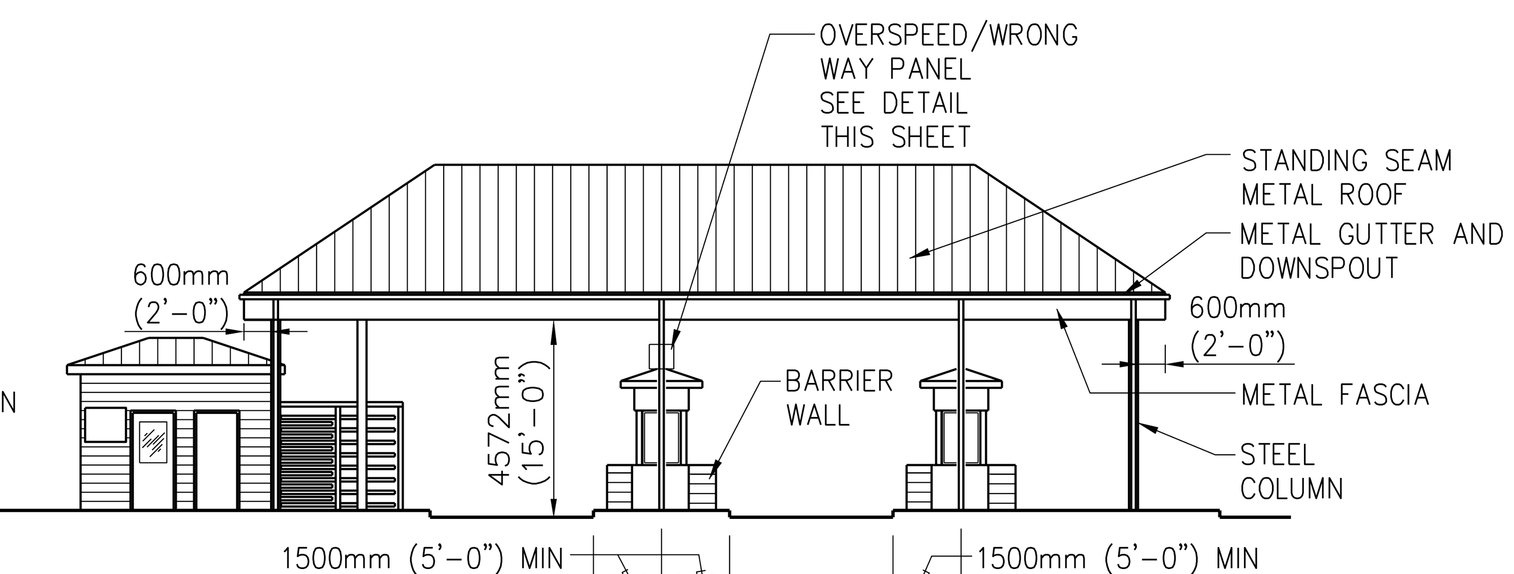

ELEVATION B




ELEVATION A




ELEVATION D




ELEVATION C

ID CHECK AREA CANOPY ELEVATIONS

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

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

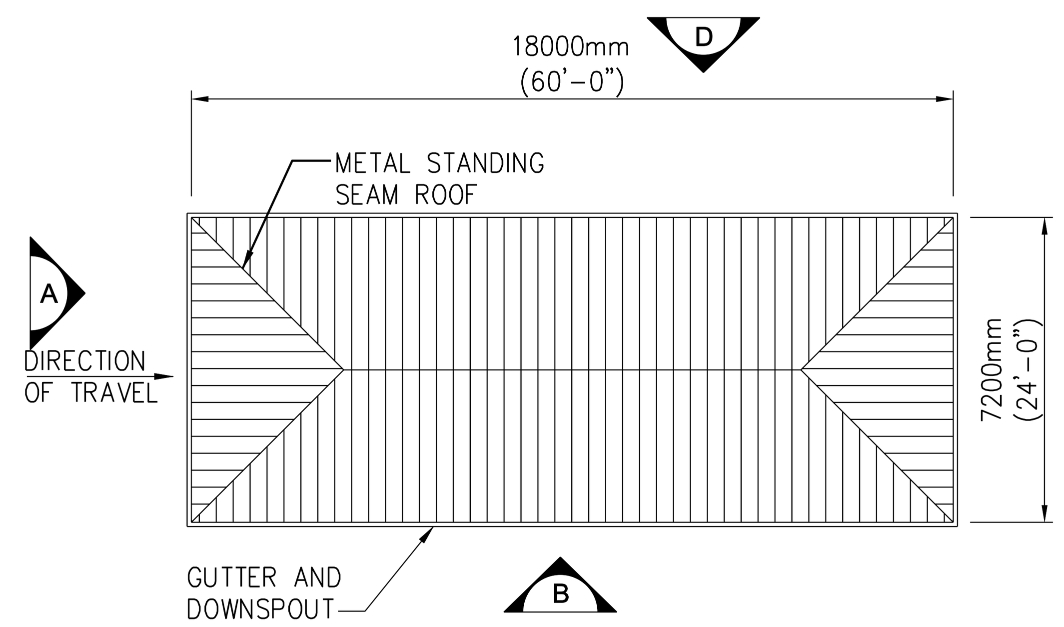
ARCHITECTURAL ID CHECK AREA CANOPY

SHEET REFERENCE NUMBER A1.10

SHEET 46 OF 60

## GENERAL NOTES

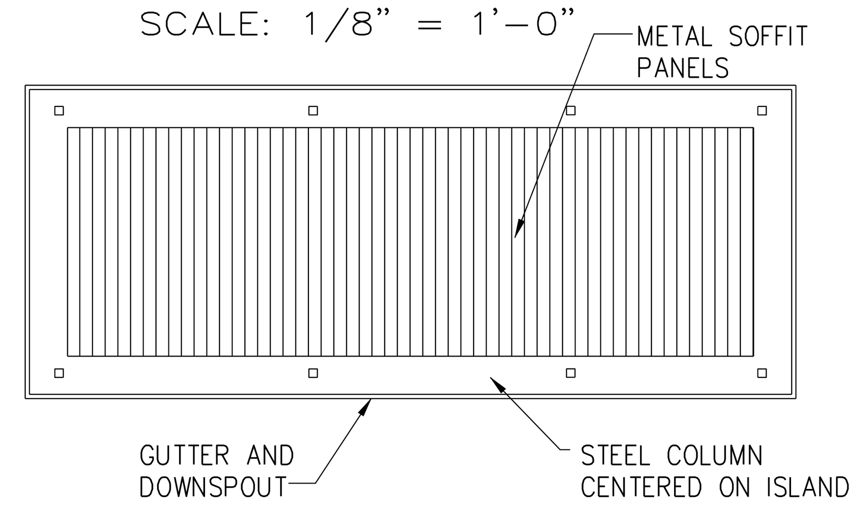
1. LIGHTS AND DIFFUSERS ARE NOT SHOWN ON THE SOFFIT PLAN. QUANITY AND LOCATIONS TO BE DETERMINED DURING DESIGN.
2. CANOPIES ARE SHOWN AT 15'-0" VERTICAL CLEARANCE FOR POV LANES AND 17'-0" VERTICAL CLEARANCE FOR TRUCKS ABOVE FINISHED ROAD SURFACE.
3. BOLLARDS OR OTHER COLUMN PROTECTION MEASURES SHOULD BE PLACED AS REQUIRED.
4. CANOPY COLUMNS TO BE PLACED 2'-6" FROM THE EDGE OF CURB OR CENTERED IN THE ISLAND.
5. CANOPY WIDTH DETERMINED BY ADDING THE LANES, COLUMN SETBACKS, AND CANOPY OVERHANG.
6. CURB RAMPS ARE REQUIRED FROM THE ISLAND AND SIDEWALKS TO THE SEARCH OFFICE.
7. 150mm (6") VERTICAL CURBING PROVIDED ADJACENT TO THE TRAVEL WAY AND INSPECTION AREAS UNLESS OTHERWISE NOTED.
8. PROVIDE DELINEATION OF ISLANDS TO ONCOMING VEHICLES.




PASSENGER VEHICLE SEARCH AREA CANOPY ROOF PLAN

8' 4' 0 8'

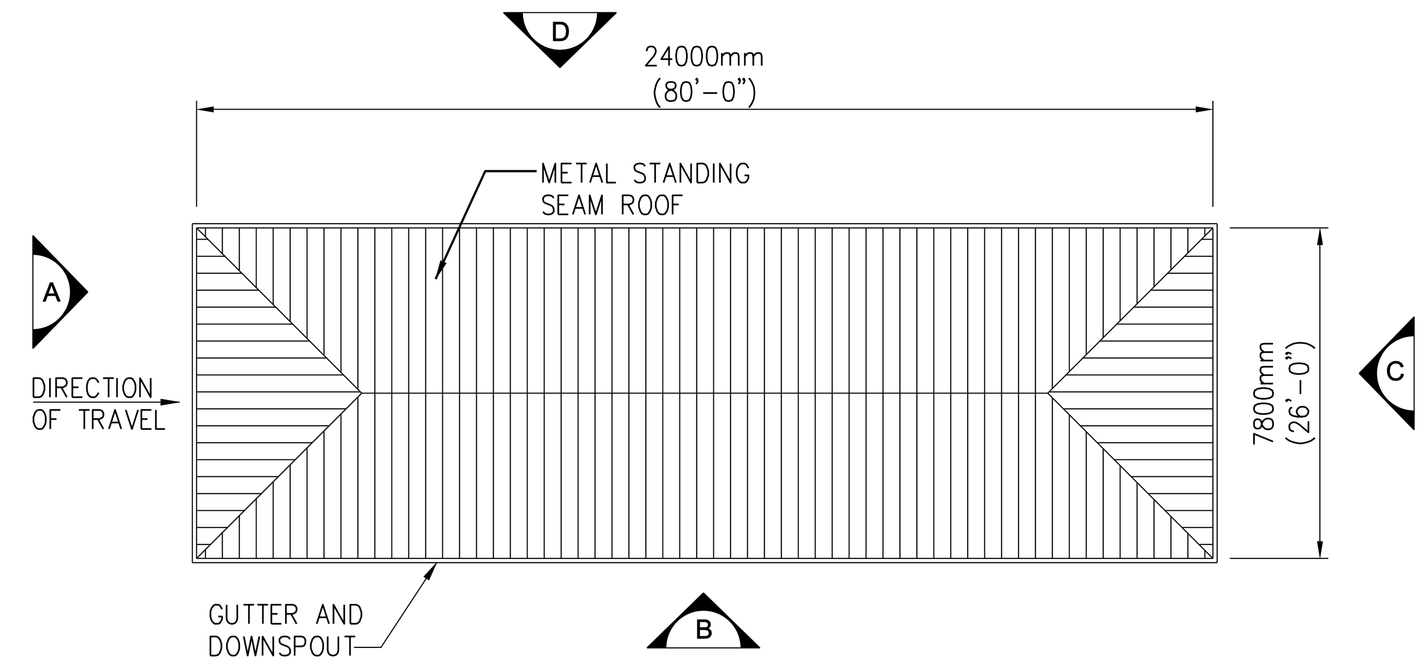
SCALE: 1/8" = 1'-0"




PASSENGER VEHICLE SEARCH AREA CANOPY SOFFIT PLAN

8' 4' 0 8'

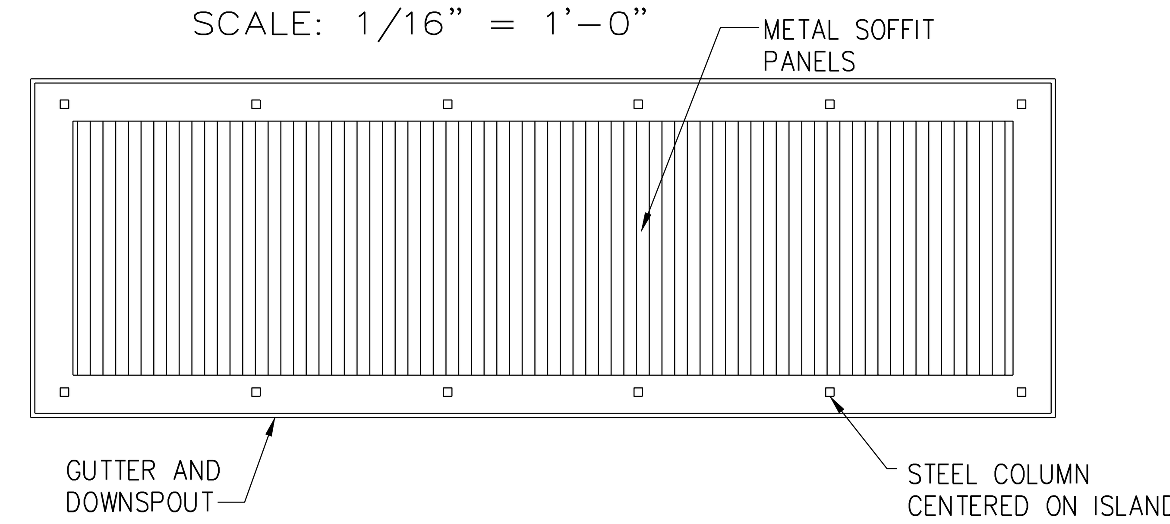
SCALE: 1/8" = 1'-0"




TRUCK SEARCH AREA CANOPY ROOF PLAN

16' 8' 0 16'

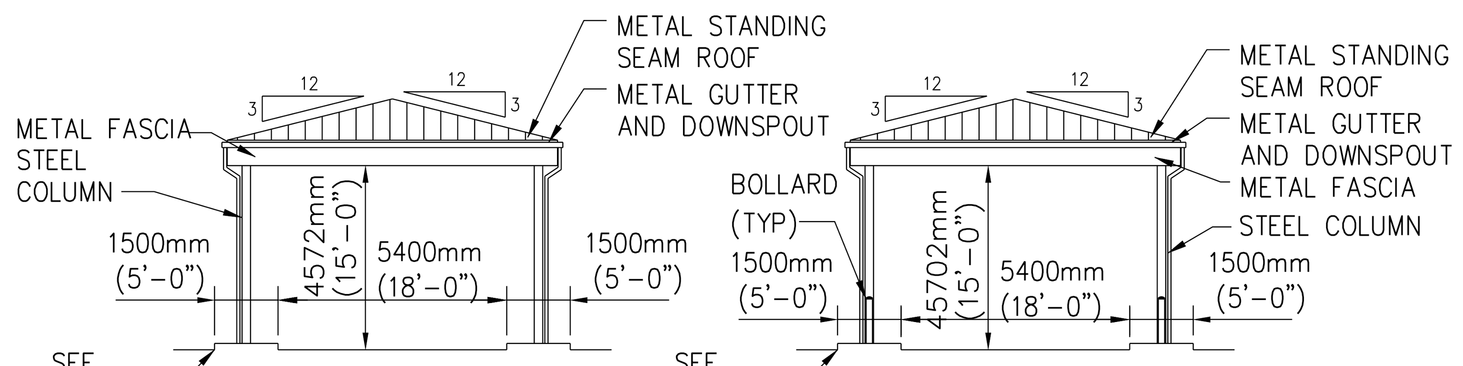
SCALE: 1/16" = 1'-0"

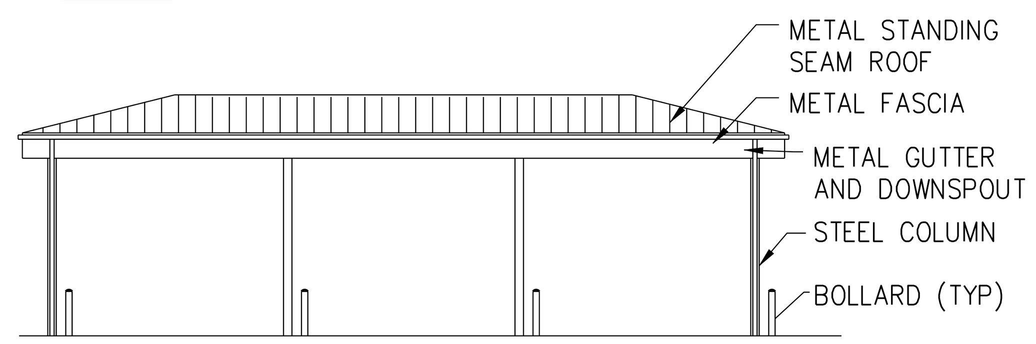



TRUCK SEARCH AREA CANOPY SOFFIT PLAN

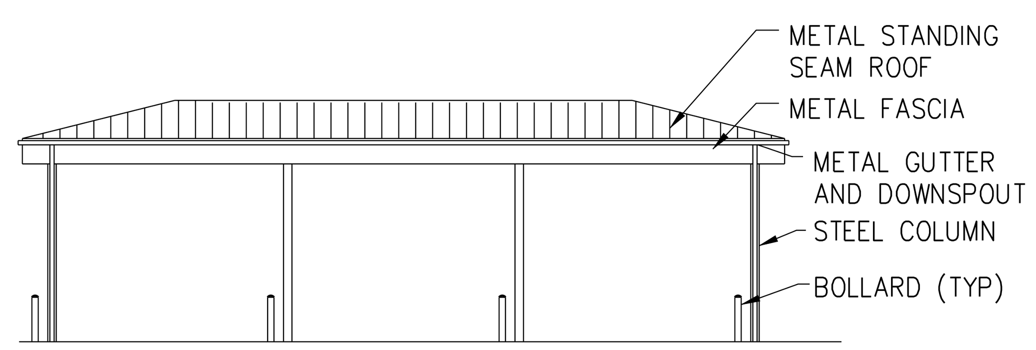
16' 8' 0 16'

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




ELEVATION D

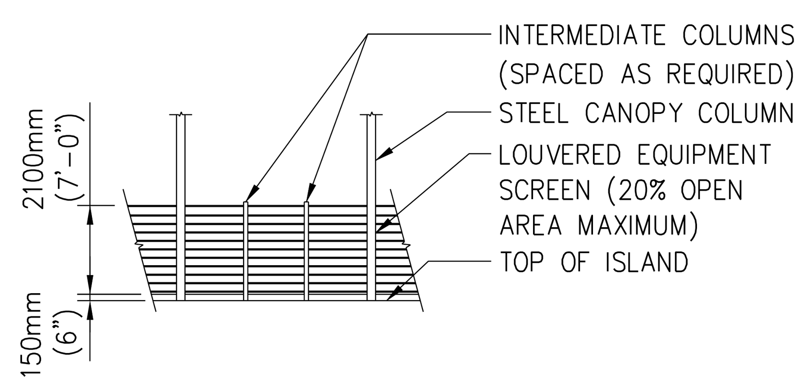



ELEVATION B

PASSENGER VEHICLE SEARCH AREA CANOPY ELEVATIONS

8' 4' 0 8'

SCALE: 1/8" = 1'-0"




CANOPY SCREEN WALL PARTIAL ELEVATION

8' 4' 0 8'

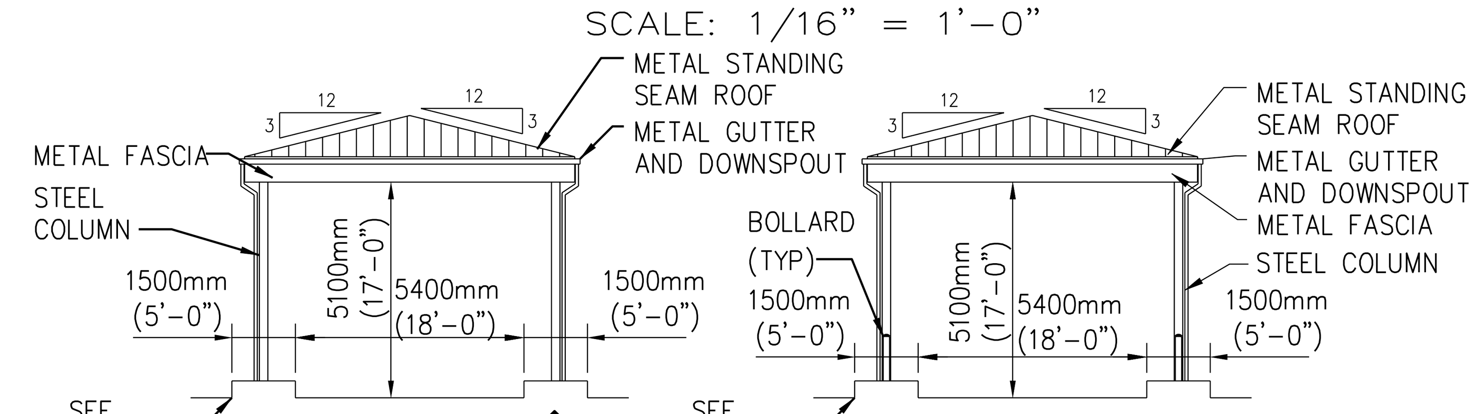
SCALE: 1/8" = 1'-0"

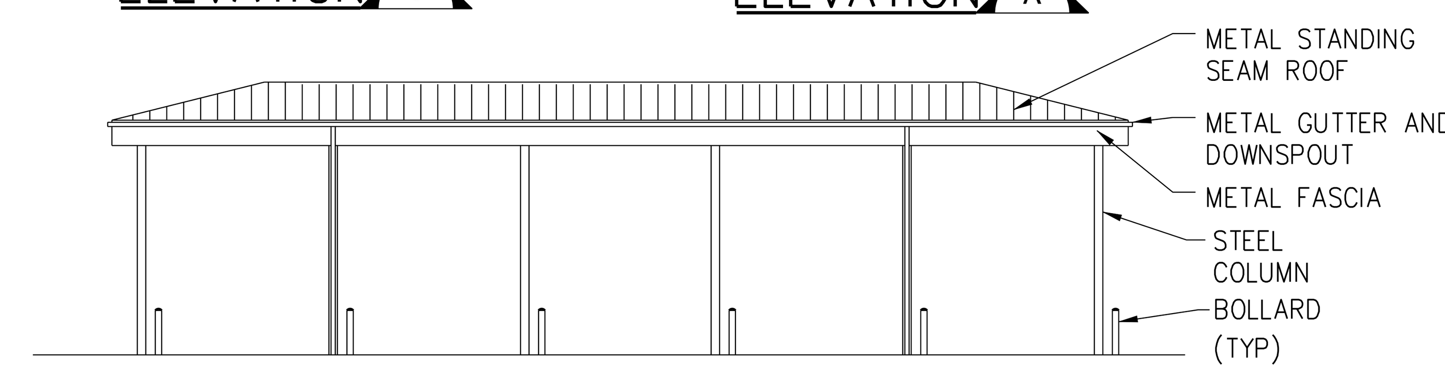
NOTE: SCREENING OF INSPECTIONS CAN BE ACCOMPLISHED THROUGH A VARIETY OF NATURAL OR MAN MADE FEATURES. IF SCREENING CANNOT BE DESIGNED INTO THE SITE LAYOUT THEN ADD SCREENING TO THE STRUCTURES THEMSELVES, BUT PEDESTRIAN ACCESSIBILITY MUST BE MAINTAINED. THE FOLLOWING MANUFACTURERS OF LOUVERED SCREENS HAVE BEEN IDENTIFIED. UNDOUBTEDLY THERE ARE OTHERS. THESE ARE LISTED TO PROVIDE USERS WITH SOURCES OF INFORMATION AND ARE NOT AN ENDORSEMENT OF ANY ONE PRODUCT LINE.

AMETCO MANUFACTURING CORP.
4326 HAMANN PKWY
PO BOX 1210
WILLOUGHBY, OH 44096
(800)321-7042 FAX (440)951-2542

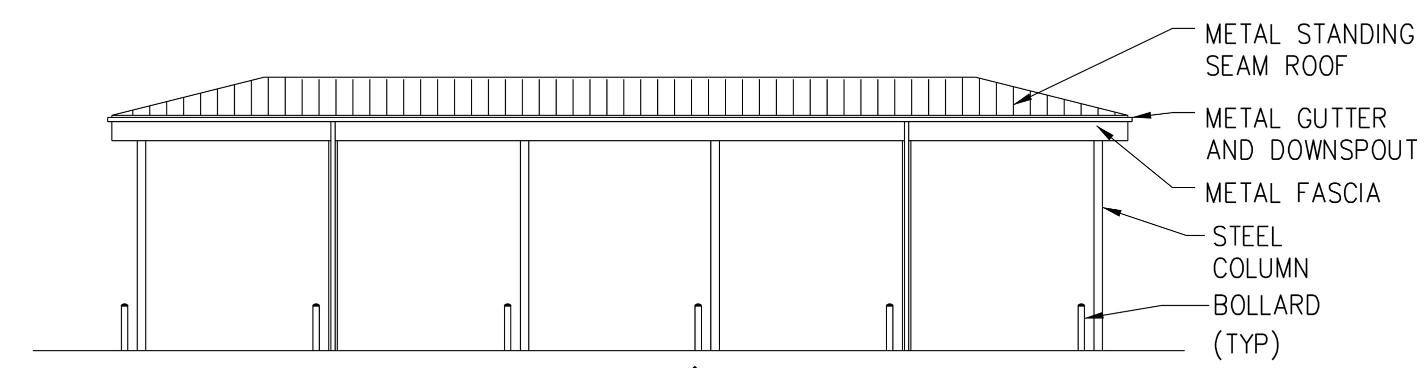
AT&T IRONWORKS, INC
25 CUFF ST
NEW ROCHELLE, NY 10801
(800)523-0973 FAX (914)632-2645

BARNETTBATES CORP
500 MILLS RD
JOLIET, IL 60433
(800) 541-3912 FAX (815)726-9210




ELEVATION D




ELEVATION B

TRUCK SEARCH AREA CANOPY ELEVATIONS

8' 4' 0 8'

SCALE: 1/8" = 1'-0"

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W912DQ-07-X-0204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

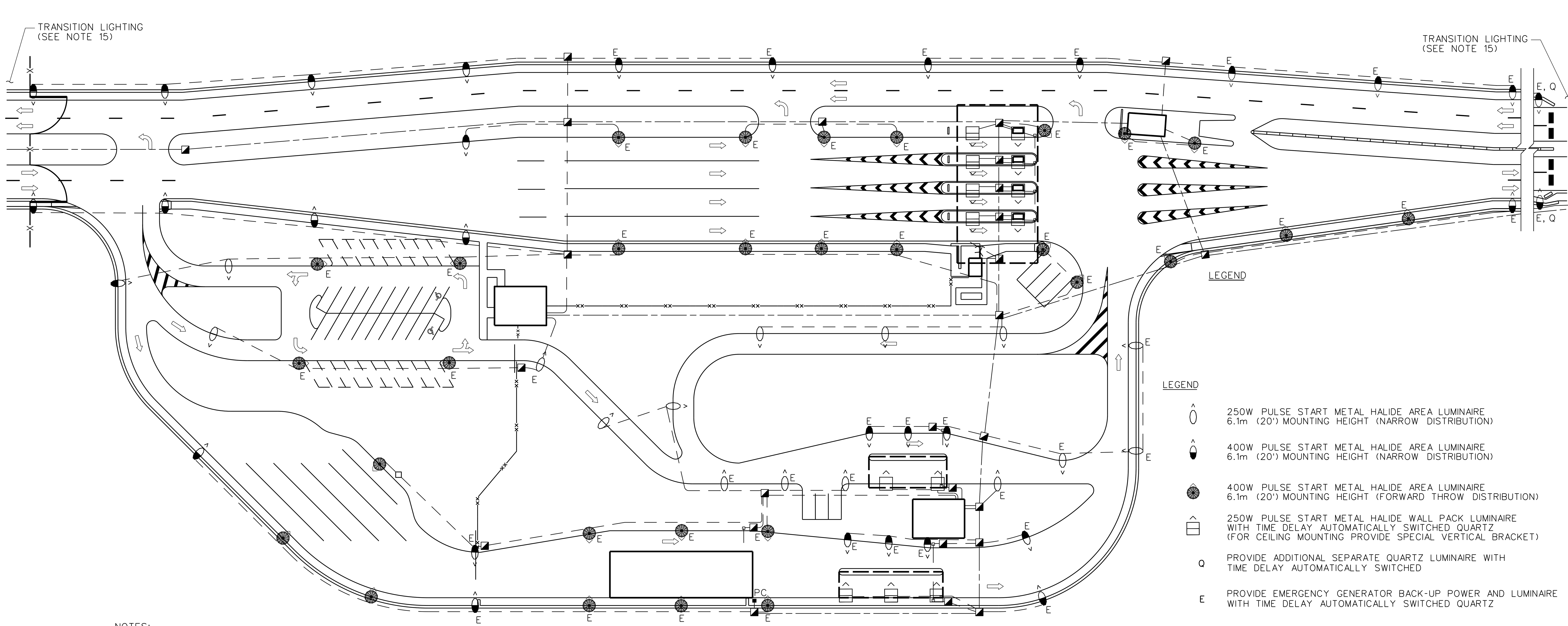
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ARCHITECTURAL
PASSENGER VEHICLE AREA AND TRUCK SEARCH AREA CANOPIES

SHEET REFERENCE NUMBER
A1.11



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




NOTES:

1. SEE DESIGN CRITERIA FOR LIGHTING LEVEL REQUIREMENTS.
2. SEE DESIGN CRITERIA FOR DESCRIPTIONS OF REQUIREMENTS FOR COMMUNICATIONS, DURESS ALARMS, INTRUSION DETECTION SENSORS, SPEED DETECTORS, WRONG-WAY DETECTORS, VEHICLE PRESENCE DETECTORS, AND ACTIVE VEHICLE BARRIER CONTROLS.
3. SIZE CONDUIT TO 40% FILL MAXIMUM PER CONDUIT.
4. PROVIDE THE REQUIRED NUMBER OF CONDUITS PLUS 2 SPARE CONDUITS FOR EACH DUCT BANK. SPARES SHOULD BE A MINIMUM OF 3" IN DIAMETER.
5. CONDUIT RUNS SHOULD NOT EXCEED 150.0m (500') IN TOTAL LENGTH.
6. SIZE CONDUCTORS FOR MAXIMUM 5% VOLTAGE DROP AND MAXIMUM AMPERES.
7. SPECIFY DIRECT BURIAL CABLE TO BE INSTALLED IN DIRECT BURIAL CONDUIT FOR LIGHTING CONDUCTORS. MINIMUM SIZE CONDUCTOR TO BE USED UNDERGROUND IS AWG•8.
8. SPECIFY CUTOFF TYPE LUMINAIRES TO REDUCE GLARE AND LIGHT TRESPASS.
9. LUMINAIRES SHOULD BE LOCATED PERPENDICULAR TO ROADWAY PAVEMENT UNLESS INDICATED OTHERWISE.
10. LOCATE POLES 0.6m (2') CLEAR FACE OF CURB OR AT BACK EDGE OF SIDEWALK OR 1.5m (5') FROM EDGE OF PAVEMENT OR SHOULDER.
11. FOR ANY UNPROTECTED POLES LOCATED INSIDE THE AASHTO CLEAR ZONE, PROVIDE POLES WITH BREAKAWAY BASES.
12. FOR ANY POLES LOCATED BEHIND GUARDRAIL, PROVIDE CLEARANCE FOR THE REQUIRED AASHTO GUARDRAIL DEFLECTION.
13. SPECIFY JUNCTION BOXES SIZED FOR SUFFICIENT SPACE TO MAKE REQUIRED CABLE CONNECTIONS. PROVIDE CONCRETE JUNCTION BOXES WITH TAMPER PROOF HARDWARE.
14. SPECIFY WATERTIGHT, SUBMERSIBLE, NON-FUSIBLE, PREMOLDED, DISCONNECTABLE CONNECTOR KITS FOR SPLICES IN JUNCTION BOXES.
15. TRANSITION LIGHTING - FOR 2 LANE ROADWAYS PROVIDE 2 ADDITIONAL LUMINAIRE/POLE LOCATIONS AND FOR ROADWAYS WITH 3 OR MORE LANES PROVIDE 4 ADDITIONAL LUMINAIRE/POLE LOCATIONS (2 EACH SIDE). TRANSITION TO EXISTING LIGHTING WHEN PRESENT IN THE SAME AREA.
16. PROVIDE COMMUNICATIONS LINK FROM GATEHOUSE TO CSMS FOR CCTV, STATUS AND ALARMS, AND FUTURE AUTOMATION INSTALLATION ENTRY (AIE) SYSTEMS.
17. SEE DWG. EL.02 FOR CONDUIT LAYOUT ON TRAFFIC ISLANDS FOR AUTOMATED INSTALLATION ENTRY.

LEGEND

- 250W PULSE START METAL HALIDE AREA LUMINAIRE 6.1m (20') MOUNTING HEIGHT (NARROW DISTRIBUTION)
- 400W PULSE START METAL HALIDE AREA LUMINAIRE 6.1m (20') MOUNTING HEIGHT (NARROW DISTRIBUTION)
- 400W PULSE START METAL HALIDE AREA LUMINAIRE 6.1m (20') MOUNTING HEIGHT (FORWARD THROW DISTRIBUTION)
- 250W PULSE START METAL HALIDE WALL PACK LUMINAIRE WITH TIME DELAY AUTOMATICALLY SWITCHED QUARTZ (FOR CEILING MOUNTING PROVIDE SPECIAL VERTICAL BRACKET)
- Q — PROVIDE ADDITIONAL SEPARATE QUARTZ LUMINAIRE WITH TIME DELAY AUTOMATICALLY SWITCHED
- E — PROVIDE EMERGENCY GENERATOR BACK-UP POWER AND LUMINAIRE WITH TIME DELAY AUTOMATICALLY SWITCHED QUARTZ
- TRAFFIC FLOW PATTERN
- Y/100mm (4") — PAINT STRIPE STYLE/WIDTH
- DY — DOUBLE YELLOW LINE
- TRAFFIC ARM
- ACTIVE VEHICLE BARRIER
- PASSIVE VEHICLE BARRIER
- ORNAMENTAL FENCE
- BOLLARDS
- CANOPY
- BARRIER WALL
- DOUBLE FACE GUARD RAIL
- SINGLE FACE GUARD RAIL
- GUARD BOOTH
- GENERATOR PAD W/SIDEWALK
- CURB RAMP
- PC — POWER AND COMMUNICATIONS CABINET
- JUNCTION BOX
- DUCT BANK: POWER/LIGHTING, COMMUNICATIONS CCTV/SECURITY, BARRIER/TRAFFIC CONTROL
- BRANCH POWER CIRCUIT
- CALL BOX

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

| | |
|---|---|
| DESIGNED BY: X.X.X. | DATE: NOV 2007 |
| DWN BY: X.X.X. | CKD BY: X.X.X. |
| SOLICITATION NO.: W912HN-07-X-6204 | |
| SUBMITTED BY: X | CONTRACT NO.: X |
| FILE NAME: X | CATEGORY CODE: X |
| SIZE: ANSI D | PLOT SCALE: 1:1 |
| PLOT DATE: | |

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

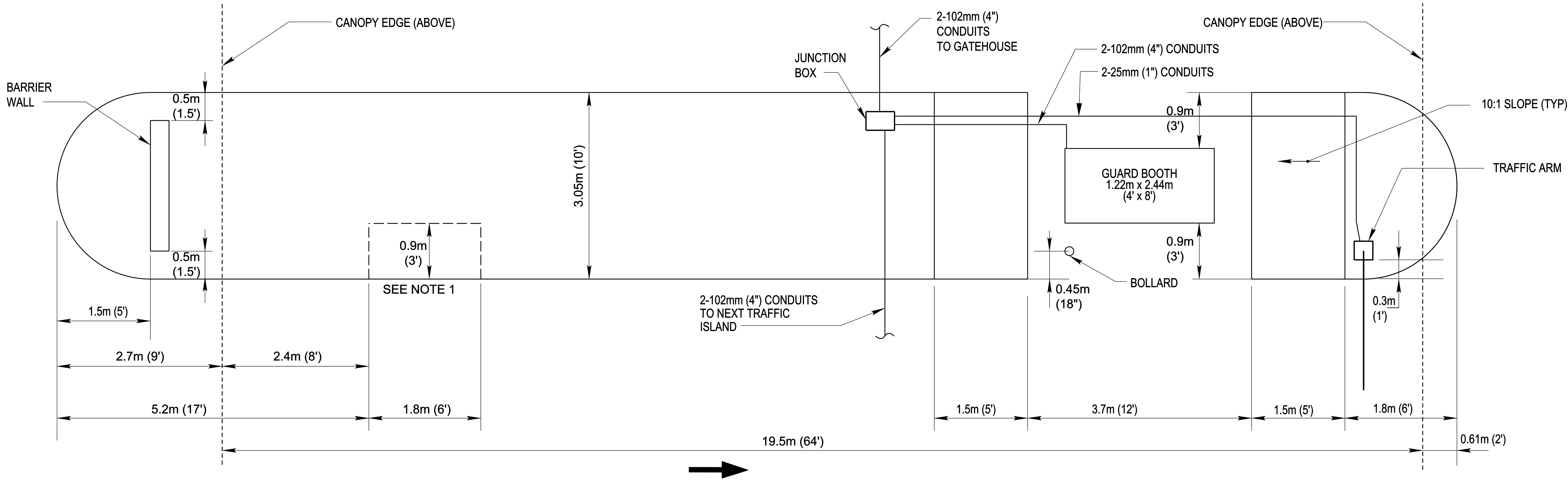
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

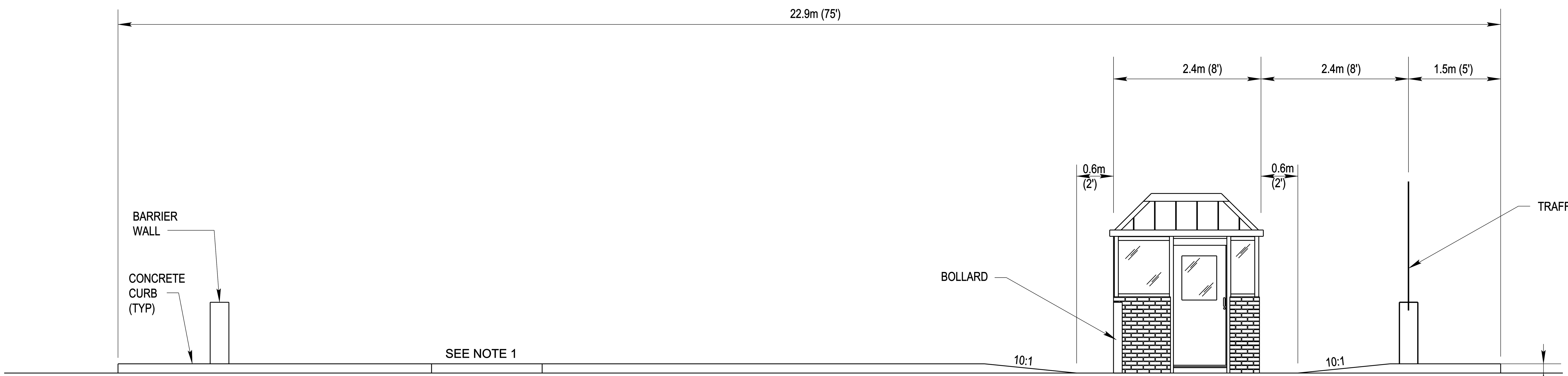
SITE PLAN
LIGHTING AND CONDUIT PLAN

SHEET REFERENCE NUMBER
EL.01



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




NOTES:

1. A CURB CUTOUT FOR THE TANDEM GUARD IS OPTIONAL. IF PROVIDED, CUTOUT SHALL BE 3' DEEP BY 6' WIDE AS SHOWN AND SHALL HAVE VERTICAL FACES.

2. DESIGN MAY VARY TO FIT EXISTING CONDITIONS.

CONDUIT PLAN
TRAFFIC ISLAND W/O AUTOMATION
GUARD BOOTH NOT ON ISLAND
NOT TO SCALE

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
| --- | --- | --- | --- |

DESIGNED BY: X.X.X. DATE: NOV 2007
DWN BY: X.X.X. CKD BY: X.X.X. SOLICITATION NO.: W912HN-07-X-0204
SUBMITTED BY: X CONTRACT NO.: X
FILE NAME: X CATEGORY CODE: X
SIZE: ANSI D PLOT SCALE: 1 : 1 PLOT DATE:

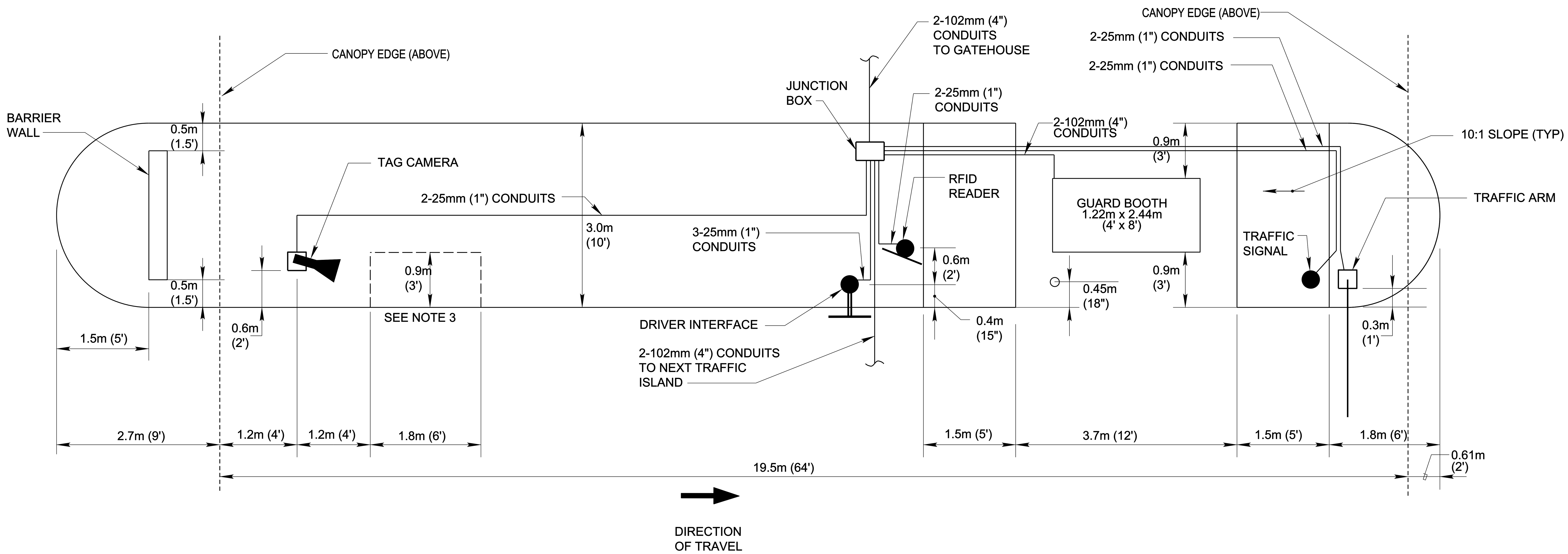
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

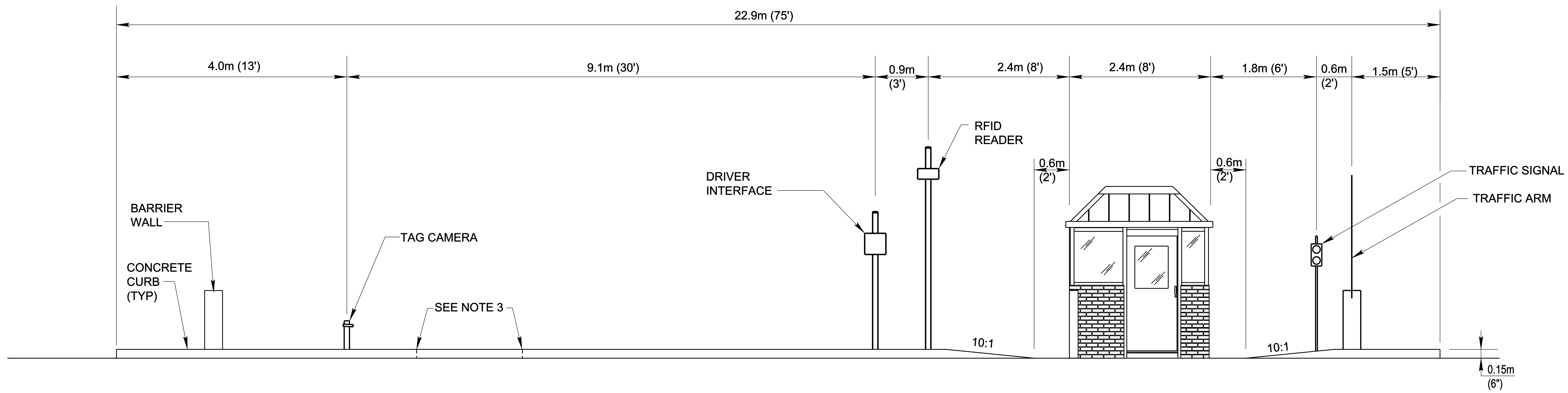
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

CONDUIT PLAN
W/O AUTOMATION AND NO ISLAND

SHEET
REFERENCE
NUMBER
EL.02
SHEET 48 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




NOTES:
1. DEVICE LOCATIONS SHOWN ARE ADVISORY, EXCEPT THE DISTANCE BETWEEN THE GATE ARM AND THE DRIVER INTERFACE PEDESTAL SHOULD BE 27' AS SHOWN. FOR EXISTING ACPs WITH SHORTER TRAFFIC ISLANDS, THIS DISTANCE SHALL BE A MINIMUM OF 16 FEET.
2. FOR EXISTING ACPs WITH TRAFFIC ISLANDS SHORTER THAN 75 FEET, EVALUATE EXISTING CONDITIONS TO DETERMINE THE OPTIMAL LOCATION OF THE REAR TAG CAMERA TO ENSURE PROPER COVERAGE.
3. A CURB CUTOUT FOR THE TANDEM GUARD IS OPTIONAL. IF PROVIDED, CUTOUT SHALL BE 3' DEEP BY 6' WIDE AS SHOWN AND SHALL HAVE VERTICAL FACES.
4. DESIGN MAY VARY TO FIT EXISTING CONDITIONS.

CONDUIT PLAN
TRAFFIC ISLAND WITH AUTOMATION
GUARD BOOTH NOT ON ISLAND
NOT TO SCALE

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

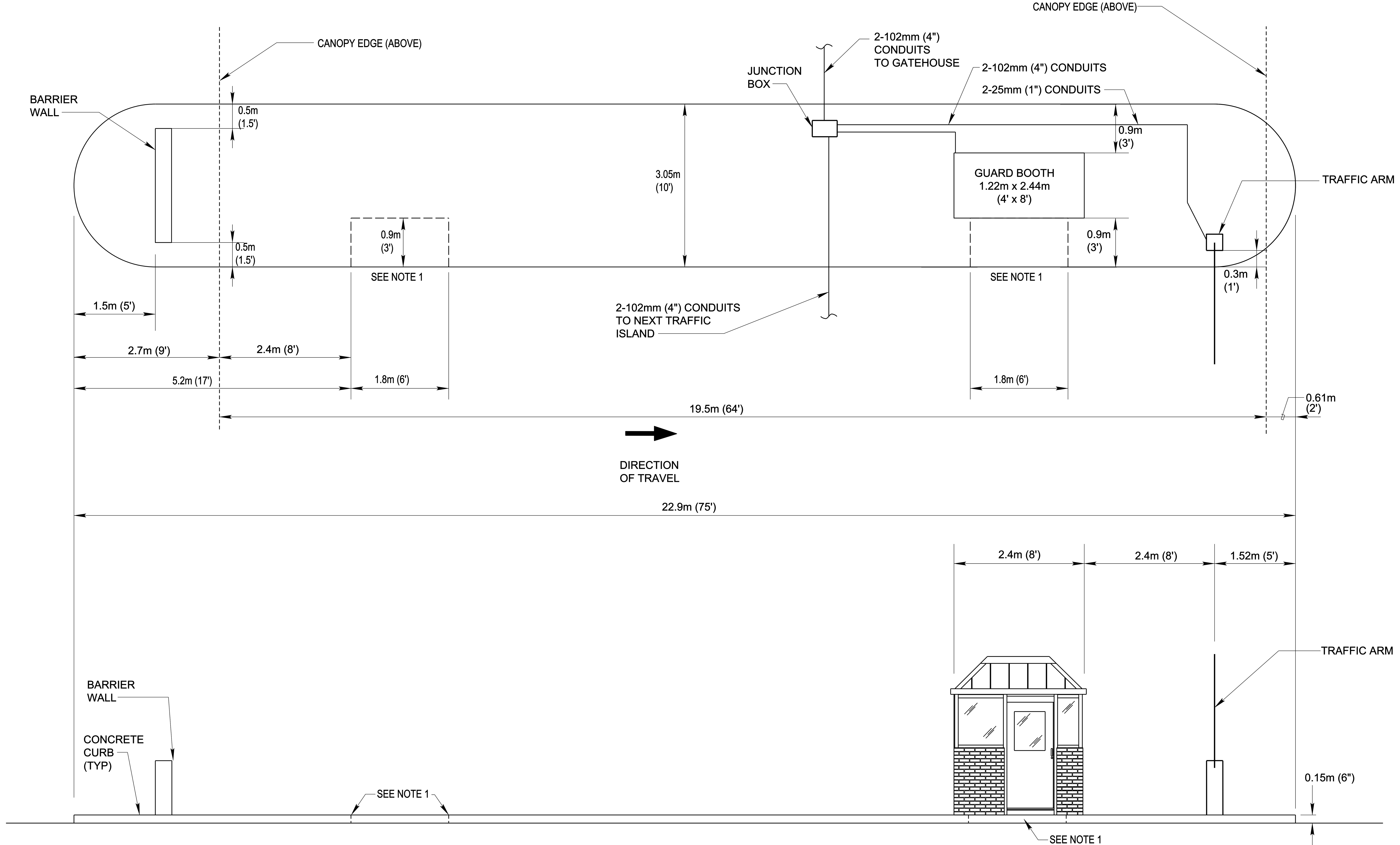
DATE: NOV 2007
SOLICITATION NO.: W9128H-07-X-0204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE:
DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
PLOT SCALE: 1:1
SIZE: ANSI D

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

CONDUIT PLAN
WITH AUTOMATION AND NO ISLAND

SHEET REFERENCE NUMBER
EL.03
SHEET 50 OF 60




NOTES:

1. A CURB CUTOUT FOR THE TANDEM GUARD IS OPTIONAL. IF PROVIDED, CUTOUT SHALL BE 3' DEEP BY 6' WIDE AS SHOWN AND SHALL HAVE VERTICAL FACES.
2. NOTE: DESIGN MAY VARY TO FIT EXISTING CONDITIONS

CONDUIT PLAN
TRAFFIC ISLAND W/O AUTOMATION
GUARD BOOTH ON ISLAND
NOT TO SCALE

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

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DESIGNED BY: X.X.X.
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PLOT SCALE: 1 : 1
DATE: NOV 2007
SOLICITATION NO.: W912HN-07-X-6204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE: .

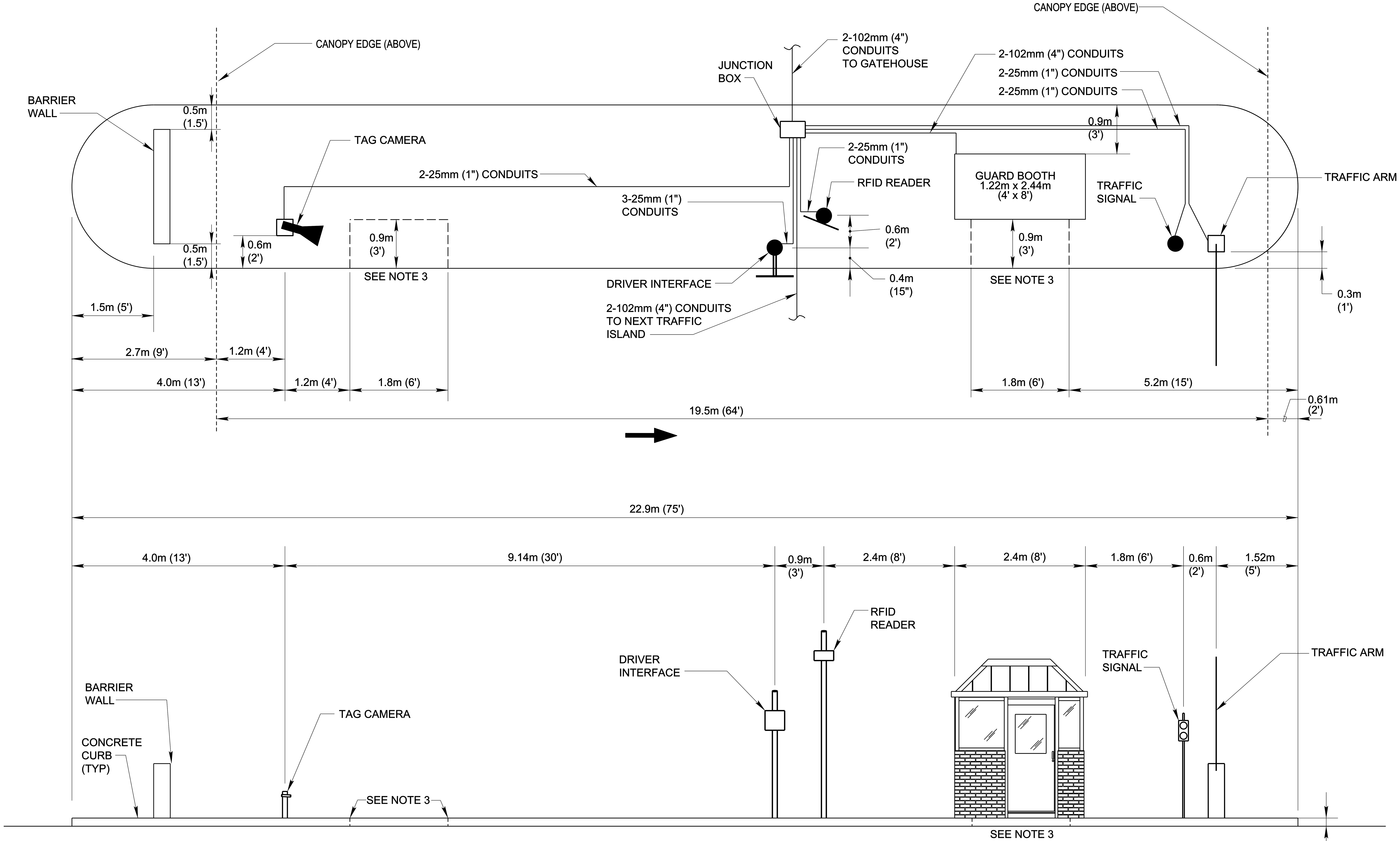
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

CONDUIT PLAN
W/O AUTOMATION ON ISLAND

SHEET REFERENCE NUMBER
EL.04
SHEET 51 OF 60

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




NOTES:

1. DEVICE LOCATIONS SHOWN ARE ADVISORY, EXCEPT THE DISTANCE BETWEEN THE GATE ARM AND THE DRIVER INTERFACE PEDESTAL SHOULD BE 27' AS SHOWN. FOR EXISTING ACPs WITH SHORTER TRAFFIC ISLANDS, THIS DISTANCE SHALL BE A MINIMUM OF 16 FEET.
2. FOR EXISTING ACPs WITH TRAFFIC ISLANDS SHORTER THAN 75 FEET, EVALUATE EXISTING CONDITIONS TO DETERMINE THE OPTIMAL LOCATION OF THE REAR TAG CAMERA TO ENSURE PROPER COVERAGE.
3. A CURB CUTOUT FOR THE TANDEM GUARD IS OPTIONAL. IF PROVIDED, CUTOUT SHALL BE 3' DEEP BY 6' WIDE AS SHOWN AND SHALL HAVE VERTICAL FACES.
4. NOTE: DESIGN MAY VARY TO FIT EXISTING CONDITIONS.

CONDUIT PLAN
TRAFFIC ISLAND WITH AUTOMATION
GUARD BOOTH ON ISLAND
NOT TO SCALE

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DATE: NOV 2007
SOLICITATION NO.: W9128N-07-X-0204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE:
DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
PLOT SCALE: 1 : 1
SIZE: ANSI D

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

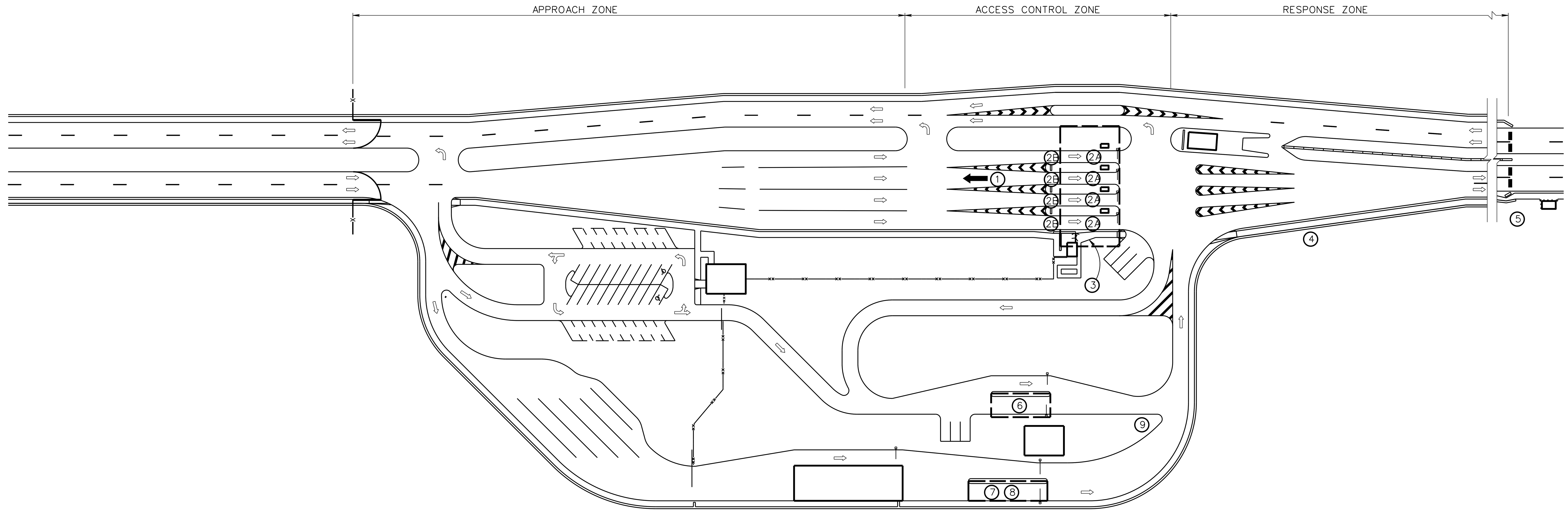
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

CONDUIT PLAN
WITH AUTOMATION ON ISLAND

SHEET REFERENCE NUMBER
EL.05



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$




PRIMARY ACP WITH VCC AND COMMERCIAL VEHICLE

| ZONE/FACILITY | NUMBER | DESCRIPTION | VIEW | CAMERA LOCATION | MONITOR LOCATION | LOCATION TYPE | NUMBER OF CAMERAS | FIXED OR PTZ |
|---|---|---|---|---|---|---|---|---|
| APPROACH ZONE | 1 | APPROACH ZONE OVERWATCH | VIEW APPROACHING TRAFFIC | POLE OR CANOPY ROOF | GATEHOUSE | EXTERNAL | 1 OR 2 (SEE NOTE 1) | F |
| ID CHECK AREA | 2A | LANE OPERATIONS | DRIVER, VEHICLE, AND ID CHECK GUARD | UNDERSIDE OF CANOPY | GATEHOUSE | COVERED | 1 PER LANE | F |
| | 2B | REAR LICENSE PLATE - FUTURE | REAR LICENSE PLATE USING SPECIAL LIGHTING | PRIMARY ISLANDS | TBD | COVERED | 1 PER LANE (SEE NOTE 2) | F |
| | 3 | PEDESTRIAN ID CHECK OPERATIONS | PEDESTRIAN GUARD BOOTH AND PEDESTRIAN ACTIVE BARRIER | UNDERSIDE OF CANOPY | GATEHOUSE | COVERED | 1 | F |
| | 4 | ID CHECK AREA OVERWATCH | ID CHECK AREA, TURNAROUND, AND SEARCH AREA ENTRANCE/EXIT | POLE OR GATEHOUSE ROOF | CENTRAL SECURITY MONITORING STATION | EXTERNAL | 1 | PTZ |
| RESPONSE ZONE | 5 | FINAL BARRIER OVERWATCH | FINAL BARRIERS | POLE | GATEHOUSE | EXTERNAL | 1 | F |
| PASSENGER VEHICLE SEARCH AREA | 6 | SEARCH OPERATIONS | DRIVER, VEHICLE, AND SEARCH AREA GUARD | UNDERSIDE OF CANOPY | GATEHOUSE | COVERED | 1 | F |
| TRUCK SEARCH AREA | 7 | SEARCH OPERATIONS | DRIVER, VEHICLE, AND SEARCH AREA GUARD | UNDERSIDE OF CANOPY | GATEHOUSE | COVERED | 1 | F |
| | 8 | AID SEARCH AREA GUARDS - OPTIONAL (SEE NOTE 3) | TOP OF VEHICLE BEING SEARCHED | UNDERSIDE OF CANOPY | SEARCH AREA | COVERED | 1 | PTZ |
| SEARCH AREA | 9 | SEARCH AREA OVERWATCH | SEARCH AREAS | POLE | GATEHOUSE | EXTERNAL | 1 (SEE NOTE 4) | PTZ |
| | | | | | | TOTAL | 12-16 ** FOR 4 LANE ENTRANCE | |

** 10-12 FOR 2 LANE ENTRANCE
11-14 FOR 3 LANE ENTRANCE

NOTES:

1. AN ADDITIONAL CAMERA MAY BE REQUIRED TO VIEW APPROACH ZONE FOR PEDESTRIANS.
2. PROVIDE CONDUIT ONLY FOR FUTURE CAMERA AND LIGHTS.
3. OPTIONAL CAMERA TO AID SEARCH AREA GUARDS.
4. MAY REQUIRE 2 CAMERAS IF TRUCK AND PASSENGER VEHICLE SEARCH AREAS CANNOT BE COVERED BY ONE CAMERA.
5. SEE DESIGN CRITERIA (APPENDIX B) FOR DESCRIPTION OF CCTV REQUIREMENTS.
6. CAMERA PLAN INTENDED TO PROVIDE INITIAL GUIDANCE PER POLICY REQUIREMENTS. LOCATIONS ARE APPROXIMATE. ACTUAL LOCATIONS AND NUMBER OF CAMERAS TO BE DETERMINED BASED ON SITE CONDITIONS AND LEVEL OF NEED.

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

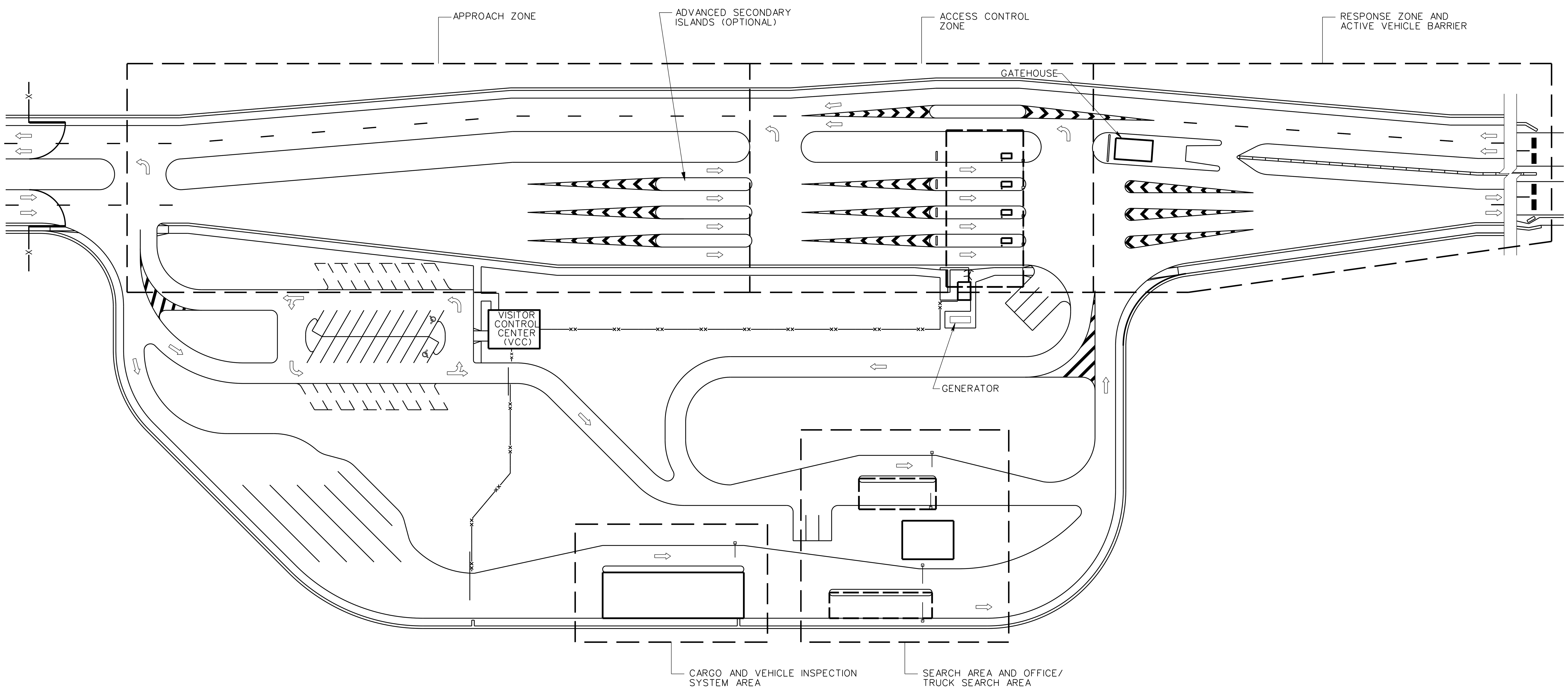
DESIGNED BY: X.X.X. | DATE: NOV 2007 | DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | CATEGORY CODE: X | SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ELECTRICAL PLAN
CAMERA PLAN

SHEET REFERENCE NUMBER
E1.01
SHEET 53 OF 60




## POWER REQUIREMENTS

NOT TO SCALE

| AREA | VA - CONNECTED | | | VA - DEMAND | | |
|---|---|---|---|---|---|---|
| | UTILITY | GENERATOR | UPS | UTILITY | GENERATOR | UPS |
| APPROACH ZONE | 7120.0 | 7120.0 | 2400.0 | 7120.0 | 7120.0 | 2400.0 |
| ADVANCE (SECONDARY) ISLANDS | 6240.0 | 6240.0 | 1200.0 | 1440.0 | 1440.0 | 1200.0 |
| ACCESS CONTROL ZONE | 32632.2 | 23919.2 | 9020.0 | 16992.2 | 16079.2 | 5980.0 |
| GATEHOUSE | 15184.6 | 8343.6 | 6934.0 | 11704.6 | 8343.6 | 6934.0 |
| RESPONSE ZONE AND ACTIVE VEHICLE BARRIER | 22578.0 | 22578.0 | 18550.0 | 4098.0 | 4098.0 | 70.0 |
| OVERWATCH POSITION | 2430.8 | 1276.8 | 1056.0 | 1710.8 | 1276.8 | 1056.0 |
| VISITOR CONTROL CENTER (VCC) | 24730.2 | 8555.2 | 3864.0 | 15740.2 | 8555.2 | 3864.0 |
| SEARCH AREA AND OFFICE | 38860.2 | 25685.2 | 6180.0 | 30910.2 | 23725.2 | 5420.0 |
| TRUCK SEARCH AREA | 8482.0 | 8482.0 | 830.0 | 7722.0 | 7722.0 | 70.0 |
| CARGO AND VEHICLE INSPECTION SYSTEM AREA | 100000.0 | 0.0 | 0.0 | 100000.0 | 0.0 | 0.0 |
| ALL | 258258.0 | 112200.0 | 50034.0 | 197438.0 | 78360.0 | 26994.0 |

NOTES:

1. POWER REQUIREMENTS PER ACP CRITERIA REQUIREMENTS AND STANDARD DRAWINGS.
2. BACKUP POWER & UPS REQUIREMENTS PER ACP CRITERIA (APPENDIX B).
3. DESIGNER TO VERIFY UPS INTERFACE CAPABILITIES.
4. PHYSICAL LOCATION(S) AND SIZE OF UPS(S) SHALL BE DETERMINED BY THE ELECTRICAL DESIGNER.
5. SEE APPENDIX F FOR DETAILED LIST OF ELECTRICAL LOADS.

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

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US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

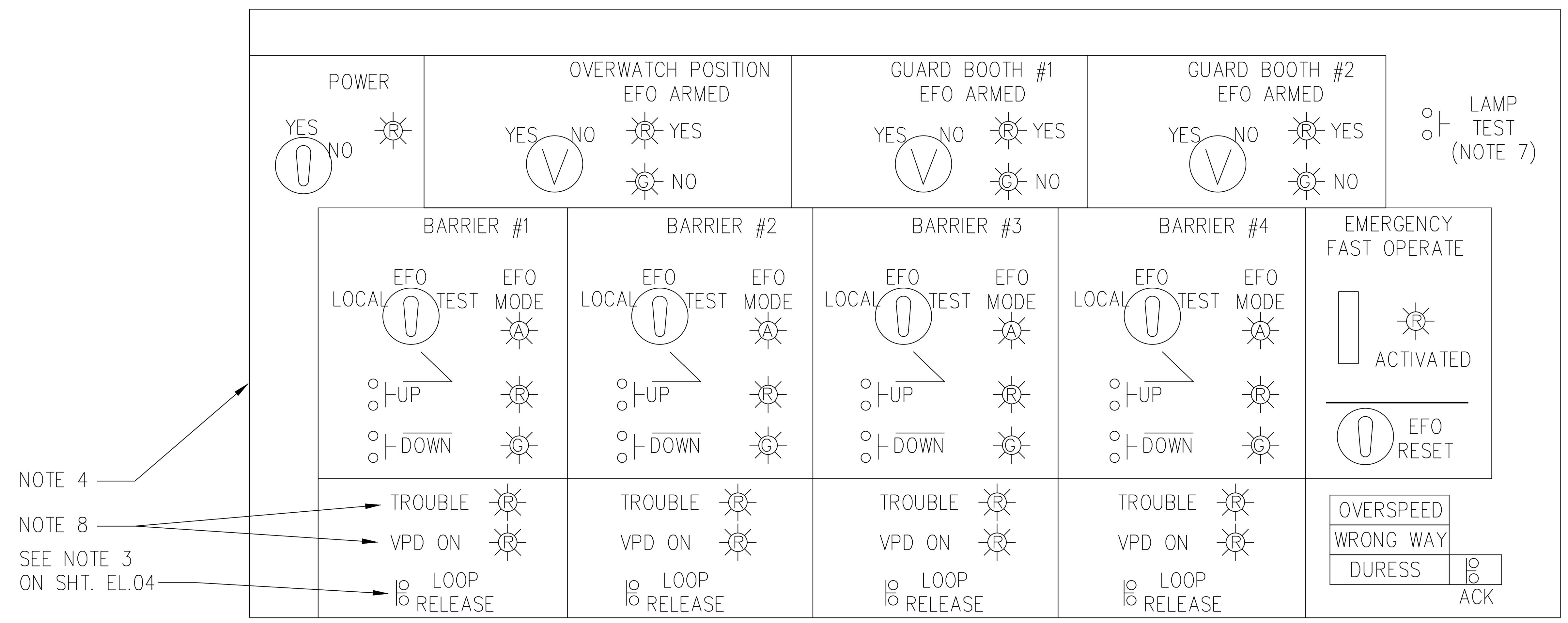
DESIGNED BY: X.X.X. | DATE: NOV 2007 | DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W9128F-07-X-0204 | SUBMITTED BY: X | CONTRACT NO.: X | FILE NAME: X | CATEGORY CODE: X | SIZE: ANSI D | PLOT SCALE: 1:1 | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

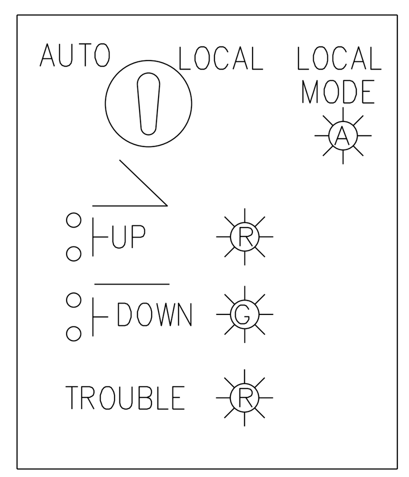
ELECTRICAL PLAN
POWER REQUIREMENTS

SHEET REFERENCE NUMBER
E1.02

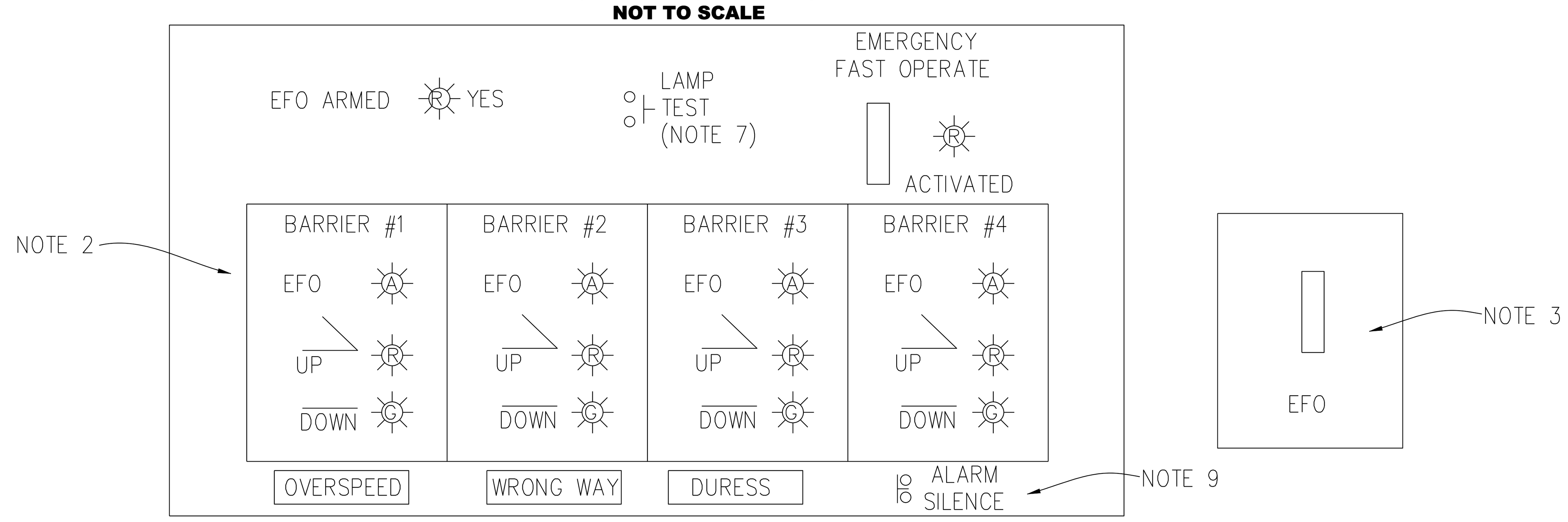



## GATEHOUSE MASTER CONTROL PANEL

**SIGNS AND SIGNALS AND**
**PRESSURE DETECTION**
**SAFETY SYSTEMS**
**NOT TO SCALE**



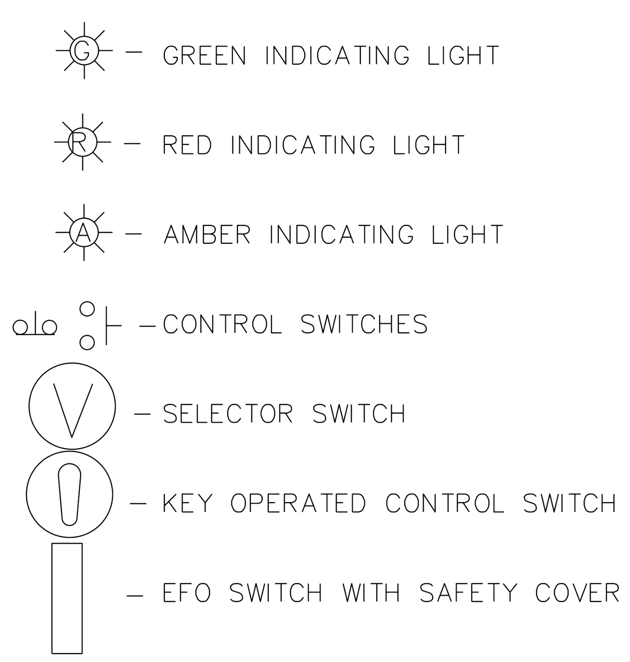

## LOCAL CONTROL PANEL AT BARRIER




## GUARD BOOTH OR OVERWATCH POSITION CONTROL PANELS

**SIGNS AND SIGNALS AND**
**PRESSURE DETECTION**
**SAFETY SYSTEMS**
**NOT TO SCALE**

LEGEND




NOTES:

1. THE CONTROL PANEL LAYOUTS DEPICT AN ACP WITH A GATEHOUSE, 2 GUARD BOOTHS, AN OVER WATCH POSITION, AND 4 ACTIVE VEHICLE BARRIERS.
2. BARRIER MODE AND STATUS INDICATING LIGHTS ARE OPTIONAL.
3. PROVIDE A SEPARATE STAND ALONE EFO TOGGLE SWITCH WITH SAFETY COVER MOUNTED ON THE INSIDE OF THE GUARD BOOTH TO THE LEFT OF THE DOOR FRAME FOR EASY ACCESS BY THE GUARD WHO MAY BE STANDING OUTSIDE GUARD BOOTH DURING ID CHECKS.
4. THE BARRIER MODE SELECTOR SWITCHES SHALL BE KEY OPERATED WITH THE KEY REMOVABLE IN ALL MODES. EACH BARRIER SHALL HAVE A UNIQUE KEY.
   a. UNDER NORMAL OPERATIONS, THE BARRIER MODE SELECTOR SWITCHES WILL BE IN THEIR EFO POSITIONS WITH KEYS REMOVED AND STORED IN A LOCKED CABINET IN THE GATEHOUSE ACCESSIBLE ONLY BY THE CHIEF OF THE GUARDS.
   b. WHEN PERFORMING BARRIER MAINTENANCE, MAINTENANCE PERSONNEL WILL OBTAIN THE KEY FROM THE CHIEF OF THE GUARDS, PUT THE SWITCH IN THE "LOCAL" POSITION, AND THEN REMOVE AND RETAIN THE KEY. THE MAINTENANCE PERSON WILL THEN PUT THE KEY IN THE MODE SELECTOR SWITCH ON THE BARRIERS LOCAL CONTROL PANEL LOCATED AT THE BARRIER AND TURN THE KEY TO THE "LOCAL" POSITION TO ACTIVATE THE OPEN AND CLOSE SWITCHES ON THE LOCAL CONTROL PANEL. WHEN MAINTENANCE IS COMPLETE, THE MAINTENANCE PERSON WILL PLACE THE MODE SELECTOR SWITCH ON THE LOCAL CONTROL PANEL BACK TO "AUTO" MODE, REMOVE THE KEY, AND RETURN THE KEY TO THE CHIEF OF THE GUARDS. THE CHIEF OF THE GUARDS WILL USE THE KEY TO PLACE THE BARRIER'S MODE SELECTOR SWITCH ON THE MASTER CONTROL PANEL IN THE "EFO" POSITION,AND THEN WILL REMOVE AND LOCKUP THE KEY.
   c. A GUARD MAY TEST OPERATE A BARRIER BY FIRST OBTAINING THE BARRIER'S MODE SWITCH KEY FROM THE CHIEF OF THE GUARDS, PUTTING THE MODE SWITCH IN THE "TEST" POSITION, AND THEN OPENING OR CLOSING THE BARRIER WITH THE PUSHBUTTONS ON THE MASTER CONTROL PANEL. UPON COMPLETION OF THE TEST OPERATIONS, THE GUARD WILL RETURN MODE TO "EFO", REMOVE THE KEY, AND RETURN IT TO THE CHIEF OF THE GUARDS. PROCEDURES MUST BE IN PLACE TO ENSURE ALL OPERABLE BARRIERS' MODE SELECTOR SWITCHES ARE PLACED IN THE EFO POSITIONS FOR THE PROPER RESPONSE TO AN EFO COMMAND.
5. SEE UFGS 34 41 26.00 10 "ACCESS CONTROL POINT CONTROL SYSTEM" APPENDIX A "SIGNS AND SIGNALS SAFETY SYSTEM" OR APPENDIX A "PRESENCE DETECTION SAFETY SYSTEM" FOR DESCRIPTIONS OF THE REQUIRED BARRIER AND TRAFFIC CONTROL SEQUENCES.
6. THE BARRIER MODE SELECTOR SWITCHES, BARRIER "DOWN" AND "UP" SWITCHES AND THE EFO RESET SWITCH MAY BE LOCATED ON A SEPARATE PANEL CALLED THE MAINTENANCE PANEL. THE MAINTENANCE PANEL MUST BE LOCATED IN THE GATEHOUSE IN AN AREA OR CABINET THAT IS ONLY ACCESSIBLE TO THE CHIEF OF THE GUARDS.

NOTES (CONT.):

7. LAMP TEST PUSH BUTTON SHALL TURN ON ALL INDICATING LIGHTS WHILE BUTTON IS PUSHED WITHOUT EFFECTING ANY CONTROLS.
8. THE INDICATING LIGHT LABELED 'TROUBLE' SHALL COME ON FOR ANY PROBLEMS OR ALARM CONDITIONS AT THE BARRIER, e.g. LOW OIL AIR PRESSURE, LOW VOLTAGE, ETC. THE INDICATING LIGHT LABELED 'VPD ON' SHALL COME ON WHEN ANY OF THE BARRIER'S VEHICLE PRESENCE DETECTORS (VPD'S) GETS A CALL (VEHICLE DETECTED) FOR MORE THAN 15 SECONDS.
9. OVERSPEED, WRONG-WAY, AND DURESS ALARMS SHALL INCLUDE BACK LIT WINDOWS AND ADJUSTABLE AUDIBLE ALARMS. DURESS ALARMS SHALL BE ON OVERWATCH POSITION PANEL AND GATEHOUSE PANEL ONLY. DURESS ALARM ACKNOWLEDGEMENT SWITCH SHALL BE ON GATEOUSE PANEL ONLY. OVERWATCH POSITION PANEL SHALL INCLUDE A DURESS ALARM SILENCE SWITCH TO SILENCE THE AUDIBLE ALARM. ALL OVERSPEED AND WRONG WAY ALARMS SHALL BE SELF CLEARING.



US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1:1 | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

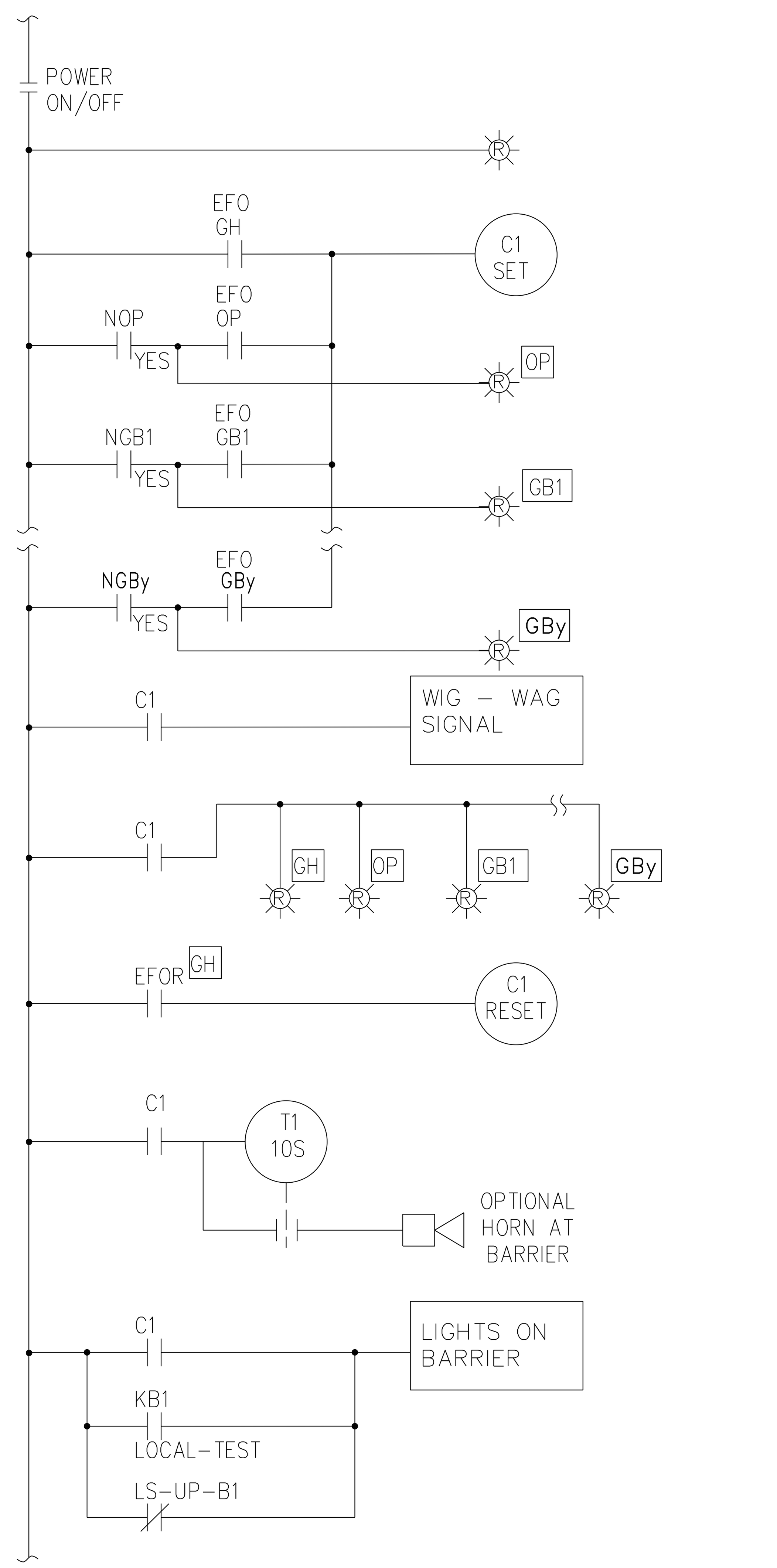
FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ELECTRICAL PLAN
ACTIVE VEHICLE BARRIER CONTROLS

SHEET REFERENCE NUMBER
E1.03
SHEET 55 OF 60

$$DGNSPEC$$ $$SYSTIME$$ $$USERNAME$$

**COMMON EFO CIRCUIT**




**DEVICE LOCATION SYMBOLS**

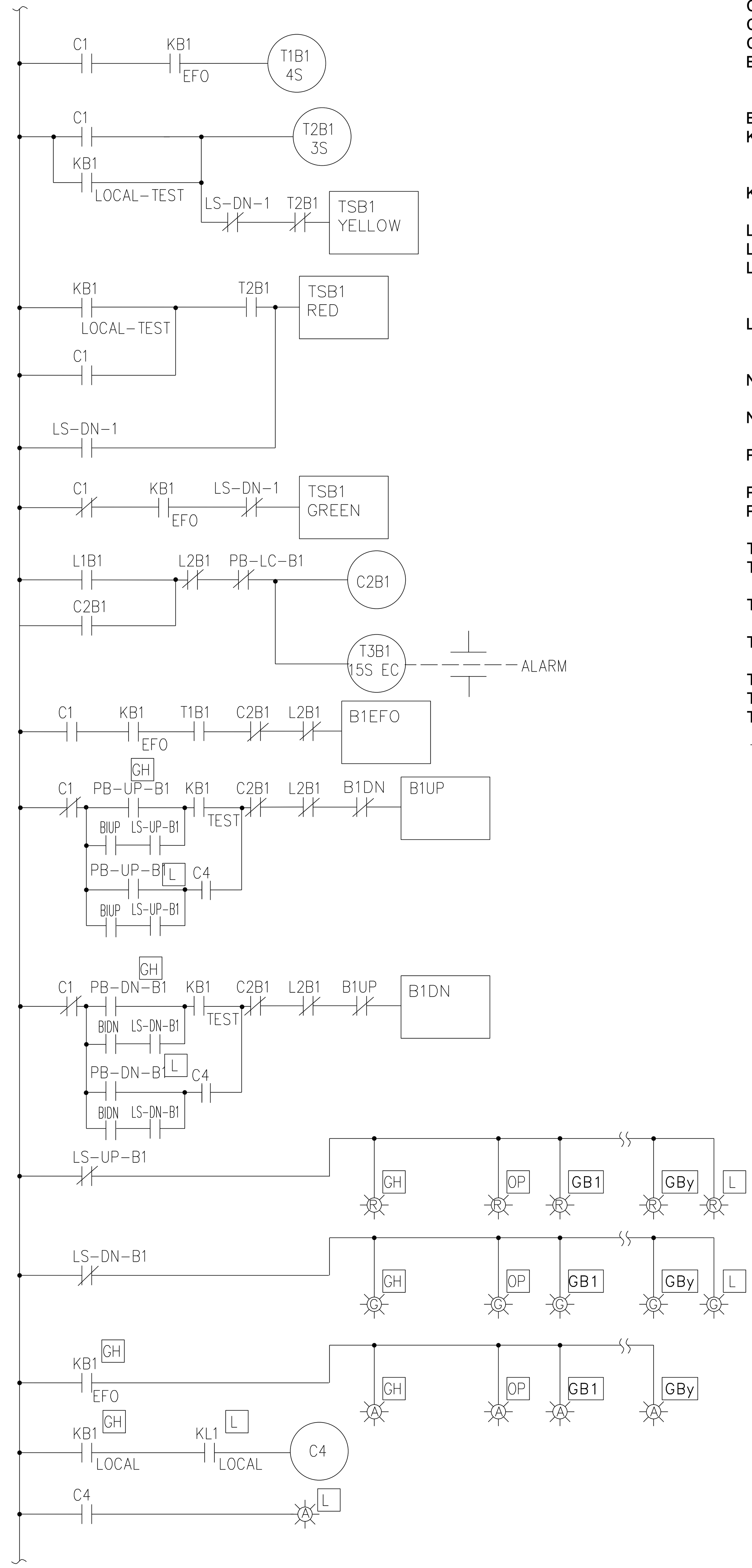
GH – GATEHOUSE MASTER CONTROL PANEL

GBy – GUARD BOOTH CONTROL PANEL – "y" DENOTES GUARD BOOTH NUMBER

OP – OVERWATCH POSITION CONTROL PANEL

L – LOCAL CONTROL PANEL AT BARRIER

**TYPICAL BARRIER CONTROLS SHOWN FOR BARRIER #1**




**DEVICE LEGEND**

BxUP BARRIER # x NORMAL UP (RAISE) ACTUATOR.
BxDN BARRIER # x DOWN (LOWER) ACTUATOR.
BxEFO BARRIER # x EFO ACTUATOR.
C1 EFO LATCHING RELAY WITH BOTH SET AND RESET COILS.
C2Bx CONTROL RELAY FOR LOOP #1 AT BARRIER # x.
C4 CONTROL RELAY FOR LOCAL MODE
EFO-a EFO CONTROL SWITCH WITH MOMENTARY CONTACT. "a" DENOTES LOCATION, GH (GATEHOUSE), OP (OVERWATCH POSITION), GBy GUARD BOOTH # y)
EFOR EFO RESET CONTROL SWITCH WITH MOMENTARY CONTACT.
KBx MODE SELECTOR SWITCH WITH LOCAL-EFO-TEST MODES FOR BARRIER # x. MAINTAINED CONTACTS. KEY OPERATED UNIQUE KEY REMOVABLE IN THE OFF POSITION ONLY.
KLI MODE SELECTOR SWITCH WITH AUTO-LOCAL MODES FOR BARRIER x OPERATED BY SAME KEY THAT OPERATES KBx.
L1Bx MAGNETIC INDUCTION LOOP #1 IN FRONT OF BARRIER # x.
L2Bx MAGNETIC INDUCTION LOOP #2 IN BACK OF BARRIER # x.
LS-UP-Bx UP LIMIT SWITCH FOR BARRIER # x. CONTACT POSITION SHOWN (OPEN OR CLOSED) WHEN THE BARRIER IS IN THE FULLY "UP" OR "CLOSED" POSITION.
LS-DN-Bx DOWN LIMIT SWITCH FOR BARRIER # x. CONTACT POSITION SHOWN (OPEN OR CLOSED) WHEN THE BARRIER IS IN THE FULLY "DOWN" OR "OPENED" POSITION.
NGBy EFO ARMED YES-NO SELECTOR SWITCH WITH MAINTAINED CONTACTS FOR GUARD BOOTH # y.
NOP EFO ARMED YES-NO SELECTOR SWITCH WITH MAINTAINED CONTACTS FOR OVERWATCH POSITION.
PB-DN-Bx DOWN PUSHBUTTON FOR BARRIER # X ON MASTER CONTROL PANEL GH AND IN LOCAL PANEL AT BARRIER L .
PB-LC-Bx PUSH BUTTON TO CLEAR THE LOOP LATCHING CIRCUIT. SEE NOTE 3.
PB-UP-Bx UP PUSHBUTTON FOR BARRIER # x ON MASTER CONTROL PANEL GH AND IN LOCAL PANEL AT BARRIER L .
T1 TIMING RELAY FOR HORN AT THE BARRIER.
T1Bx TIMING RELAY TO DELAY EFO FOR BARRIER # x. 4 SECOND TIME DELAY IS ON ENERGIZATION.
T2Bx TIMING RELAY FOR YELLOW TRAFFIC SIGNAL FOR BARRIER # x. 3 SECOND TIME DELAY IS ON ENERGIZATION.
T3Bx TIMING RELAY FOR LOOP #1 ALARM. 15 SECOND TIME DELAY IS ON ENERGIZATION.
TSBx-G TRAFFIC SIGNAL (GREEN) AT BARRIER # x.
TSBx-R TRAFFIC SIGNAL (RED) AT BARRIER # x.
TSBx-Y TRAFFIC SIGNAL (YELLOW) AT BARRIER # x.

**NOTES:**

1. THIS DRAWING SHOWS REPRESENTATIVE LADDER DIAGRAMS INDICATING THE REQUIRED FUNCTIONS OF THE BARRIER AND TRAFFIC SIGNAL CONTROLS USING THE CONTROL SWITCHES SHOWN ON SHEET E1.03. THE CONTRACTOR'S ACTUAL LADDER LOGIC MUST INCLUDE ALL OF THE CONTROL FUNCTIONS SHOWN HERE AND DESCRIBED IN APPENDIX A (SIGNS AND SIGNALS SAFETY SYSTEM) OF UFGS 34 21 26.00 10. ANY DEVIATIONS FROM THE SIMPLE LADDER LOGIC SHOWN ON THIS DRAWING MUST BE JUSTIFIED AND EXPLAINED ON CONTRACTORS CONTROL SUBMITTALS.
2. THE PREFERRED CONTROL SEQUENCE SHOWN REQUIRES AN INDIVIDUAL TRAFFIC SIGNAL FOR EACH LANE WITH A BARRIER. IF INDIVIDUAL TRAFFIC SIGNALS PER LANE ARE NOT POSSIBLE, PLACING ANY BARRIER'S MODE SELECTOR SWITCH IN THE TEST OR LOCAL POSITIONS SHALL NOT CHANGE THE TRAFFIC SIGNAL. FOR THIS CONDITION, CARE MUST BE TAKEN BY THE GUARDS TO ENSURE THAT A LANE IS BLOCKED OFF AND PROPERLY SIGNED BEFORE THE BARRIER'S MODE IS CHANGED TO EITHER TEST OR LOCAL.
3. LOOP SAFETY. WHEN THE PRESENCE DETECTION LOOPS IN FRONT OF AND BEHIND THE BARRIER ARE MORE THAN 10 FEET APART, A SAFETY CIRCUIT MUST BE ADDED TO ENSURE THAT THE BARRIER WILL NOT CLOSE (DEPLOY) ON A VEHICLE THAT IS OVER THE BARRIER BUT BETWEEN THE LOOPS SO IS NOT DETECTED BY EITHER LOOP. THE FOLLOWING ARE APPROVED CIRCUITS:
   a. LATCHING CIRCUIT (SHOWN ON THE DRAWING). WHEN A VEHICLE IS DETECTED BY LOOP 1, RELAY C2Bx PICKS-UP AND SEALS ITSELF IN. AFTER THE VEHICLE PASSES OVER THE BARRIER IT SHOULD BE DETECTED BY LOOP 2 WHICH WILL DROP OUT RELAY C2Bx. PUSHBUTTON PB-CL-Bx IS REQUIRED TO DROPOUT RELAY C2Bx IN THE EVENT A VEHICLE IS DETECTED BY LOOP 1 (CAUSING C2BX TO PICK UP AND SEAL-IN) BUT IS NOT DETECTED BY LOOP 2 AS IT PASSES OVER THE BARRIER. IF THE VEHICLE PASSES OVER THE BARRIER BUT IS NOT DETECTED BY LOOP 2, RELAY C2Bx STAYS PICKED-UP EVEN THOUGH THERE IS NO VEHICLE OVER THE BARRIER. AFTER 15 SECONDS AT THIS CONDITION, AN ALARM SOUNDS TO ALERT THE GUARD THAT BARRIER x'S LOOP CURCUIT IS LATCHED. THE GUARD MUST VISUALLY CHECK THE BARRIER AND, IF THERE IS NOT A VEHICLE OVER IT, HE/SHE MUST PUSH THE PB-CL-Bx TO DROP OUT C2Bx AND CLEAR THE LOOP LATCH.
   b. TIME DELAY CIRCUIT. AN ALTERNATIVE TO THE LOOP LATCH CIRCUIT DESCRIBED ABOVE IS A CIRCUIT USING A SHORT (0.5 SECOND) TIME DELAY. A VEHICLE PASSING OVER LOOP 1 PICKS-UP A TIMER RELAY WHICH IMMEDIATELY OPENS ONE OF ITS NORMALLY CLOSED CONTACTS. AFTER THE VEHICLE CLEARS LOOP 1, THE NORMALLY CLOSED TIMER CONTACT STAYS OPEN FOR 0.5 SECONDS BEFORE CLOSING (TIME DELAY ON DROP-OUT LOGIC). THE ADDED 0.5 SECONDS BEFORE CLOSING ALLOWS THE PASSING VEHICLE TO TRAVEL THE DISTANCE BETWEEN LOOPS 1 AND 2. BEFORE THE TIMER RUNS OUT, THE VEHICLE SHOULD BE DETECTED BY LOOP 2, WHICH WILL CONTINUE TO PREVENT BARRIER CLOSURE (DEPLOYMENT) UNTIL THE VEHICLE CLEARS LOOP 2.

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
| --- | --- | --- | --- |

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA DISTRICT

DESIGNED BY: X.X.X. | DATE: NOV 2007
DWN BY: X.X.X. | CKD BY: X.X.X. | SOLICITATION NO.: W912HN-07-X-6204
SUBMITTED BY: X | CONTRACT NO.: X
FILE NAME: X | CATEGORY CODE: X
SIZE: ANSI D | PLOT SCALE: 1 : 1 | PLOT DATE:

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

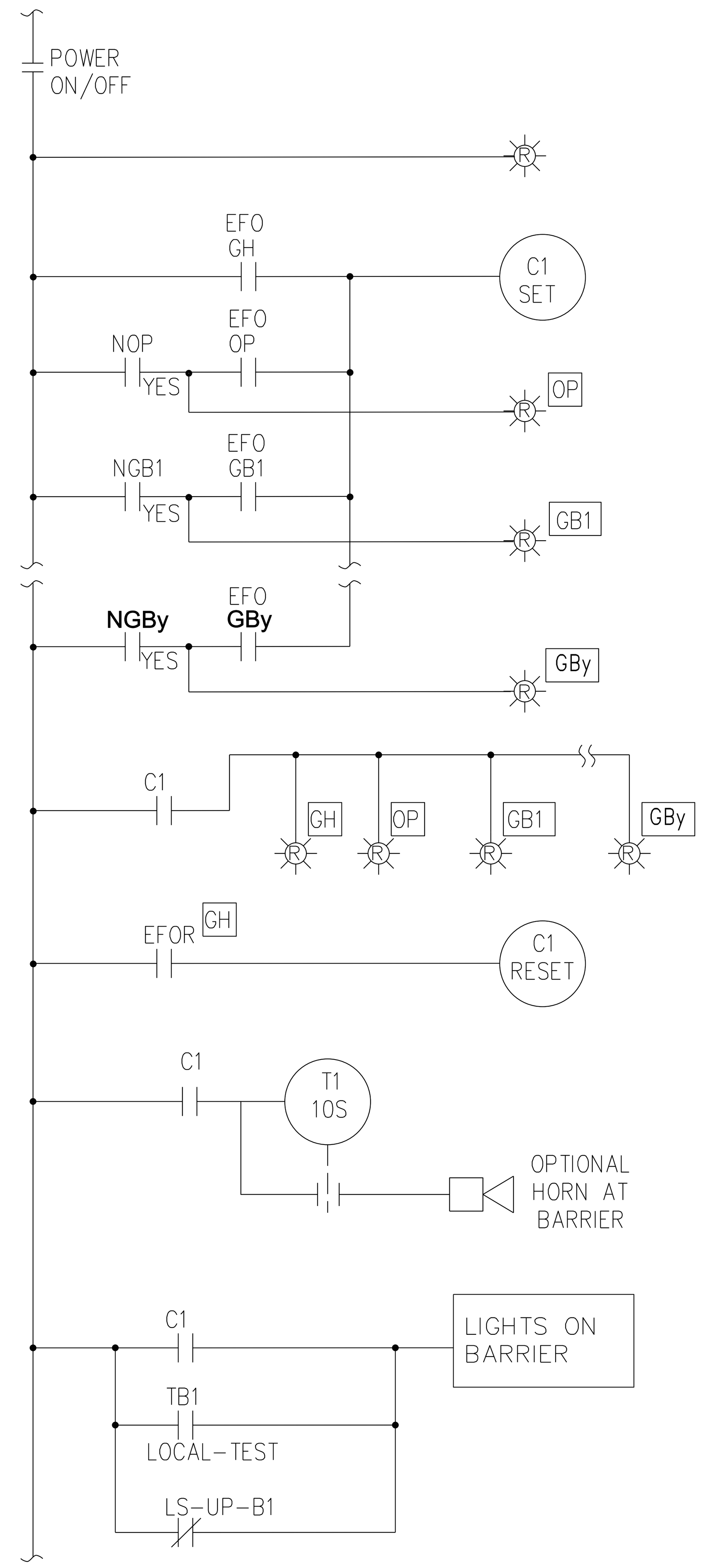
CONTROL LOGIC FOR
SIGNS AND SIGNALS SAFETY SYSTEM

SHEET REFERENCE NUMBER
E1.04

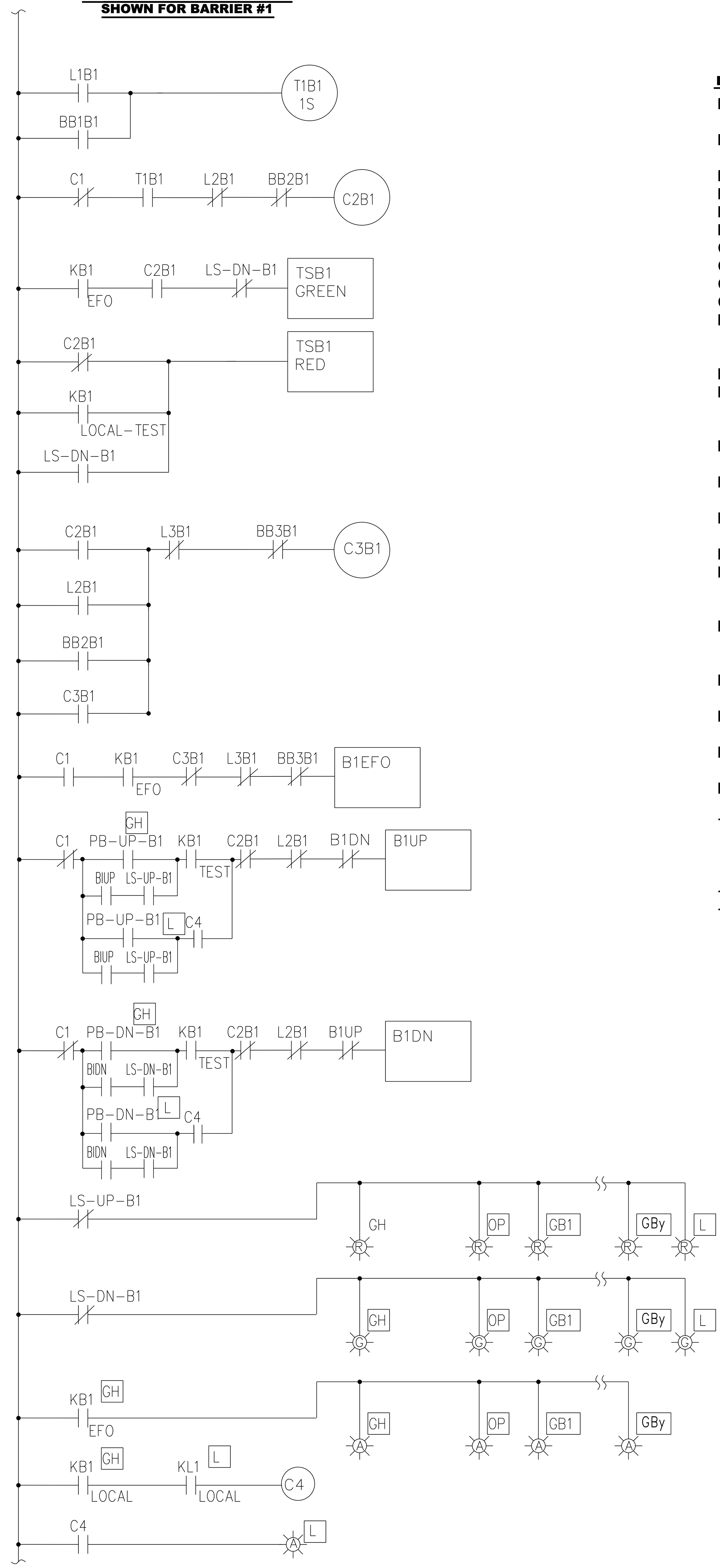


$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

## COMMON EFO CIRCUIT




## TYPICAL BARRIER CONTROLS SHOWN FOR BARRIER #1




**DEVICE LEGEND**

| | |
|---|---|
| BB1Bx | BREAK BEAM SENSOR #1 IN FRONT OF BARRIER # x's STOP LINE. |
| BB2Bx | BREAK BEAM SENSOR #2 IN BACK OF THE STOP LINE BUT IN FRONT OF BARRIER # x. |
| BB3Bx | BREAK BEAM SENSOR #3 IN BACK OF BARRIER # x. |
| BxUP | BARRIER # x NORMAL UP (RAISE) ACTUATOR. |
| BxDN | BARRIER # x DOWN (LOWER) ACTUATOR. |
| BxEFO | BARRIER # x EFO ACTUATOR. |
| C1 | EFO LATCHING RELAY WITH BOTH SET AND RESET COILS. |
| C2Bx | CONTROL RELAY FOR TRAFFIC SIGNAL AT BARRIER # x. |
| C3Bx | CONTROL RELAY FOR EFO PREEMPTION OF THE BARRIER # x. |
| C4 | CONTROL RELAY FOR LOCAL MODE |
| EFO-a | EFO CONTROL SWITCH WITH MOMENTARY CONTACT. "a" DENOTES LOCATION, GH (GATEHOUSE), OP (OVERWATCH POSITION), GBy GUARD BOOTH # y) |
| EFOR | EFO RESET CONTROL SWITCH WITH MOMENTARY CONTACT. |
| KBx | MODE SELECTOR SWITCH WITH LOCAL-EFO-TEST MODES FOR BARRIER # x. MAINTAINED CONTACTS. KEY OPERATED UNIQUE KEY REMOVABLE IN THE LOCAL POSITION ONLY. |
| KL1 | MODE SELECTOR SWITCH WITH AUTO-LOCAL MODES FOR BARRIER x OPERATED BY SAME KEY THAT OPERATES KBx. |
| L1Bx | MAGNETIC INDUCTION LOOP #1 IN FRONT OF BARRIER # x's STOP LINE. |
| L2Bx | MAGNETIC INDUCTION LOOP #2 IN BACK OF THE STOP LINE BUT ON FRONT OF BARRIER # x. |
| L3Bx | MAGNETIC INDUCTION LOOP #3 IN BACK OF BARRIER # x. |
| LS-UP-Bx | UP LIMIT SWITCH FOR BARRIER # x. CONTACT POSITION SHOWN (OPEN OR CLOSED) WHEN THE BARRIER IS IN THE FULLY "UP" OR "RAISED" POSITION. |
| LS-DN-Bx | DOWN LIMIT SWITCH FOR BARRIER # x. CONTACT POSITION SHOWN (OPEN OR CLOSED) WHEN THE BARRIER IS IN THE FULLY "DOWN" OR "LOWERED" POSITION. |
| NGBy | EFO ARMED YES-NO SELECTOR SWITCH WITH MAINTAINED CONTACTS FOR GUARD BOOTH # y. |
| NOP | EFO ARMED YES-NO SELECTOR SWITCH WITH MAINTAINED CONTACTS FOR OVERWATCH POSITION. |
| PB-DN-Bx | DOWN PUSHBUTTON FOR BARRIER # X ON MASTER CONTROL PANEL GH AND IN LOCAL PANEL AT BARRIER L . |
| PB-UP-Bx | UP PUSHBUTTON FOR BARRIER # X ON MASTER CONTROL PANEL GH AND IN LOCAL PANEL AT BARRIER L . |
| T1Bx | TIMING RELAY FOR TRAFFIC SIGNALS FOR BARRIER # x. 1 SECOND TIME DELAY IS ON ENERGIZATION, i.e., NO CONTACTS CLOSE (AND NC CONTACTS OPEN) 1 SECOND AFTER COIL IS ENERGIZED. |
| TSBx-G | TRAFFIC SIGNAL (GREEN) AT BARRIER # x. |
| TSBx-R | TRAFFIC SIGNAL (RED) AT BARRIER # x. |

NOTES:

1. THIS DRAWING SHOWS REPRESENTATIVE LADDER DIAGRAMS INDICATING THE REQUIRED FUNCTIONS OF THE BARRIER AND TRAFFIC SIGNAL CONTROLS USING THE CONTROL SWITCHES SHOWN ON SHEET E1.03. THE CONTRACTOR'S ACTUAL LADDER LOGIC MUST INCLUDE ALL OF THE CONTROL FUNCTIONS SHOWN HERE AND DESCRIBED IN APPENDIX A (PRESENCE DETECTION SAFETY SYSTEM) OF UFGS 34 21 26.00 10.
2. SEE NOTE 3 ON DRAWING E1.04 FOR LOOP SAFETY REQUIREMENT.
3. SEE APPENDIX G FOR DESCRIPTION OF CONTROLS.

**DEVICE LOCATION SYMBOLS**

- GH – GATEHOUSE MASTER CONTROL PANEL
- GBy – GUARD BOOTH CONTROL PANEL – "y" DENOTES GUARD BOOTH NUMBER
- OP – OVERWATCH POSITION CONTROL PANEL
- L – LOCAL CONTROL PANEL AT BARRIER



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

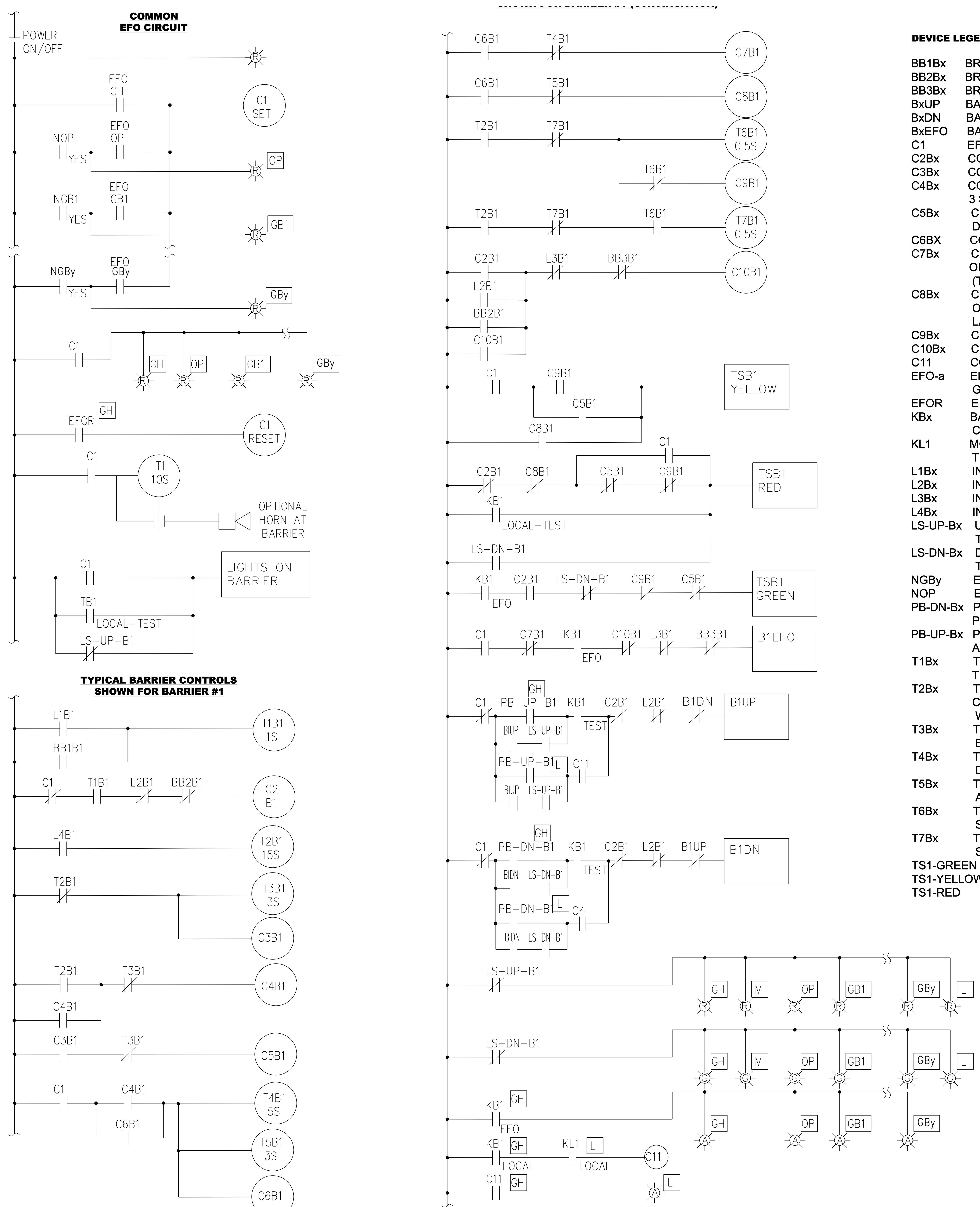
| | |
|---|---|
| DESIGNED BY: X.X.X. | DATE: NOV 2007 |
| DWN BY: X.X.X. / CKD BY: X.X.X. | SOLICITATION NO.: W912HN-07-X-6204 |
| SUBMITTED BY: X | CONTRACT NO.: X |
| FILE NAME: X | CATEGORY CODE: X |
| SIZE: ANSI D / PLOT SCALE: 1 : 1 | PLOT DATE: |

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

CONTROL LOGIC FOR PRESENCE DETECTION SAFETY SYSTEM

SHEET REFERENCE NUMBER E1.05




**DEVICE LEGEND**

| | |
|---|---|
| BB1Bx | BREAK BEAM SENSOR #1 IN FRONT OF BARRIER'S STOP LINE. |
| BB2Bx | BREAK BEAM SENSOR #2 IN BACK OF STOP LINE BUT IN FRONT OF BARRIER. |
| BB3Bx | BREAK BEAM SENSOR #3 IN BACK OF BARRIER. |
| BxUP | BARRIER UP (CLOSE) ACTUATOR. |
| BxDN | BARRIER DOWN (OPEN) ACTUATOR. |
| BxEFO | BARRIER EFO ACTUATOR. |
| C1 | EFO INITIATION RELAY WITH BOTH SET AND RESET COILS. |
| C2Bx | CONTROL RELAY TO CONTROL TRAFFIC SIGNAL. |
| C3Bx | CONTROL RELAY FOR QUEUE MODE. |
| C4Bx | CONTROL RELAY THAT PICKS-UP AT BEGINNING OF QUEUE (T2 TIMES OUT), AND DROPS OUT 3 SECONDS AFTER QUEUE ENDS (T3 TIMES OUT). |
| C5Bx | CONTROL RELAY THAT PICKS-UP AT END OF QUEUE (T2 DROPS OUT AND PICKS UP C3), AND DROPS OUT 3 SECONDS LATER (T3 TIMES OUT). |
| C6BX | CONTROL RELAY FOR EFO PREEMPTION DURING QUEUE MODE. |
| C7Bx | CONTROL RELAY THAT PICKS UP WHEN THERE IS AN EFO ACTUATION (C1) DURING THE PERIOD OF THE QUEUE PLUS 3 SECONDS AFTER THE QUEUE ENDS (C4). DROPS OUT 5 SECONDS LATER (T4 TIMES OUT). |
| C8Bx | CONTROL RELAY THAT PICKS UP WHEN THERE IS AN EFO ACTUATION (C1) DURING THE PERIOD OF THE QUEUE PLUS 3 SECONDS AFTER THE QUEUE ENDS (C4). DROPS OUT 3 SECONDS LATER (T5 TIMES OUT). |
| C9Bx | CONTROL RELAY TO CONTROL FLASHING YELLOW ON TRAFFIC SIGNAL. |
| C10Bx | CONTROL RELAY TO SUPPRESS BARRIER CLOSURE WHEN VEHICLE IS PRESENT. |
| C11 | CONTROL RELAY FOR LOCAL MODE |
| EFO-a | EFO CONTROL SWITCH WITH MOMENTARY CONTACT. "a" DENOTES LOCATION, GH (GATEHOUSE), OP (OVERWATCH POSITION), GBy GUARD BOOTH # y) |
| EFOR | EFO RESET CONTROL SWITCH WITH MOMENTARY CONTACT. |
| KBx | BARRIER MODE SELECTOR SWITCH WITH LOCAL-EFO-TEST MODES FOR BARRIER #1. MAINTAINED CONTACTS. KEY OPERATED WITH UNIQUE KEY REMOVABLE IN THE LOCAL POSITION ONLY. |
| KL1 | MODE SELECTOR SWITCH WITH AUTO-LOCAL MODES FOR BARRIER x OPERATED BY SAME KEY THAT OPERATES KBx. |
| L1Bx | INDUCTION LOOP SENSOR #1 IN FRONT OF BARRIER'S STOP LINE. |
| L2Bx | INDUCTION LOOP SENSOR #2 IN BACK OF STOP LINE BUT IN FRONT OF BARRIER. |
| L3Bx | INDUCTION LOOP SENSOR #3 IN BACK OF BARRIER. |
| L4Bx | INDUCTION LOOP SENSOR #4 FOR QUEUE INITIATION. |
| LS-UP-Bx | UP (CLOSED) LIMIT SWITCH ON BARRIER. CONTACT POSITION SHOWN (OPEN OR CLOSED) WHEN THE BARRIER IS IN THE FULLY UP POSITION. |
| LS-DN-Bx | DOWN (OPEN) LIMIT SWITCH ON BARRIER. CONTACT POSITION SHOWN (OPEN OR CLOSED) IS WHEN THE BARRIER IS IN THE FULLY DOWN POSITION. |
| NGBy | EFO ARMED YES-NO SELECTOR SWITCH WITH MAINTAINED CONTACTS FOR GUARD BOOTH # y. |
| NOP | EFO ARMED YES-NO SELECTOR SWITCH WITH MAINTAINED CONTACTS FOR OVERWATCH POSITION. |
| PB-DN-Bx | PUSHBUTTON TO LOWER (DOWN) BARRIER # X ON MASTER CONTROL PANEL GH AND IN LOCAL PANEL AT BARRIER L. |
| PB-UP-Bx | PUSHBUTTON TO RAISE (UP) BARRIER # X ON MASTER CONTROL PANEL GH AND IN LOCAL PANEL AT BARRIER L. |
| T1Bx | TIMING RELAY WITH 1 SECOND DELAY TO CONTRL RED/GREEN CYCLE ON THE TRAFFIC SIGNAL AT THE BARRIER. |
| T2Bx | TIMING RELAY WHOSE NO CONTACTS CLOSE AND NC CONTACTS OPEN 15 SECONDS AFTER A CONTINUOUS CALL ON THE QUEUE LOOP (L4). CONTACTS REVERT BACK TO NORMAL POSITION WHEN THE CALL ON L4 DROPS. T2 MARKS THE DURATION OF THE QUEUE PERIOD. |
| T3Bx | TIMING RELAY SET AT 3 SECONDS TO CONTROL YELLOW CYCLE ON THE TRAFFIC SIGNAL AT THE BARRIER AT THE END OF QUEUE MODE. |
| T4Bx | TIMING RELAY SET AT 5 SECONDS TO CONTROL BARRIER SUPPRESSION UPON EFO ACTIVATION DURING QUEUE MODE. |
| T5Bx | TIMING RELAY SET AT 3 SECONDS TO CONTROL YELLOW CYCLE OF THE TRAFFIC SIGNAL UPON ACTIVATION OF EFO DURING QUEUE MODE. |
| T6Bx | TIMING RELAY SET AT 0.5 SECONDS TO CONTROL FLASHING YELLOW CYCLE OF THE TRAFFIC SIGNAL DURING QUEUE MODE. |
| T7Bx | TIMING RELAY SET AT 0.5 SECONDS TO CONTROL FLASHING TELLOW CYCLE OF THE TRAFFIC SIGNAL DURING QUEUE MODE. |
| TS1-GREEN | GREEN LIGHT ACTUATOR FOR THE TRAFFIC SIGNAL AT BARRIER #1. |
| TS1-YELLOW | YELLOW LIGHT ACTUATOR FOR THE TRAFFIC SIGNAL AT BARRIER #1. |
| TS1-RED | RED LIGHT ACTUATOR FOR THE TRAFFIC SIGNAL AT BARRIER #1. |

NOTES:

1. THIS DRAWING SHOWS REPRESENTATIVE LADDER DIAGRAMS INDICATING THE REQUIRED FUNCTIONS OF THE BARRIER AND TRAFFIC SIGNAL CONTROLS USING THE CONTROL SWITCHES SHOWN ON SHEET E1.03. THE CONTRACTOR'S ACTUAL LADDER LOGIC MUST INCLUDE ALL OF THE CONTROL FUNCTIONS SHOWN HERE AND DESCRIBED IN APPENDIX A (PRESENCE DETECTION SAFETY SYSTEM) OF UFGS 34 21 26.00 10.
2. SEE NOTE 3 ON DWG E1.04 FOR LOOP SAFETY REQUIREMENT.
3. SEE APPENDIX G FOR DESCRIPTION OF CONTROLS.

**DEVICE LOCATION SYMBOLS**

GH – GATEHOUSE MASTER CONTROL PANEL
GBy – GUARD BOOTH CONTROL PANEL – "y" DENOTES GUARD BOOTH NUMBER
OP – OVERWATCH POSITION CONTROL PANEL
L – LOCAL CONTROL PANEL AT BARRIER



US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1 : 1
DATE: NOV 2007 | SOLICITATION NO.: W912HN-07-X-6204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE: .

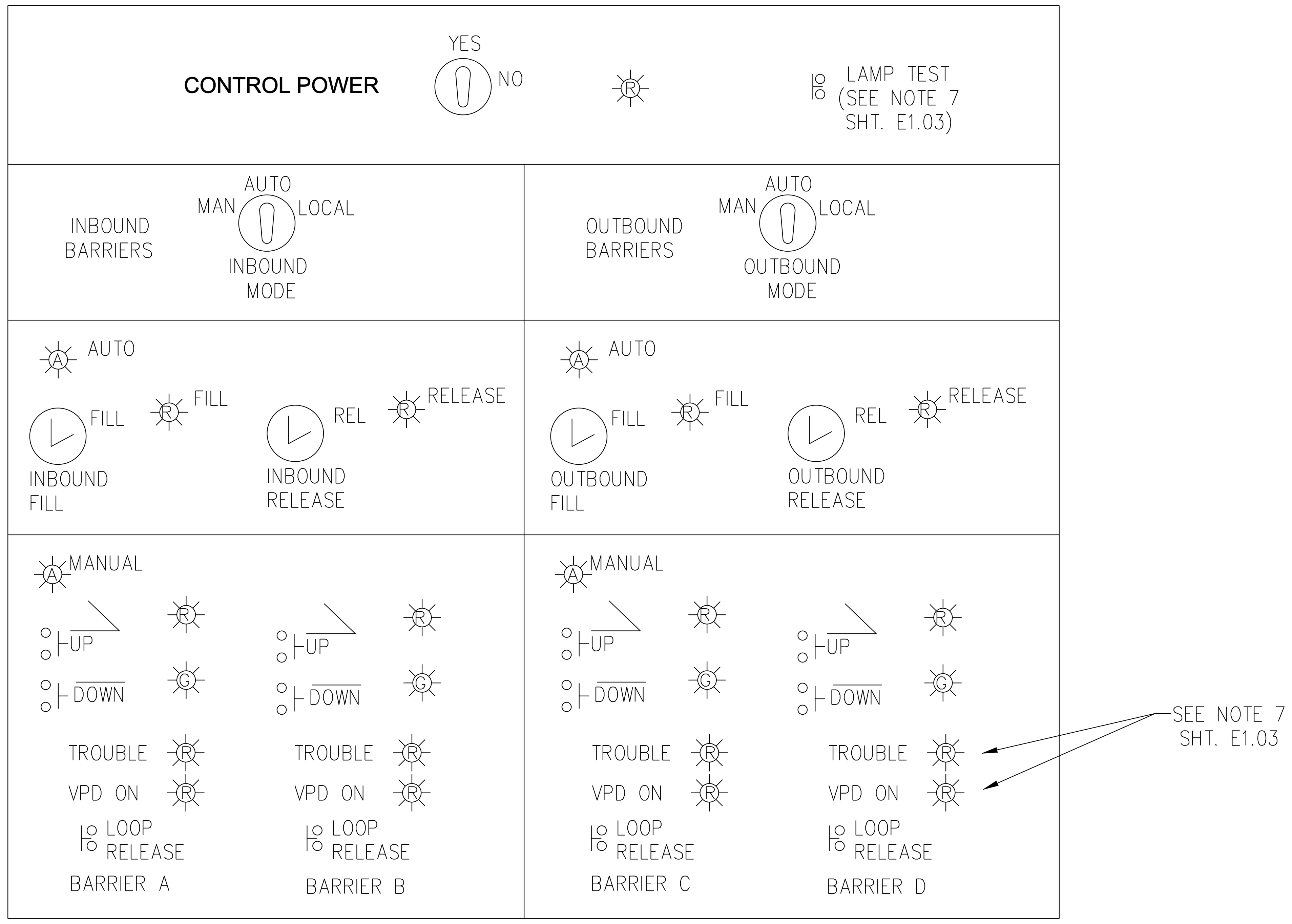
U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

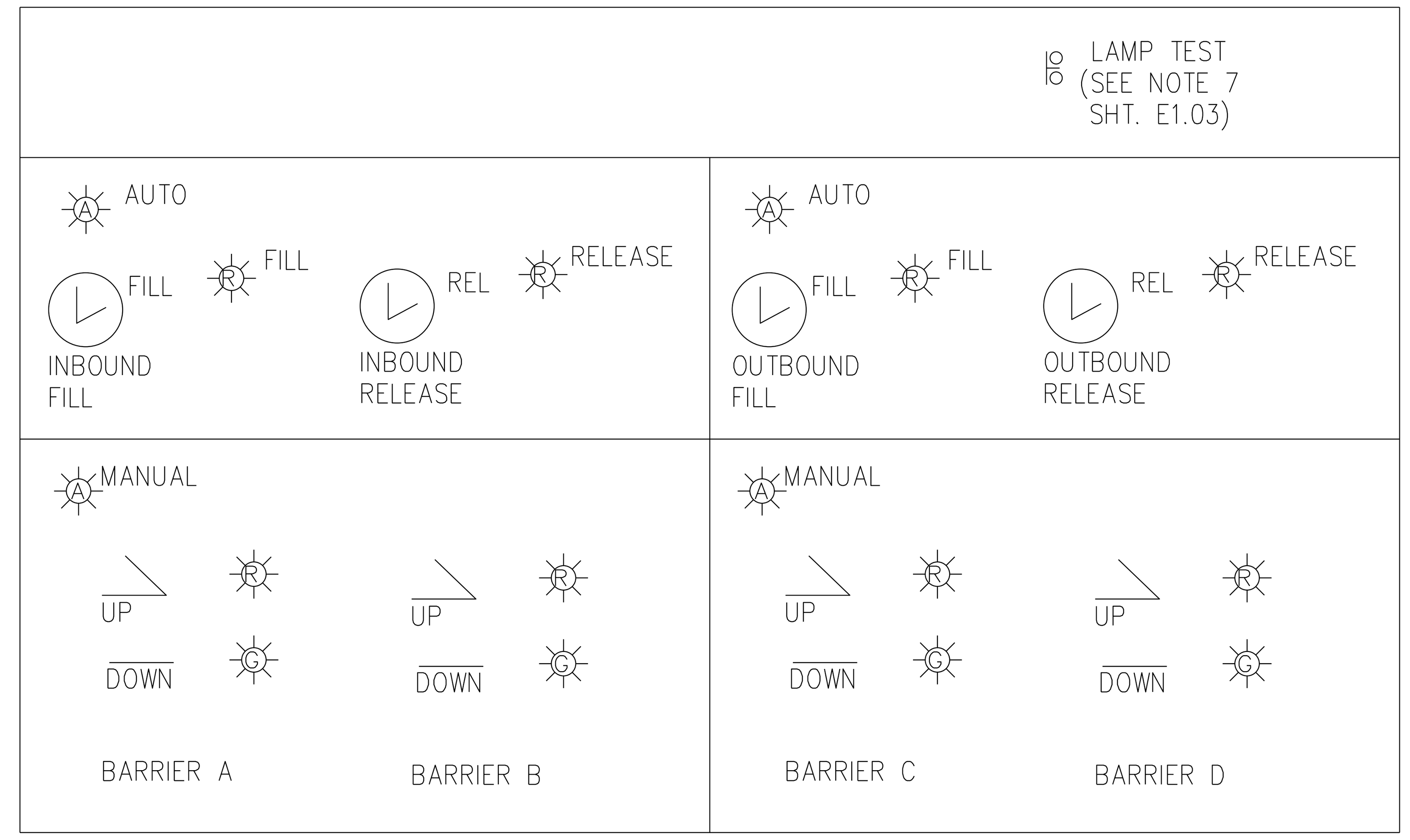
CONTROL LOGIC FOR PRESENCE DETECTION SAFETY SYSTEM WITH QUEUE CLEARANCE



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

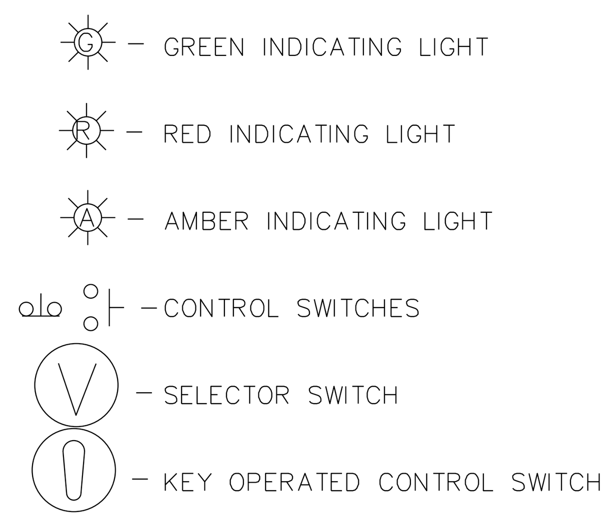



**GATEHOUSE MASTER CONTROL PANEL**
**(BARRIER NORMALLY CLOSED SAFETY SYSTEM)**
**NOT TO SCALE**




**GUARD BOOTH CONTROL PANEL**
**(BARRIER NORMALLY CLOSED SAFETY SYSTEM)**
**NOT TO SCALE**

## LEGEND




**NOTES**

1. **THE CONTROL PANEL LAYOUTS DEPICT AN ACP WITH A GATEHOUSE, 2 GUARD BOOTHS, AND 4 ACTIVE VEHICLE BARRIERS. (2 FOR INBOUND ENTRAPMENT AREA AND 2 FOR OUTBOUND ENTRAPMENT AREA).**
2. **SEE UFGS 34 41 26.00 10 "ACCESS CONTROL POINT CONTROL SYSTEM" APPENDIX A "BARRIER NORMALLY CLOSED SAFETY SYSTEM" FOR DESCRIPTION OF REQUIRED BARRIER AND TRAFFIC CONTROL SEQUENCES.**

STANDARDS DEVELOPED UTILIZING COMMON ENGINEERING AND ARCHITECTURAL RESOURCES. ENGINEERING JUDGEMENT APPLIED WHERE APPROPRIATE. ALL FEATURES AND DIMENSIONS SHOULD BE VALIDATED AND ADJUSTED AS APPROPRIATE AS PART OF THE DESIGN PROCESS.

$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

| SYMBOL | DESCRIPTION | DATE | BY |
|---|---|---|---|

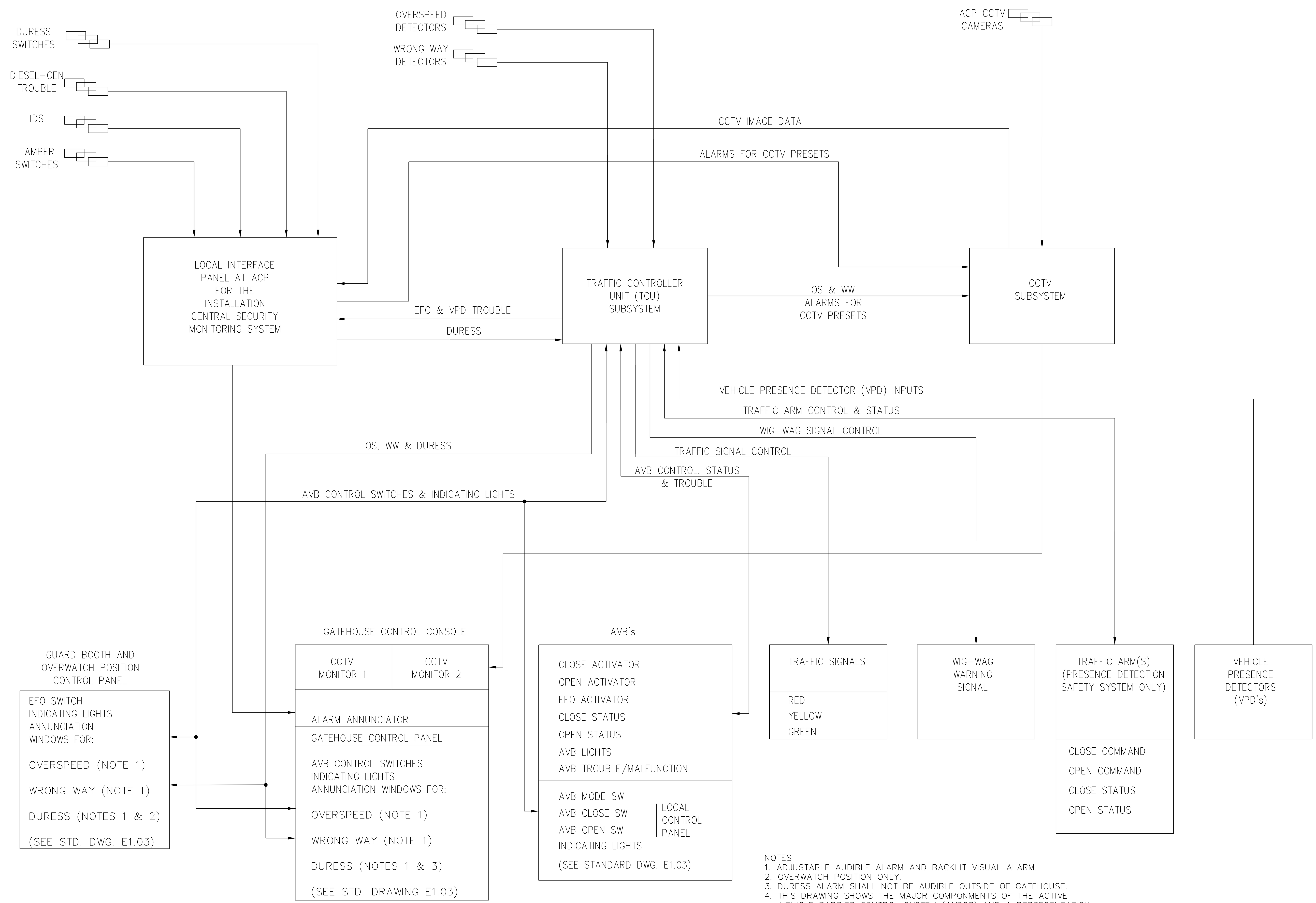
DESIGNED BY: X.X.X. | DWN BY: X.X.X. | CKD BY: X.X.X. | SUBMITTED BY: X | FILE NAME: X | SIZE: ANSI D | PLOT SCALE: 1 : 1 | DATE: NOV 2007 | SOLICITATION NO.: W9128F-07-X-0204 | CONTRACT NO.: X | CATEGORY CODE: X | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS

ELECTRICAL PLAN
BARRIER NORMALLY CLOSED SAFETY SYSTEM

SHEET REFERENCE NUMBER
E1.07




NOTES

1. ADJUSTABLE AUDIBLE ALARM AND BACKLIT VISUAL ALARM.
2. OVERWATCH POSITION ONLY.
3. DURESS ALARM SHALL NOT BE AUDIBLE OUTSIDE OF GATEHOUSE.
4. THIS DRAWING SHOWS THE MAJOR COMPONMENTS OF THE ACTIVE VEHICLE BARRIER CONTROL SYSTEM (AVBCS) AND A REPRESENTATION OF THE COMMUNICATIONS LINKS BETWEEN COMPONENTS. THE DESIGNER SHALL COORDINATE WITH THE INSTALLATION AND THE INSTALLATION'S CENTRAL SECURITY MONITORING SYSTEM (CSMS) CONTRACTOR TO DETERMINE THE INTERFACE REQUIREMENTS BETWEEN THE AVBCS AND THE CSMS. THE DESIGNER SHALL THEN EDIT THIS DRAWING TO REFLECT THE REQUIRED COMMUNICATIONS LINKS AMONG THE VARIOUS AVBCS COMPONENTS AND THE CSMS.



US ARMY CORPS OF ENGINEERS OMAHA DISTRICT

SYMBOL | DESCRIPTION | DATE | BY

DESIGNED BY: X.X.X.
DWN BY: X.X.X.
CKD BY: X.X.X.
SUBMITTED BY: X
FILE NAME: X
SIZE: ANSI D
PLOT SCALE: 1:1
DATE: NOV 2007
SOLICITATION NO.: W9128F-07-X-0204
CONTRACT NO.: X
CATEGORY CODE: X
PLOT DATE:

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA DISTRICT

FACILITIES STANDARDIZATION PROGRAM
ACCESS CONTROL POINTS FOR U.S. ARMY INSTALLATIONS
ACTIVE VEHICLE BARRIER CONTROL SYSTEM (AVBCS) CONFIGURATION

SHEET REFERENCE NUMBER
E1.08



$$DGNSPEC$$
$$SYSTIME$$
$$USERNAME$$

# APPENDIX D

# DESIGN PROCEDURE

Appendix D
Design Procedure

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Attachments

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## Figures



## Tables

A. General.

1. Designers shall use the following design procedure to determine ACP features that can be used to defeat the four Threat Scenarios defined in the Design Criteria (Appendix B). If additional Threat Scenarios are defined in the project specific criteria, designers can use the equations and methodologies in this Design Procedure to help determine appropriate ACP features against these scenarios as well. The designer shall assemble all selected ACP features into a Protective System.

2. The Designer must select ACP features that enable detection of possible threat vehicles and ACP features that delay the threat vehicle for the times described in the Design Criteria. Detection features include vehicle speed detectors, vehicle wrong-way detectors, and vehicle presence detectors along with detection by security guards. Delay features include straight roadways and roadways with speed management features such as chicanes, loops, serpentines, or turns.

3. Based on the opportunities and constraints of the site, the designer must determine appropriate detection and delay features and perform calculations to assure that the selected features provide the delays required for the given Threat Scenarios.

4. The designer must prepare a Design Analysis showing the Protective System including descriptions of selected ACP features, layouts of detection and delay features, and calculations verifying delay times for each threat scenario listed in the Design Criteria (Appendix B). Calculations must verify that a threat vehicle is detected and delayed a sufficient time to allow guards to deploy the final barriers before the threat vehicle reaches them. For each Threat Scenario, the calculation procedure must identify the following:
   a. Point of detection. This is the point in or before the ACP corridor that the Threat Vehicle is detected.
   b. The speed of the Threat Vehicle at the point of detection ($V_d$).
   c. The time (T) it takes the threat vehicle to reach the barrier starting from the point of detection and traveling at an initial speed of $V_d$ at that point. Note, time T is dependent on the maximum acceleration and deceleration rates of the threat vehicle and the roadway features between the point of detection and the barrier, e.g., straight roadway, curved roadway, passive barriers in the roadway (serpentines), and turns in the roadway.
   d. Time T must be equal to or greater than the time delay required in the Design Criteria (Appendix B).

B. Criteria.

1. Threat Scenarios: Show calculations to defeat the following Threat Scenarios:
   a. Threat Scenario #1 – High Speed. In this threat scenario, Threat Vehicle enters the ACP at the highest speed it can attain considering roadway features before and in the ACP corridor. Threat Vehicle disregards any overspeed detection systems if used. The Threat Vehicle's speed is limited only by the acceleration capability of the threat vehicle and the characteristics of the roadway before and in the ACP corridor.
   b. Threat Scenario #2 – High Speed. This threat scenario applies only when the Protective System includes overspeed detection. In this threat scenario, the Threat Vehicle enters the ACP at a speed that it is just under the setting of one or more of the overspeed detectors in order to avoid detection. Immediately after passing the range(s) of the overspeed detector(s), the Threat Vehicle begins to accelerate. After passing the range(s) of the overspeed detector(s), the Threat Vehicle's speed will be limited only by the acceleration capability of the threat vehicle and the characteristics of the roadway in the ACP corridor.
   c. Threat Scenario #3 – Covert Entry at the ID Check Point. In this threat scenario, the Threat Vehicle attempts to gain entry through the ACP using false credentials. When the guard rejects the false credentials and denies access, the Threat Vehicle bolts from the ID Check Point and accelerates toward the final barriers. The Threat Vehicle's speed will be limited only by the acceleration capability of the threat vehicle and the characteristics of the roadway in the ACP corridor.
   d. Threat Scenario #4 – Covert Entry at the end of the last Turn-around. In this threat scenario, the Threat Vehicle attempts to gain entry through the ACP by using false credentials. When guards at the ID Check Point or Search Area direct the Threat Vehicle to the ACP rejection lane or when guards at the ID Check Point direct the Threat Vehicle to the Search Area, the Threat Vehicle feigns compliance and starts at a low speed (under the 25 mph ACP speed limit) toward the rejection lane or Search Area. Once at the point of the turn, the Threat Vehicle bolts toward the final barriers instead of making the turn. The Threat Vehicle's speed will be limited only by the acceleration capability of the threat vehicle and the characteristics of the roadway in the ACP corridor.

2. Barrier Safety Systems: One of the following active vehicle barrier safety systems must be incorporated in the ACP design:

a. Signs and Signals Safety System: This safety system consists of a normally open active barrier in each inbound and outbound lane, vehicle presence detectors (VPDs) on both sides of each barrier, warning signs, a traffic signal for each barrier, and controls. Upon actuation of the barrier Close (deployment) command by ACP guards, actual barrier deployment is delayed for 4 seconds while traffic signals at the barrier go through a predefined sequence to warn innocent vehicles who may be approaching the barrier. Also, barrier deployment is suppressed when a vehicle is detected by either VPD.
b. Presence Detection Safety System: This safety system consists of a normally open active barrier in each inbound and outbound lane, VPDs immediately before and after each barrier, warning signs, a traffic signal for each inbound and outbound barrier, a Stop line in front of each barrier, VPDs in front of each Stop line, and controls. Each barrier's traffic signal is normally Red, which will require an innocent vehicle to stop at the Stop Line. The VPDs in front of the Stop Line will sense the vehicle. If there has not been an active barrier deployment command by ACP guards, the Traffic Signal will change to Green, allowing the vehicle to pass. If there has been a barrier deployment command, the traffic signal will stay Red, holding the vehicle at the Stop Line. If there are no vehicles detected by the VPDs immediately in front of and behind the barrier when a deployment command is initiated by guards, the barrier will immediately close (deploy). If either of the VPDs immediately before or after the barrier detects a vehicle when the barrier deployment command is initiated by guards, barrier deployment will be suppressed until the vehicle clears both of these VPDs. There is no time delay required for safety warning signals for this safety system.
c. Barrier Normally Closed Safety System: This safety system consists of normally closed active barriers, (VPDs) on both sides of each barrier, warning signs, a traffic signal for each barrier, and controls. In this safety system, two active barriers are arranged to form an entrapment area in each inbound and outbound lane. Barrier controls prevent both barriers in a lane to be open at the same time. Guards ensure that only cleared vehicles are allowed into the entrapment area before closing the initial entrapment barrier and opening the final entrapment barrier. Upon actuation of a barrier Close (deployment) command by ACP guards, actual barrier deployment is delayed for 4 seconds while traffic signals at the barrier go through a predefined sequence to warn innocent vehicles in front of the barrier. Also, barrier deployment is suppressed when a vehicle is detected by either of its VPDs. Since there is always at least one closed barrier in the entrapment area, there is no need to

delay the Threat Vehicle. Calculations to defeat the Threat Scenarios are not required for this safety system.

3. Delay Times:
   a. Per OPMG Criteria (Appendix B), the following delay times must be considered for the Signs and Signals Safety System and the Presence Detection Safety System:
      i. Guard Reaction Time: Guard reaction time per the OPMG Criteria (Appendix B) is 3 seconds for Threat Scenarios 1, 2, and 3 and 1 second for Threat Scenario #4.
      ii. Warning Signal Sequence Time: Warning signals sequence time is 4 seconds for the Signs and Signals Safety System and 0 seconds for the Presence Detection Safety System.
      iii. Barrier Deployment Time. Per the OPMG Criteria (Appendix B), active barriers utilized in the normally open mode (Signs and Signals Safety System and Presence Detection Safety System) must have an Emergency Fast Operate (EFO) mode that provides complete barrier closure (deployment) in less than 2 seconds from the time the barrier close control is energized.
   b. Total Delay Times: The following total delay times will be used in the calculations to defeat the required Threat Scenarios:
      i. Signs and Signals Safety System:
         1. Nine (9) seconds for Threat Scenarios 1, 2, and 3.
         2. Seven (7) seconds for Threat Scenario 4.
      ii. Presence Detection Safety System:
         1. Five (5) seconds for Threat Scenarios 1, 2, and 3.
         2. Three (3) seconds for Threat Scenario 4.

C. Protective System: The Protective System for the ACP must consist of features that detect the Threat Vehicle and features that delay the Threat Vehicle.
   1. Detection Features. The Threat Vehicle can be detected by guards at the ID Check Point, wrong-way detectors located in outbound lanes, and overspeed detectors located at some distance in front of the ID Check Point.
      a. Guards.
         i. Threat Scenario #1. In the absence of advanced overspeed detection, the ID Check Point guard is the means of Threat Vehicle detection. In the worst case, the ID Check Point guard will detect the Threat Vehicle, but not until it speeds by the ID Check Point.

ii. Threat Scenario #2. In this threat scenario, the Threat Vehicle stays under the setting(s) of the overspeed detector(s) so as not to be detected by them. Guards will detect the Threat Vehicle as it passes by the ID Check Point.
iii. Threat Scenario #3. Guards detect the Threat Vehicle when it bolts out of the ID Check Point.
iv. Threat Scenario #4. Guards detect the Threat Vehicle at the last turn-around when it bolts toward the AVB instead of making the turn to the exit or search lanes.

b. Wrong-way Detectors. Wrong-way detectors are located in the outbound lanes to detect a Threat Vehicle attempting to enter the ACP in the outbound lanes.

c. Overspeed Detectors. There are two types of overspeed detectors that can be utilized at an ACP.

i. Point Overspeed Detection. A point overspeed detector will detect the speed of a vehicle at a particular point on the roadway. Typical point overspeed sensors are paired magnetic loops embedded in the roadway, radar and lidar sensors applied across (transverse to) the roadway, and video motion sensors. Point overspeed detectors located at an ACP measure the speed of vehicles as they cross a point in the roadway, which is a specified distance from the ID Check Point.
ii. Continuous Overspeed Detection. A continuous overspeed detector will detect vehicle speed over a range of the roadway. Typical continuous overspeed sensors are Doppler radar sensors looking up (parallel to) the roadway and video motion sensors. Continuous overspeed detectors located at an ACP measure the speed of vehicles in a range starting at a point that is some distance in front of the ID Check Point and ending at a point either at the ID Check Point or a shorter distance in front of the ID Check Point than the starting point. The range of continuous overspeed detectors should usually be no more than 400 feet.

2. Delay Features. The ACP must include features that will delay the Threat Vehicle a sufficient time to allow guards to deploy the Active Vehicle Barrier (AVB). Delay features include straight roadways and roadways with speed management features, e.g., curves, turns, chicanes, loops, or serpentine barriers that require all vehicles including the Threat Vehicle to slow down. A Threat Vehicle driving through such a speed management feature faster than the feature’s spin-out speed will spin out and thus loose time in its race to the AVB before it deploys.
3. Examples. The following sections provide procedures and examples for calculating delay times for ACPs with various detection and delay features. All examples are on Excel Spreadsheets. These spreadsheets can be used by the designer to input alternative parameters and fine tune a design. However, care

should be used in selecting parameters to ensure results are consistent with the assumptions made in developing the spreadsheets. Results should always be verified by hand calculations. If results are suspect, contact the USACE Protective Design Center (PDC) for verification of method and assumptions. Procedures and examples in the paragraphs below are divided into the following roadway types:

a. Straight Roadways,
b. Roadways with a Curve or Turn,
c. Roadways with a Chicane or Loop, and
d. Roadways with Serpentine Barriers.

D. Straight Roadway.

1. General:
   a. For ACPs with a straight roadway, the Protective System will usually require advanced overspeed detection to detect the Threat Vehicle early in its attack. The distance between the ID Check Point and AVB (Dib) required to delay the Threat Vehicle is a function of the settings of the overspeed detectors. The higher the settings of the overspeed detectors are, the longer the distance Dib must be. Overspeed detectors must be set at speeds that are high enough to avoid excessive nuisance alarms. Therefore, maximizing the distance Dib, whether for a new ACP or upgrading an existing ACP, is a primary design objective.
   b. Distance Dib must be selected to defeat all four Threat Scenarios. In most cases, the worst case (longest) Dib will be the one required to contain high speed Threat Scenarios #1 or #2. Paragraphs 3 and 4 below describe calculation methods for defeating the high speed threats. Paragraph 5 below describes calculation methods for the covert entry threats.
2. ACP Corridor: The following two conditions must be considered when calculating delay for the high speed threat scenarios at an ACP with a straight roadway corridor.
   a. Limited Entry Speed. The first condition is when the speed of the Threat Vehicle entering the ACP corridor is limited by a speed management feature such as a curve, turn, or other permanent roadway feature for which the Threat Vehicle must slow down. The Threat Vehicle’s speed in the speed management feature must not exceed the spin-out speed of the feature or else it will spin out and loose the race to the AVB.
   b. Unlimited Entry Speed. The second condition is when the speed of the Threat Vehicle entering the ACP corridor is unlimited by any roadway features outside of the ACP corridor. For this type of ACP, the Threat Vehicle can attain an extremely high speed. Its speed approaching the ACP will be limited

only by restrictions in the ID Check Point area. The ID Check Point's raised islands provide sufficient restrictions to limit the Threat Vehicle's speed to 100 mph as it goes through the ID Check Point. Similar restrictions may be required in the outbound lanes for a Threat Vehicle attempting to enter the Installation through the outbound lanes. For protective systems requiring a maximum speed of 100 mph in the outbound lanes adjacent to the ID Check Point, install raised islands between adjacent lanes that are a minimum of 6" high with vertical curb faces similar to the traffic islands in the ID Check area.

3. High Speed Attack - Limited Entry Speed.
   a. No Advanced Overspeed Detection. Note, without advanced overspeed detection, there is no Threat Scenario #2. See examples at Attachment 2 for the Signs and Signals Safety System and Attachment 8 for the Presence Detection Safety System. Without advanced overspeed detection, the Threat Vehicle is not detected until it passes the ID Check Point (worst case), where it is traveling at a high rate of speed.
      i. Determine the spin-out speed Vs of the speed management feature near the ACP entrance. See Section E below for the method to calculate the spin-out speed of a speed management feature.
      ii. Determine the distance Dsi between the end of the speed management feature and the ID Check Point.
      iii. Assuming the Threat Vehicle uses Threat Scenario #1 to attack, determine the Threat Vehicle's speed Vi at the point of detection (ID Check Point). This speed is a function of Vs, Dsi, and the acceleration rate of the Threat Vehicle. Note, this speed cannot be greater than 100 mph because of restrictions in the ID Check area (see paragraph D2b above).
      iv. Calculate the distance Dib that the Threat Vehicle can travel in the required delay time from the point of detection (ID Check Point) at an initial speed of Vi and accelerating toward the AVB.
      v. Locate the AVB at a distance Dib or greater beyond the ID Check Point to defeat Threat Scenario #1.
   b. Advanced Overspeed Detection. Without advanced overspeed detection, the required distance Dib between the ID Check Point and the barrier is very large (up to 1778 feet for the Signs and Signal Safety System). Most ACP corridors are not long enough to place the AVB this far from the ID Check Point. Distance Dib is a function of the point where the Threat Vehicle is detected (ID Check Point in the example above) and the Threat Vehicle's speed at the point of detection. In order to reduce the required distance Dib, the Threat Vehicle's speed at the point of detection must be reduced or the point of detection must be moved ahead of the ID Check Point. The following calculation method shows how to select overspeed detection features that have

the effect of either reducing the Threat Vehicle's speed at the point of detection or moving the point of detection ahead of the ID Check Point.

i. One Zone of Continuous Overspeed Detection. Select a continuous overspeed detector to cover a zone in the ACP corridor from the ID Check Point to a certain distance ahead of the ID Check Point. The Threat Vehicle has two options in attacking an ACP with a continuous overspeed detector. The first option is Threat Scenario #1, where the Threat Vehicle ignores the detectors and speeds through the ACP as fast as it can. The second option is Threat Scenario #2, where the Threat Vehicle attempts to stay under the setting of the detector. If the Threat Vehicle exceeds the set point of the detector anywhere within the detector's zone, overspeed alarms notify the guards and the threat vehicle is detected. However, if the Threat Vehicle's speed stays just under the detector setting, the Threat Vehicle will not be detected until it reaches the ID Check Point. At that point, the ID Check Point guards will detect the vehicle and it will be traveling (in the worst case) very close to the overspeed setting of the detector. Therefore, the required distance Dib between the ID Check Point and the AVB is a function of the speed setting of this continuous overspeed detector.

    1. Select the desirable or available distance Dib between the ID Check Point and the AVB. Maximize this distance as described below.
    2. Using the selected distance Dib between the ID Check Point and the AVB, determine the setting of the continuous overspeed detector required to achieve distance Dib. The setting of the continuous overspeed detector should be set at as high a speed as possible to reduce nuisance alarms. If nuisance alarms are excessive, guards will either ignore the alarms or even turn them off. Without advanced overspeed detection, the ACP will not defeat the high speed threats.
    3. In order to maximize the detector's alarm point setting, the distance between the ID Check Point and the AVB (Dib) must be maximized. Where possible, set the distance between the ID Check Point and the AVB at 1118 feet for the Signs and Signals Safety System and 508 feet for the Presence Detection Safety System. These distances require that the continuous overspeed detector be set at 50 mph.
    4. For ACPs with limited real estate, the minimum distances between the ID Check Point and the AVB should be 853 feet for the Signs and Signals Safety System and 361 feet for the Presence Detection Safety System. These distances require that the continuous overspeed detectors be set at 30 mph. For ACPs where these minimum distances cannot be achieved, contact the PDC for guidance.

5. For ACPs with available distances Dib between 853 feet and 986 feet, install a second set of continuous overspeed detectors as described in paragraph ii below to help reduce nuisance alarms.
6. Calculate the range of the continuous overspeed detector. See examples at Attachment 3 for the Signs and Signals Safety System and Attachment 9 for the Presence Detection Safety System. Assume the Threat Vehicle begins its attack in Threat Scenario #1 at the end of the speed management feature traveling at the speed management feature's spin-out speed and is accelerating. Determine the point where the Threat Vehicle must be detected in order to delay it for the required delay time before reaching the AVB. This point is the beginning of the zone of the continuous overspeed detector.
7. If the range of the overspeed detector calculated above is beyond the range of available detectors or will cause excessive nuisance alarms, add a point overspeed detector or an additional continuous overspeed zone at the point determined above and recalculate the overspeed detector range.

ii. Two Zones of Continuous Overspeed Detection. If a second zone of continuous overspeed detection is required, see examples at Attachment 4 for the Signs and Signals Safety System and Attachment 10 for the Presence Detection Safety System for the calculation method. Adding a second zone of continuous overspeed detection shrinks the required range of the overspeed zone closest to the ID Check Point (Zone 2), where innocent vehicles must be slowing down anyway to have their ID's checked.

1. Set the zone closest to the ID Check Point (Zone 2) at the speed required to achieve the selected Dib.
2. Set the zone furthest from the ID Check Point (Zone 1) at 15 mph over the setting of the closer zone (Zone 2). This setting will provide a range of 198 feet for Zone 2.
3. Calculate the range of the outer continuous overspeed zone (Zone 1) using Threat Scenario #1 and the method described in paragraph D3bi6 above.
4. If the range of the Zone 1 overspeed detector calculated above is beyond the range of available detectors or will cause excessive nuisance alarms, add a point overspeed detector at the point determined above and recalculate the Zone 1 overspeed detector range.

iii. Overspeed Zones. Whenever speed zones are used in the ACP's protective system, post speed limit signs at 15 mph at least 250 feet in front of the ID Check Point. Education of ACP users and diligent speed enforcement by the Installation will be necessary to minimize nuisance overspeed alarms.

4. High Speed Attack - Unlimited Entry Speed ACP.
   a. No Advanced Overspeed Detection. See examples at Attachments 5 for the Signs and Signals Safety System and 11 for the Presence Detection Safety System. Note, without overspeed detection, there is no Threat Scenario #2.
      i. The practical maximum speed of the Threat Vehicle at the point of detection (ID Check Point) is Vimax=100 mph.
      ii. Calculate the distance Dib that the Threat Vehicle can travel in the required delay time at an initial speed of Vimax and accelerating toward the AVB. For Vimax=100 mph, this distance is 1778 feet for the Signs and Signals Safety system and 875 feet for the Presence Detection Safety System.
      iii. Locate the AVB a distance Dib or greater beyond the ID Check Point to defeat Threat Scenario #1.
   b. Advanced Overspeed Detection.
      i. One Zone of Continuous Overspeed Detection. See examples at Attachment 6 for the Signs and Signals Safety System and Attachment 12 for the Presence Detection Safety System.
         1. Select the desirable or available distance Dib between the ID Check Point and the AVB. Maximize this distance as described above for the case of the limited entry speed ACP.
         2. Using Threat Scenario #2, determine the setting of the continuous overspeed detector required to achieve the Dib selected above.
         3. Using Threat Scenario #1, calculate the time Tib for the Threat Vehicle to travel distance Dib at an initial speed of Vimax=100mph.
         4. Subtract Tib from the required delay time to determine the remaining time the Threat Vehicle must be delayed. This time is designated Tdi and is the time the Threat Vehicle must take to go from the point of detection to the ID Check Point, which is designated as distance Ddi.
         5. The least time that the Threat Vehicle can go distance Ddi is by starting at the point of detection at a high initial speed and decelerating at the Threat Vehicle's maximum deceleration rate to Vimax by the time it gets to the ID Check Point. Calculate Ddi as a function of Vimax, Tdi, and the maximum deceleration rate of the Threat Vehicle.
         6. Locate a point overspeed detector at distance Ddi in front of the ID Check Point.
         7. Calculate the range of the continuous overspeed detector by assuming the Threat Vehicle will pass the point overspeed detector at just under its setting and then begin to accelerate. The point of detection will then be the beginning of the range of the continuous overspeed detector.

8. If the range of the overspeed detector calculated above is beyond the range of available detectors or will cause excessive nuisance alarms, add a point overspeed detector or an additional continuous overspeed zone at the point determined above and recalculate the overspeed detector range.

ii. Two Zones of Continuous Overspeed Detection. If a second zone of continuous overspeed detection is required, see examples at Attachment 7 for the Signs and Signals Safety System and Attachment 13 for the Presence Detection Safety System for the calculation method. Adding a second zone of continuous overspeed detection shrinks the required range of the overspeed zone closest to the ID Check Point (Zone 2), where innocent vehicles must be slowing down anyway to have their ID's checked.

1. Set the zone closest to the ID Check Point (Zone 2) at the speed required to achieve the selected Dib.
2. Set the zone furthest from the ID Check Point (Zone 1) at 15 mph over the setting of the closer zone (Zone 2). This setting will provide a range of 198 feet for Zone 2.
3. Calculate the range of the outer continuous overspeed zone (Zone 1) using Threat Scenario #1 and the method described in paragraph D4bi7 above.
4. If the range of the Zone 1 overspeed detector calculated above is beyond the range of available detectors or will cause excessive nuisance alarms, add a point overspeed detector at the point determined above and recalculate the Zone 1 overspeed detector range.

iii. Overspeed Zones. Whenever speed zones are used in the ACP's protective system, post speed limit signs at 15 mph at least 250 feet in front of the ID Check Point. Education of ACP users and diligent speed enforcement by the Installation will be necessary to minimize nuisance overspeed alarms.

5. Covert Entry Attack.

a. Threat Scenario #3. Threat Scenario #3 begins at the ID Check Point with the Threat Vehicle stopped. The Threat Vehicle's speed at the point of detection is then Vd=0 mph. Threat Scenarios #1 or #2 are always a worse case than Threat Scenario #3.

b. Threat Scenario #4. Threat Scenario #4 begins at the end of the last turn-around with the Threat Vehicle traveling at the ACP speed limit. The Threat Vehicle's speed at the point of detection is then Vd=25 mph. Threat Scenario #4 may be a worse case than Threat Scenario's #1 and #2, especially if the last turn-around is far from the ID Check Point.

i. Determine the distance Dtb the Threat Vehicle can travel from the point of detection in the required time delay (7 seconds for Signs and Signals Safety System and 3 seconds for the Presence Detection Safety System) assuming it reaches the end of the last turn-around at a speed of 25 mph and begins to accelerate.

ii. Add the distance Dit from the ID Check Point to the end of the last turn-around to distance Dtb calculated above to find distance Dib.

iii. Compare distance Dib calculated above to the Dib selected for the high speed threat scenarios. If the Dib calculated for Threat Scenario #4 is greater, move the last turn-around closer to the ID Check Point if possible. If not possible, use the Dib calculated for Threat Scenario #4 and adjust as necessary the settings and locations of any overspeed detectors required for the high speed threats.

6. Summary for ACPs with Straight Roadway Corridors.

a. Although speed zones reduce the required length of the Response Zone, they add a level of complexity to the protective system for both guard force operations and equipment maintenance. They should be utilized only when real estate for the ACP is limited and speed management features are not possible. If speed zones are to be utilized, care must be taken when selecting an over-speed detection system. Select system components including sensors, software, and head end equipment that have been proven for similar applications.

b. Where possible, maximize the distance between the ID Check Point and the barrier. The locations and settings of the overspeed detectors are a function of this distance. The larger this distance is, the higher the settings of the sensors can be. Higher sensor settings will result in fewer nuisance overspeed alarms, which will improve the efficiency of the guards in identifying potential Threat Vehicles.

c. Table 1 “Signs and Signals” lists the required distances between the ID Check Point and the AVB for various settings of the continuous overspeed detector for the Signs and Signals Safety System. Table 2 “Presence Detection” lists the same information for the Presence Detection Safety System.

E. Speed Management.

1. General. Speed Management features such as curves, chicanes, turns, and serpentine barriers can be utilized to slow down the Threat Vehicle and, therefore, provide required delay times in less distance than straight roadways. Speed management features (SMF) provide delay by forcing vehicles to slow down to the spinout speed of the SMF. If a Threat Vehicle exceeds this speed, it will spin out. Even if it recovers, time lost will cause it to lose the race to the

final barrier. The Response Zone is the most effective location for an SMF, as an SMF here will delay the Threat Vehicle in all of the Threat Scenarios.

2. SMF Selection. To select an appropriate SMF, the first step is to evaluate its effect on defeating the given Threat Scenarios. The following is an evaluation of the four Threat Scenarios given in the Design Criteria considering an SMF is deployed in the Response Zone:

   a. High Speed Threat Scenario #1. In high speed Threat Scenario #1, the Threat Vehicle speeds through the ID Check Area at the maximum speed it can attain. However, in order to keep from spinning out when it reaches the SMF, it must decelerate at some point before the SMF entrance so its speed when it reaches the SMF is at or below the SMF's spinout speed. If the SMF is selected carefully, advance overspeed detection is not necessary. Select an SMF based on the following and considering that the point of detection is the ID Check Point, i.e., there is no advanced overspeed detection:
      i. Determine the quickest path through the SMF.
      ii. Determine the spinout speed or speeds if there is more than one SMF.
      iii. Determine the time a threat vehicle will take in getting through the SMF considering the path through the SMF and the SMF spinout speed.
      iv. Using the spinout speed at the SMF entrance, the distance between the SMF entrance and the ID Check Point, and the threat vehicle's deceleration rate; determine the time it takes the threat vehicle to go from the ID Check Point to the SMF entrance assuming it is decelerating at its maximum rate over the entire distance.
      v. Subtract the time that the threat vehicle takes to go from the ID Check Point to the SMF entrance plus the time it takes it to go through the SMF from the required delay time to determine if additional delay is required for Threat Scenario #1. If additional delay is required, determine the straight line length of roadway between the end of the SMF and the barrier to get the required delay.

   b. Threat Scenario #2. With no advanced overspeed detection, there is no Threat Scenario #2.

   c. Threat Scenario #3. Threat Scenario #3 begins and is detected at the ID Check Point. However, the Threat Vehicle's speed when it is detected is zero. The Threat Vehicle in Threat Scenario #1 above is also detected at the ID Check position, but it is traveling much faster. Therefore, Threat Scenario #1 is a worse case than Threat Scenario #3.

d. Threat Scenario #4. Threat Scenario #4 begins and is detected at the end of the last Turn-around. The last turn-around is the turn to the rejection lane or the turn in to the Search Area, whichever is closer to the barrier.

i. Using the threat vehicle's speed at the end of the last turn around (25 mph), the spinout speed at the SMF entrance, the distance between the SMF entrance and the end of the last Turn-around, and the threat vehicle's acceleration and deceleration rates; determine the time (Tts) that it takes the threat vehicle to go from the end of the last Turn-around to the SMF entrance.

ii. Add the time Tts to the time it takes the Threat Vehicle to go through the SMF (Ts). Subtract this time from the required delay time to determine if additional delay is required for Threat Scenario #4. If additional delay is required, determine the straight line length of roadway between the end of the SMF and the AVB to get the required delay. Remember, the required time delay for TS#4 is 2 seconds less than for TS #'s 1, 2, and 3 because of the reduced guard reaction time from 3 to 1 second.

F. Curves and Turns: A curve or turn in the Response Zone can be used to slow the threat vehicle and reduce the Response Zone distance required for delay. The threat vehicle in the high speed attack will have to decelerate to the spinout speed of the turn as it enters the turn. Therefore, design the turn and Response Zone such that advanced overspeed detection is not necessary. Without advanced overspeed detection, there is no Threat Scenario #2. The ID Check Point is the point of detection for Threat Scenario #'s 1 and 3 and the end of the last Turn-around is the point of detection for Threat Scenario #4.

1. Design Procedure:

   a. From the Traffic Study, determine the required roadway width and minimum inside radius of the turn.

   b. Select an angle of deflection or Turn angle (CA) for the curve/turn based on the desired delay. Turn angle is the angle between the curve's entrance and exit. The larger the Turn angle, the longer the curve is.

   c. Determine the quickest path through the curve. The quickest path through a curve is a function of the Turn angle, the unobstructed roadway width, and the inside radius of the curve. See Figure 1 below– Path of Threat Vehicle in a Curve/Turn for the calculation method for determining the spinout speed ($V_s$) of a curve/turn.

d. Based on the spinout speed ($V_s$) calculated above, the distance between the ID Check Point (point of detection) and the beginning of the curve ($D_{ic}$), and the deceleration rate of the threat vehicle ($a_d$); determine the time the threat vehicle takes to go from the ID Check Point to the beginning of the curve:
   i. $T_{ic} = (-V_s+(V_s^2+2*a_d*D_{ic})^{½})/a_d$.
e. Determine the time to go through the curve:
   i. $T_c$ = CA/360*2*pi*R/$V_s$, where R is computed from the method shown in Figure 7 – Path of Threat Vehicle in a Curve/Turn.
f. Calculate the delay time remaining ($T_r$):
   i. $T_r = T_d-T_{ic}-T_c$, where $T_d$ is the delay time required for Threat Scenario #1.
g. Determine the required straight line distance between the end of the turn to the final barrier ($D_{cb}$):
   i. $D_{cb} = V_s*T_r + ½*a*T_r^2$.
h. Perform similar procedure for TS#4, only determine the time the Threat Vehicle travels between the end of the last turn around to the beginning of the curve/turn ($T_{ec}$). $T_{ec}+T_c+T_r$ must be equal to or greater than the required delay time for Threat Scenario #1 (Td). If Tec+Tc+Tr is greater than Td, increase Tr by moving the final barrier further away until Tec+Tc+Tr is equal or greater than Td.

2. Examples:
   a. See Attachment 14 for an example of a curve in the Response Zone utilizing the Signs and Signals Safety System and no advanced overspeed detection.
   b. See Attachment 15 for an example of a curve in the Response Zone utilizing the Signs and Signals Safety System with a point overspeed detector and one zone of continuous overspeed detection.
   c. See Attachment 16 for an example of a curve in the Response Zone utilizing the Presence Detection Safety System and no advanced overspeed detection.
   d. See Attachment 17 for an example of a curve in the Approach Zone utilizing the Signs and Signals Safety System and no advanced overspeed detection.

G. Chicanes and Loops.

1. Parameters of Chicanes and loops. Chicanes and loops are a series of turns whose exit is in the same alignment as its entrance. An example of a loop is shown on Drawing C3.14. Examples of chicanes are shown on Drawings C3.13 and C3.15. In order to determine delay times provided by chicanes and loops, the parameters of the chicane/loop must be defined. Parameters include inside turning radius, unobstructed roadway width, and angle of deflection or turn angle.

a. Turning radius determines how fast the threat vehicle can turn without spinning out. The spinout speed of a passenger vehicle can be calculated from the following equation (see page 119 of "A Policy on Geometric Design of Highways and Streets 1990" from AASHTO):

   i. Eq. 1) $V_s = ((f+e) * g * R)^{½}$ , Where:
      1. f=friction factor (assume 0.75 for good tires and dry pavement)
      2. e=super elevation rate (usually between 0.00 and 0.04)
      3. g=acceleration of gravity (32.2 feet/second$^2$)
      4. R=radius of turn in feet.
   ii. Note, the radius (R) of the turn is not the same radius as the Inside Radius of the curve. The R used to calculate $V_s$ is the radius of the quickest path or path segments through the chicane/loop. The quickest path can have several turns and straight sections. The radius of each turn was computed geometrically and checked graphically to determine each turn's spinout speed. The various spinout speeds, curve distances, and straight line distances were used to calculate the chicane/loop traverse times.

b. The unobstructed roadway width is the width of the roadway between curbs. It includes the width of each lane plus the width of any shoulders or gutters. In order to minimize the unobstructed roadway width, roadways through chicanes and loops should be curbed on both sides. For one, two, and three-lane roadways, the unobstructed widths would normally be 14, 26, and 38 feet respectively, that is the 12-foot wide lanes plus one 2-foot gutter.

c. For a chicane or loop that ends in the same direction and alignment as it started (see Drawings C3.13, 14, and 15), the chicane/loop is a series of four turns; one right turn, two consecutive left turns, and one final right turn or vice versa. The turn angle is the angle that each turn makes between its entrance and exit. The turn angle determines the total distance traveled. The larger the turn angle is, the longer the turn distance is and, therefore, the longer the delay time is. To provide sufficient delay, turn angles normally vary between 50 and 90 degrees. Care must be taken in selecting turn angles. For wide roadway widths, larger turn angles are required to provide required delay, because the threat vehicle will use the wide roadway to switch between lanes and achieve a large radius path or paths through the chicane/loop. Use the following equations to calculate the total travel distance in the chicane/loop and the length and width of the chicane/loop given the inside radius, the turn angle, the roadway width, and the median width.

i. For Chicanes:
   1. Eq. 2) CLR (Chicane Centerline Radius) = IR+W+M/2
   2. Eq. 3) CD (Centerline Distance) = 4*CLR*Theta
   3. Eq. 4) CL (Chicane Length) = 4*CLR*Sin(Theta)
   4. Eq. 5) CW (Chicane Width) = 2*CLR*(1-Cos(Theta))+2*W+M,
      Where:
      a. IR is the inside radius of chicane;
      b. Theta is the turn angle;
      c. W is the roadway width, and
      d. M is the median width.

ii. For Loops:
   1. Eq. 2a) CLR (Loop Centerline Radius) = IR+W/2
   2. Eq. 3a) CD (Centerline Distance) = 4*CLR*Theta
   3. Eq. 4a) CL (Loop Length) = 4*CLR*Sin (Theta)
   4. Eq. 5a) CW (Loop Width) = 2*(2*CLR*(1-Cos (Theta))+ W)+M,
      Where:
      a. IR is the inside radius of curve;
      b. Theta is the turn angle;
      c. W is the roadway width, and
      d. M is the median width.

2. Time Delay through Chicanes and loops.

   a. The ideal minimum time required to traverse a chicane/loop can be calculated using the chicane/loop centerline distance (Eq. 3 or 3a) divided by the maximum speed in the chicane/loop (Eq. 1). However, the ideal time assumes the threat vehicle will follow the centerline radius through the chicane/loop. In reality, the threat vehicle will use the entire width of the roadway to maximize the turning radii and thus maximize its spinout speeds. The practical traverse time can be calculated by analyzing the chicane/loop and determining the quickest path through it. This path will consist of several segments. Once the segments of the path are determined, calculate the radius, distance, maximum speed, and time to traverse each segment and add these times together to obtain the total traverse time.

b. The fastest path through a chicane/loop depends on the turn angle, the clear roadway width, and physical features at the entrance and exit. Two different paths were analyzed in this design procedure as follows:

   i. Tangent Method – This path consists of 3 curved sections and 2 straight sections. Considering the chicane/loop consists of 4 Turns as described above, the path through the chicane/loop follows:

      1. Approach Turn #1 from the left most ID Check Lane and gradually turn on a circular path toward the right hand curb of Turn #1. For a 6-foot wide vehicle, the centerline of the vehicle would travel toward a curve with a radius of 3 feet longer than the inside radius of Turn #1. Travel speed is limited by the radius of the curve.
      2. Follow this curve a certain distance through Turn #1 and then turn straight toward the left curb of Turn #2. The straight section is a line tangent to the two circles defined by Turn #1 and Turn #2. These circles are separated by a distance s=RW-6, where RW is the unobstructed roadway width and the 6 feet is the width of the threat vehicle. Travel speed in the straight section is limited by how fast the vehicle can accelerate after exiting the first curve and how fast it must decelerate before entering the second curve.
      3. The vehicle would then follow the left curb of the rest of Turn #2 and part of Turn #3 and then turn straight again toward the right curb of Turn #4.
      4. The vehicle would finally travel along the right curb of Turn #4 and exit along a curve with the maximum radius attainable through the active vehicle barriers at the end of the curve.

   ii. Three Curve Method – This path consists of three circle segments, one segment entering the Chicane/loop, one segment through the middle section of the Chicane/loop, and one segment exiting the Chicane/Turn. The middle circle segment is tangent to both the entrance and exit circle segments. Travel speeds are limited by the radius of each circle segment.

c. Chicanes and loops with various inside radii and roadway widths were evaluated to determine the quickest paths through them. Tables 3 and 4 below show parameters of these chicanes and loops respectively. For a given roadway width (number of lanes) and inside roadway radius, the tables show the required turn angle to achieve the 9 or 7 seconds of delay required for the Signs and Signals Safety System. The tables also list the distance through the Chicane/Loop (CD), Chicane/Loop Length (CL), Roadway Corridor Width (CW), Chicane/loop Traverse Time (Trz), and the time to traverse the distance between the ID Check Point and the active barriers ($T_{ib}$). Times Trz and Tib listed in the tables are the best (least) traverse times between the two paths described above. Generally, for low turn angles, the Three Curve method is fastest, whereas, for higher turn angles, the Tangent method is fastest. Tables 5 and 6 below show the same information for chicanes and loops using the Presence Detection Safety System.

d. In Tables 3 through 6, the computed chicane and loop parameters assume that the ID Check Point is 90 feet in front of the chicane/loop and that inbound lanes are separated by raised islands. Also, the computed parameters assume that the active vehicle barriers are just beyond the end of the chicane/loop. These assumptions affect the radii of both entrance and exit curves and, therefore, the threat vehicle's entry and exit speeds. If conditions at the entrance or exit to the chicane/loop are different than described above, calculations using the actual conditions must be performed.

3. Design Procedure for a Chicane or Loop:
   a. For a Chicane or Loop deployed in the Response Zone and meeting the requirements listed above, perform the following:
      i. Step 1 – Consider traffic volumes and types based on the Traffic Engineering Study and select appropriate parameters for the roadway width and the chicane/loop's inside radius.
      ii. Step 2 - Select the AVB safety system, either Signs and Signals or Presence Detection.
      iii. Step 3 – Select the appropriate Table 3, 4, 5, or 6 based on the type feature (chicane or loop) and the AVB Safety System (Signs and Signals or Presence Detection).
      iv. Step 4 - For the appropriate roadway width and roadway inside radius, find the required chicane/loop parameters from the Table.
   b. For chicanes or loops that do not meet the requirements listed above, determine the fastest path through the chicane/loop and perform calculations to determine traverse times, or consult the PDC.

H. Serpentine Barriers:

1. General:
   a. Passive barriers arranged in a serpentine and placed in the Response Zone can be used to slow the threat vehicle and reduce Response Zone distances required for delay. Passive barriers must be substantial enough to stop or at least significantly slow down a vehicle upon impact. Concrete Jersey Barriers

or other equivalent passive barriers are suitable for serpentine application. See Figure 2 for layout.

b. Similar to the case for curves and turns, the threat vehicle in the high speed attack will have to decelerate to the spinout speed of the serpentine as it enters the serpentine. Therefore, design the serpentine and Response Zone such that advanced overspeed detection is not necessary. Without advanced overspeed detection, there is no Threat Scenario #2. The ID Check Point is the point of detection for Threat Scenario #'s 1 and 3. The end of the last turn-around is the point of detection for Threat Scenario #4.

2. Design Procedure:
   a. Refer to Figure 3 Serpentine Spinout Speeds to determine the spinout speed ($V_s$) of the serpentine. Note, the spinout speed is a function of the spacing between passive barriers.
   b. Based on the spinout speed ($V_s$) determined above, the distance between the ID Check Point (point of detection) and the beginning of the serpentine ($D_{is}$), and the deceleration rate of the threat vehicle ($a_d$); determine the time the threat vehicle takes to go from the ID Check Point to the beginning of the serpentine:
      i. $T_{is} = (-V_s+(V_s^2+2*a_d*D_{is})^{½})/a_d$.
   c. Determine the time to go through the serpentine:
      i. $T_s = 2*s/V_s$, Where s=barrier spacing.
      ii. Note: the actual distance through the serpentine is slightly larger than 2*s, but only slightly, so use 2*s.
   d. Calculate the delay time remaining ($T_r$):
      i. $T_r = T_d-T_{is}-T_s$, Where $T_d$ is the delay time required for Threat Scenarios 1 and 3.
   e. Determine the required straight line distance between the end of the serpentine and the AVB ($D_{sb}$).
      i. $D_{sb}=V_s*T_r+½*a*T_r^2$
   f. Perform similar procedure for TS#4; only determine the time the Threat Vehicle travels between the end of the last Turn-around to the beginning of the serpentine ($T_{es}$). $T_{es}+T_s+T_r$ must be equal to or greater than the required delay time for Threat Scenario #4.

3. Example: See Attachments 18 and 19 for examples for computing delay for serpentines in the Response Zone. Note, use of serpentine barriers reduces the effective roadway width. For a typical 2 lane roadway, the serpentine barriers

reduce the roadway to 1 lane. Serpentine barriers should only be used when traffic volumes can be handled by the reduced roadway widths.

I. Vehicle Barrier Sizing:

1. General: Per the OPMG Criteria (Appendix B) there are two types of threat vehicle, the high performance threat vehicle capable of accelerating at 11.3 f/s/s, and the 15,000-pound truck threat vehicle. The high performance threat vehicle is used to determine the barrier location to meet delay requirements. The 15,000-pound threat vehicle is used to determine the required stopping capacity of active and passive vehicle barriers. The stopping capacity of vehicle barriers is measured in kinetic energy. The barrier's stopping capacity must be greater than the threat vehicle's kinetic energy at the point of impact with the barrier. The threat vehicle's kinetic energy at the point of impact with the barrier is determined by the following formula:
   a. $KE=1/2*M*(V*Sin(\theta))^2$, where
      1. KE=Kinetic Energy,
      2. M=Mass of Threat Vehicle,
      3. V=Velocity of Threat Vehicle, and
      4. $\theta$=Angle of impact between the barrier and the Threat Vehicle.

2. Active Barriers: Per the OPMG Criteria (Appendix B), active vehicle barriers shall be capable of stopping a 15,000-pound vehicle traveling at the maximum speed it can attain before impacting the barrier, but in no case shall the speed be less than 30 mph. The 15,000-pound threat vehicle's speed when it reaches the barrier depends on several factors, including initial speed, maximum acceleration rate(s), distance to barrier, and the alignment and grade of the roadway approaching the barrier. To determine the required vehicle stopping energy of the active vehicle barrier, use the following procedure:
   a. Determine the distance from the ID Check Point to the barrier (Dib) by evaluating the high speed Threat Vehicle (see Paragraphs D through H above).
   b. Determine roadway alignment in front of and through the ACP corridor including any speed management features that will limit the Threat Vehicle's speed.
   c. Determine the grade of the ACP corridor.
   d. Determine the acceleration characteristics of the Threat Vehicle. Traditionally, trucks with a gross vehicle weight rating (GVWR) of 15,000 pounds are large single unit (SU) trucks. Acceleration characteristics at various grades for a large SU truck with a GVWR of 12,000-pounds are shown in Figure 4. Acceleration rates for a 15,000 pound SU will be similar.

Recently, heavy duty pick-up trucks are becoming available with GVWR approaching 15,000 lbs. Figure 5 shows the acceleration characteristics at various grades for the Ford F450, which has a GVWR of 14,500 pounds. Note for both vehicles, the acceleration rate is fairly constant up to about 15 mph, but then continually decreases as speed increases. However, the acceleration rates for the F450 are significantly higher than the SU truck.

e. Calculate the 15,000-pound threat vehicle's velocity and energy at the barrier under each Threat Scenario. Threat vehicle kinetic energy is found from the equation in paragraph 1a above. Note, the impact angle θ is 90° for active barriers deployed in the roadway.

f. Select a barrier whose kinetic energy stopping capacity is greater than the highest threat vehicle kinetic energy determine above.

3. Active Barrier Example. Assume the evaluation of the high speed threat vehicle resulted in an ACP with a straight and level corridor, no speed management features, one zone of continuous overspeed detection set at 50 mph, and a Dib=1118 feet.

   a. Threat Scenario #1: In Threat Scenario #1, the threat vehicle enters the ACP as fast as it can go considering any speed management features (SMF) or other features in the ACP corridor that would cause it to slow down. In this example, there are no SMFs, however the threat vehicle's speed will be limited by restrictions in the ID Check Point area. For the high speed Threat Vehicle, the maximum speed through the ID Check Point area was limited to 100 mph (see paragraph D2b above). A practical limit for the SU truck would be 40 mph and for the F450 would be 60 mph. Per Figure 4, at an initial speed of 40 mph, a 15,000-pound SU truck will accelerate to about 50 mph after traveling 1118 feet. The threat vehicle's kinetic energy would be 1,253,000 foot-pounds, which would require a K12 rated barrier. Per Figure 5, at an initial speed of 60 mph, the F450 will accelerate to about 70 mph after traveling 1118 feet. The threat vehicle's kinetic energy would be 2,373,000 foot-pounds, which would exceed the capacity of a K12 rated barrier.

   b. Threat Scenario #2: In Threat Scenario #2, the Threat Vehicle is detected at the ID Check Point when it is traveling at or below a speed equal to the setting of the continuous overspeed detector nearest to the ID Check Point. For this example, the continuous overspeed detector is set at 50 mph, which is higher than the maximum practical speed of the 15,000-pound SU truck at the ID Check Point but lower than the maximum speed of the F450. Therefore, the threat vehicle's speed and energy at the barrier will be less than the speed and energy for Threat Scenario #1 determined above.

c. Threat Scenario #3: In Threat Scenario #3, the Threat Vehicle is detected at the ID Check Point and is stopped. Per Figure 4, at an initial speed of 0 mph, the 15,000-pound SU truck will accelerate to about 43 mph after traveling 1118 feet. The threat vehicle's kinetic energy would be 926,000 foot-pounds, which is less than that determined for Threat Scenario #1 above. Per Figure 5, the F450 starting at 0 mph and traveling 1118 feet will accelerate to about 57 feet when it reaches the barrier. The F450's kinetic energy will be 1,574,000 foot-pounds, which is less than that determined for Threat Scenario #1 above.

d. Threat Scenario #4: In Threat Scenario #4, the Threat Vehicle is detected at the end of the last turn-around, which is 90 feet beyond the ID Check Point and is traveling at 25 mph. Per Figure 4, at an initial speed of 25 mph, the 15,000-pound SU Truck will accelerate to about 43 mph after traveling (1118-90=) 1028 feet. The threat vehicle's kinetic energy would be 926,000 foot-pounds, which is less than that determined for Threat Scenario #1 above. Per Figure 5, at an initial speed of 25 mph, the F450 will accelerate to about 57 mph after traveling (1118-90=) 1028 feet. The threat vehicle's kinetic energy would be 1,574,000 foot-pounds, which is less than that determined for Threat Scenario #1 above.

e. Select Threat Scenario #1 as the worst case. Note, the F450's kinetic energy at the barrier of 2,373,000 foot-pounds exceeds the rating of a K12 barrier (1,253,000 foot-pounds). However, at speeds over 50 mph, most K12 rated active vehicle barriers will disable if not destroy a 15,000 pound SU or a F450 type heavy duty pick-up. Therefore, based on engineering judgment, a K12 rated active vehicle barrier would be sufficient to defeat the Threat Vehicle in this example.

4. Passive Barriers: Per the OPMG Criteria (Appendix B), passive barriers are required to stop a 15,000 pound threat vehicle anywhere along the ACP corridor traveling at whatever speed and impact angle it can attain upon barrier impact. The 15,000-pound threat vehicle's energy when it impacts the barrier depends on its speed and impact angle per the equation in paragraph I1 above. To determine the required vehicle stopping energy of passive vehicle barriers, use the following procedure:

   a. Evaluate the entire ACP corridor. Determine each curve, turn, and straight segment in the ACP corridor.

   b. For each corridor segment, determine the maximum speed and impact angle attainable by the 15,000 pound threat vehicle. Note, corridor segments with curves or turns may allow larger impact angles (which may require higher energy capacity barriers) than straight segments.

i. The threat vehicle's kinetic energy increases with increasing impact angles and increasing velocities per the equation in paragraph I1 above.
ii. The impact angle for the threat vehicle is a function of the vehicle's velocity and the clear roadway width, i.e., the width of the roadway between the passive barriers.
iii. Figure 6 shows the relationship between the clear roadway width and the threat vehicle's impact angle for a straight roadway segment. From Figure 6, as the threat vehicle's speed increases, the radius of its turn into the passive barrier must also increase to keep from spinning out. As the threat vehicle's turn radius increases, its impact angle into the barrier decreases. Increasing threat vehicle speed increases kinetic energy, however, because of the resultant decrease in impact angles, speeds above 50 mph result in only small increases in kinetic energy. Table 7 shows the threat vehicle's kinetic energy for various clear roadway widths for a 15,000 pound threat vehicle traveling at 50 mph upon impact.
iv. Figure 7 shows the relationship between the clear roadway width and the threat vehicle's impact angle for a roadway segment with a curve.

c. Determine the maximum threat vehicle speed for each passive barrier segment in the corridor and the resultant impact angles from the method shown in Figure 6 for straight corridor segments and Figure 7 for corridor segments with curves.
d. Using the equation in paragraph I1 above, determine the maximum kinetic energy of the threat vehicle for each corridor segment.
e. Select a passive barrier with stopping capability equal to or greater than the threat vehicle's kinetic energy for each corridor segment.

5. Passive Barrier Example. Assume the evaluation of the high speed threat vehicle resulted in an ACP with a 50' wide clear roadway width and a right hand 130' radius 90° turn that is 225' beyond the ID Check Point. Using Attachment 14 "Example - Curve in Response Zone, Signs and Signals Safety System", there must be 249' of straight roadway beyond the end of the threat vehicle's path in the turn to the barrier.
   a. Determine the passive barrier capacity for barriers along the curve and for barriers in the straight roadway sections before and after the curve.
   b. Barriers along the curve.
      i. For a turn to the right, the Threat Vehicle can impact the left side passive barrier without having to slow down for the curve. The impact angle is a function of the curve radius and the clear roadway width between the passive barriers – see Figure 7 – Threat Vehicle Impact Angle in a Curve. From Figure 7 with an inside radius of IR=130 feet and a clear roadway

width of RW=50 feet (4 lane roadway), the Threat Vehicle's impact angle is θ = 90°-ArcSin((R-RW+Dpb)/R); where R=IR+RW=180', RW=50', and Dpb=4'. For this example, θ = 41.9°.

ii. From Attachment 14, the maximum speed in the curve is 57 mph and the maximum speed at the ID Check Point to keep from spinning out in the curve is 77 mph. The maximum speed of the 14,500 pound F450 through the ID Check Point, per paragraph I3a above, is 60 mph. The distance between the ID Check Point and the point of impact with the left side passive barrier is 225' + R*Sin(θ) = 345' (see figure 7). The Threat Vehicle will pass the ID Check Point at 60 mph and then start to accelerate through the 345' to the barrier. From Figure 5, the Threat Vehicle's speed at the point of impact with the barrier is about 63 mph. The Threat Vehicle's kinetic energy at the point of impact is KE=1/2*14,500/32.2*(63*5280/3600*Sin(41.9°))$^2$=857,000 foot-pounds.

c. Barriers along the straight sections.

i. For straight sections of the roadway, the Threat Vehicle's impact angle with the barrier is a function of the Threat Vehicle's speed and the clear roadway width between the passive barriers along the roadway – see Figure 6.

ii. Straight Section after the curve. From paragraph 5bii above, the Threat Vehicle's maximum speed through the curve is 57 mph. The active barrier is 249' from the end of the threat vehicle's path in the curve. From Figure 5, the Threat Vehicle can attain a speed of about 60 mph before impacting the active barrier. To attain its maximum speed upon impact, the Threat Vehicle would attempt to impact the passive barrier just ahead of the active barrier. Using the method shown on Figure 6 at a speed of 60 mph, the radius of the Threat Vehicle's turn into the barrier must be no greater than 341' and its impact angle into the barrier can be no greater than θ=30°. Maximum Threat Vehicle kinetic energy is then KE=1/2*14,500/32.2*(60*5820/3600*Sin(30°)$^2$ = 436,000 foot-pounds.

iii. Straight Section before the curve. The Threat Vehicle's maximum speed through the ID Check Point is 60 mph. In order maximize its impact speed, the Threat Vehicle would attempt to impact the straight section of the passive barrier just ahead of the curve. This point is 225' from the ID Check Point. Per Figure 5, the Threat Vehicle's speed at the point of impact would be about 62 mph. Using the method shown on Figure 6 at a speed of 62 mph, the radius of the Threat Vehicle's turn into the barrier must be no greater than 342' and its impact angle into the barrier can be no greater than θ=30°. Maximum Threat Vehicle kinetic energy is then KE=1/2*14,500/32.2*(62*5820/3600*Sin(30°)$^2$ = 465,000 foot-pounds.

d. Conclusion. The required kinetic energy capacity of the passive barriers along the first straight roadway section is 465,000 foot-pounds, which is slightly higher than the stopping capacity required for the straight section after the curve, which is 436,000 foot-pounds. Use passive barriers with a stopping capacity of 465,000 foot-pounds for both straight roadway sections and the right side of the curve section. Use passive barriers with a stopping capacity of 824,000 foot-pounds for the left side of the curve section, which is slightly higher than the 802,000 foot-pound capacity of a K8 rated barrier.

J. Summary: Using properly designed Speed Management Features in the Response Zone can effectively delay the Threat Vehicle in all 4 of the Threat Scenarios defined in the criteria. When SMF's cannot be utilized, large distances in the Response Zones are required to defeat the Threat Scenarios defined in the criteria, especially Threat Scenario #2. Over-speed detection systems can be utilized to reduce Response Zone lengths, but these systems add complexity in ACP operations and equipment maintenance and are not as effective as Speed Management Features.

| Signs & Signals | |
|---|---|
| Detector Setting | Dib |
| 30 mph | 854' |
| 35 mph | 920' |
| 40 mph | 986' |
| 45 mph | 1052' |
| 50 mph | 1118' |

**Table 1**

| Presence Detection | |
|---|---|
| Detector Setting | Dib |
| 30 mph | 361' |
| 35 mph | 398' |
| 40 mph | 435' |
| 45 mph | 471' |
| 50 mph | 508' |

**Table 2**

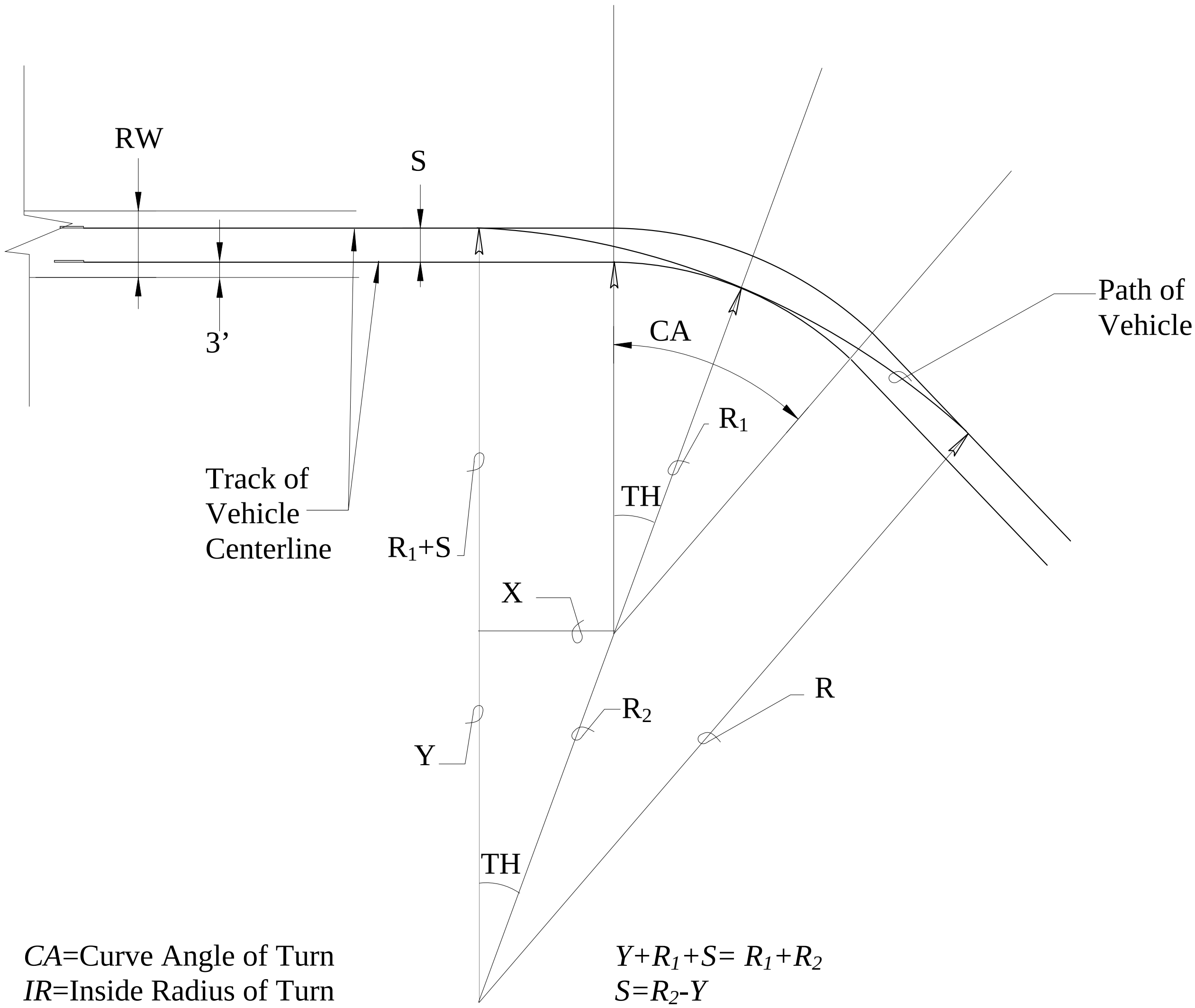
| TABLE 3 - CHICANES - SIGNS AND SIGNALS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Width (feet) | 14 | 14 | 14 | 14 | 26 | 26 | 26 | 38 | 38 | 38 |
| Inside Radius (feet) | 50 | 65 | 130 | 205 | 65 | 130 | 205 | 65 | 130 | 205 |
| Curve Angle (Deg) | 70 | 80 | 50 | 50 | 70 | 60 | 50 | 70 | 60 | 50 |
| C/L Radius (feet) | 76 | 91 | 156 | 231 | 103 | 168 | 243 | 115 | 180 | 255 |
| Distance thru Feature (feet) | 371 | 508 | 545 | 806 | 503 | 704 | 848 | 562 | 754 | 890 |
| Length of Feature (feet) | 286 | 358 | 478 | 708 | 387 | 582 | 745 | 432 | 624 | 781 |
| Width of Feature (feet) | 152 | 202 | 163 | 217 | 212 | 244 | 250 | 251 | 280 | 282 |
| ID Chk Pt to Barrier Traverse Time (sec) | 9.3 | 12 | 9.3 | 11.1 | 9.9 | 10.8 | 10.7 | 9.6 | 11 | 11 |
| Feature Traverse Time (sec) | 7.7 | 10 | 8.1 | 10.1 | 8.4 | 9.6 | 9.8 | 8.3 | 9.5 | 9.6 |
| Median Width is | 24 feet | | | | | | | | | |
| ID Check Point to Loop Entrance is 90 feet. | | | | | | | | | | |

| TABLE 4 - LOOPS - SIGNS AND SIGNALS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roadway Width (feet) | 14 | 14 | 14 | 26 | 26 | 26 | 38 | 38 | 38 |
| Inside Radius (feet) | 65 | 130 | 205 | 65 | 130 | 205 | 65 | 130 | 205 |
| Curve Angle (Deg) | 70 | 60 | 50 | 80 | 60 | 50 | 80 | 60 | 50 |
| C/L Radius (feet) | 72 | 137 | 212 | 78 | 143 | 218 | 84 | 149 | 224 |
| Distance thru Feature (feet) | 352 | 574 | 740 | 436 | 599 | 761 | 469 | 624 | 782 |
| Length of Feature (feet) | 271 | 475 | 650 | 307 | 495 | 668 | 331 | 516 | 686 |
| Width of Feature (feet) | 241 | 326 | 355 | 334 | 362 | 387 | 378 | 398 | 420 |
| ID Chk Pt to Barrier Traverse Time (sec) | 9.1 | 10.5 | 10.7 | 9.9 | 10 | 10.2 | 9.5 | 9.5 | 9.9 |
| Feature Traverse Time (sec) | 7.5 | 9.2 | 9.6 | 8.4 | 8.77 | 9.2 | 8.1 | 8.5 | 8.9 |
| Median Width is | 24 feet | | | | | | | | |
| ID Check Point to Loop Entrance is 90 feet. | | | | | | | | | |

| TABLE 5 - CHICANES - PRESENCE DETECTION | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Width (feet) | 14 | 14 | 14 | 14 | 26 | 26 | 26 | 38 | 38 | 38 |
| Inside Radius (feet) | 50 | 65 | 130 | 205 | 65 | 130 | 205 | 65 | 130 | 205 |
| Curve Angle (Deg) | 40 | 40 | 30 | 30 | 50 | 40 | 30 | 50 | 40 | 30 |
| C/L Radius (feet) | 76 | 91 | 156 | 231 | 103 | 168 | 243 | 115 | 180 | 255 |
| Distance thru Feature (feet) | 212 | 254 | 327 | 484 | 360 | 469 | 509 | 401 | 503 | 534 |
| Length of Feature (feet) | 195 | 234 | 312 | 462 | 316 | 432 | 486 | 352 | 463 | 510 |
| Width of Feature (feet) | 88 | 95 | 94 | 114 | 150 | 155 | 141 | 182 | 184 | 168 |
| ID Chk Pt to Barrier Traverse Time (sec) | 5.1 | 5.6 | 5.5 | 6.5 | 6.5 | 6.8 | 5.8 | 6.3 | 6.3 | 5.2 |
| Feature Traverse Time (sec) | 3.8 | 4.3 | 4.3 | 5.6 | 5.4 | 5.7 | 4.9 | 5.1 | 5.3 | 4.4 |
| Median Width is | 24 feet | | | | | | | | | |
| ID Check Point to Loop Entrance is 90 feet. | | | | | | | | | | |

| TABLE 6 - LOOPS - PRESENCE DETECTION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roadway Width (feet) | 14 | 14 | 14 | 26 | 26 | 26 | 38 | 38 | 38 |
| Inside Radius (feet) | 65 | 130 | 205 | 65 | 130 | 205 | 65 | 130 | 205 |
| Curve Angle (Deg) | 40 | 30 | 30 | 50 | 40 | 30 | 60 | 40 | 40 |
| C/L Radius (feet) | 72 | 137 | 212 | 78 | 143 | 218 | 84 | 149 | 224 |
| Distance thru Feature (feet) | 201 | 287 | 444 | 272 | 399 | 457 | 352 | 416 | 626 |
| Length of Feature (feet) | 185 | 274 | 424 | 239 | 368 | 436 | 291 | 383 | 576 |
| Width of Feature (feet) | 119 | 125 | 166 | 187 | 210 | 193 | 268 | 239 | 310 |
| ID Chk Pt to Barrier Traverse Time (sec) | 5.2 | 5.1 | 6.4 | 5.7 | 6.1 | 5.3 | 6.6 | 5.3 | 7.4 |
| Feature Traverse Time (sec) | 3.7 | 3.9 | 5.4 | 4.3 | 5 | 4.5 | 5.3 | 4.4 | 6.4 |
| Median Width is | 24 feet | | | | | | | | |
| ID Check Point to Loop Entrance is 90 feet. | | | | | | | | | |

| TABLE 7 - THREAT VEHICLE KINETIC ENERGY VS. ROADWAY WIDTH | | | | |
|---|---|---|---|---|
| **Number of Lanes** | **Clear Width (feet)** | **Threat Vehicle Speed (mph)** | **Attack Angle (degrees)** | **Impact Energy (Ft-Lbs)** |
| | | | | |
| **1** | **15** | **50** | **18.1** | **120,694** |
| **2** | **27** | **50** | **26.3** | **245,387** |
| **3** | **39** | **50** | **32.6** | **362,806** |
| **4** | **51** | **50** | **37.9** | **472,950** |
| **5** | **63** | **50** | **42.7** | **575,819** |
| **6** | **75** | **50** | **47.1** | **671,413** |




$CA$=Curve Angle of Turn

$IR$=Inside Radius of Turn

$RW$=Width of Unobstructed Roadway

$R$=Radius of Path of Threat Vehicle

$R_1 = IR + 3$

$S = RW - 6$

$$TH = \frac{CA}{6}$$

$$COS(TH) = \frac{Y}{R_2}$$

$Y = R_2 \bullet COS(TH)$

$R = Y + R_1 + S$

$R = R_1 + R_2$

$Y + R_1 + S = R_1 + R_2$

$S = R_2 - Y$

$S = R2 - R2 \bullet COS(TH)$

$$R_2 = \frac{S}{1 - COS(TH)}$$

$$R = \mathrm{R}_1 + \frac{\mathrm{S}}{1 - \mathrm{COS(TH)}}$$

$$V_S = \sqrt{R \bullet g \bullet (f + e)}$$

$$X = \frac{S \bullet SIN(TH)}{1 - COS(TH)}$$

Figure 1

Path of Threat Vehicle in a Curve/Turn

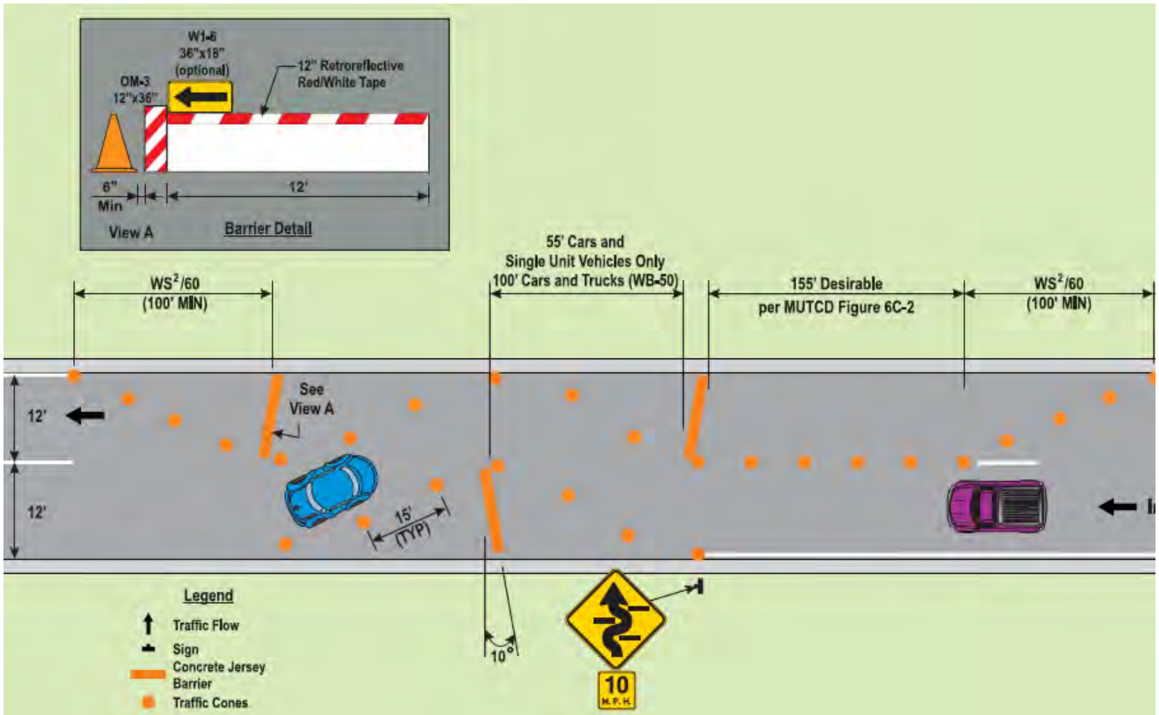



Figure 2 – Serpentine Barriers Layout

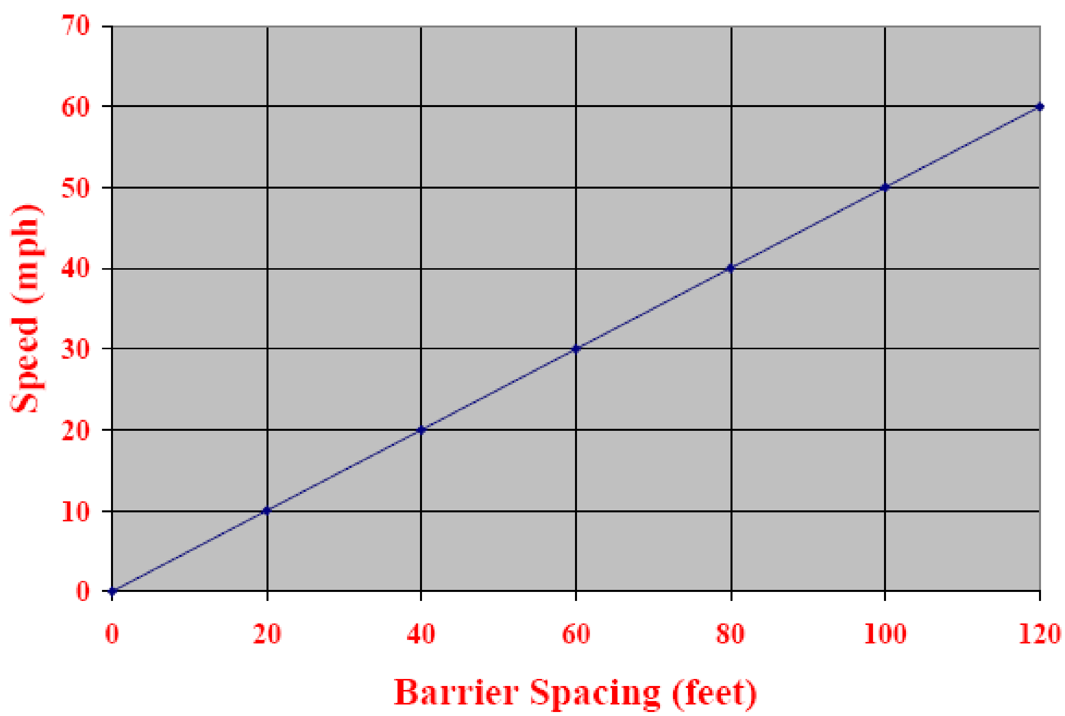



Figure 3 – Serpentine Spinout Speeds

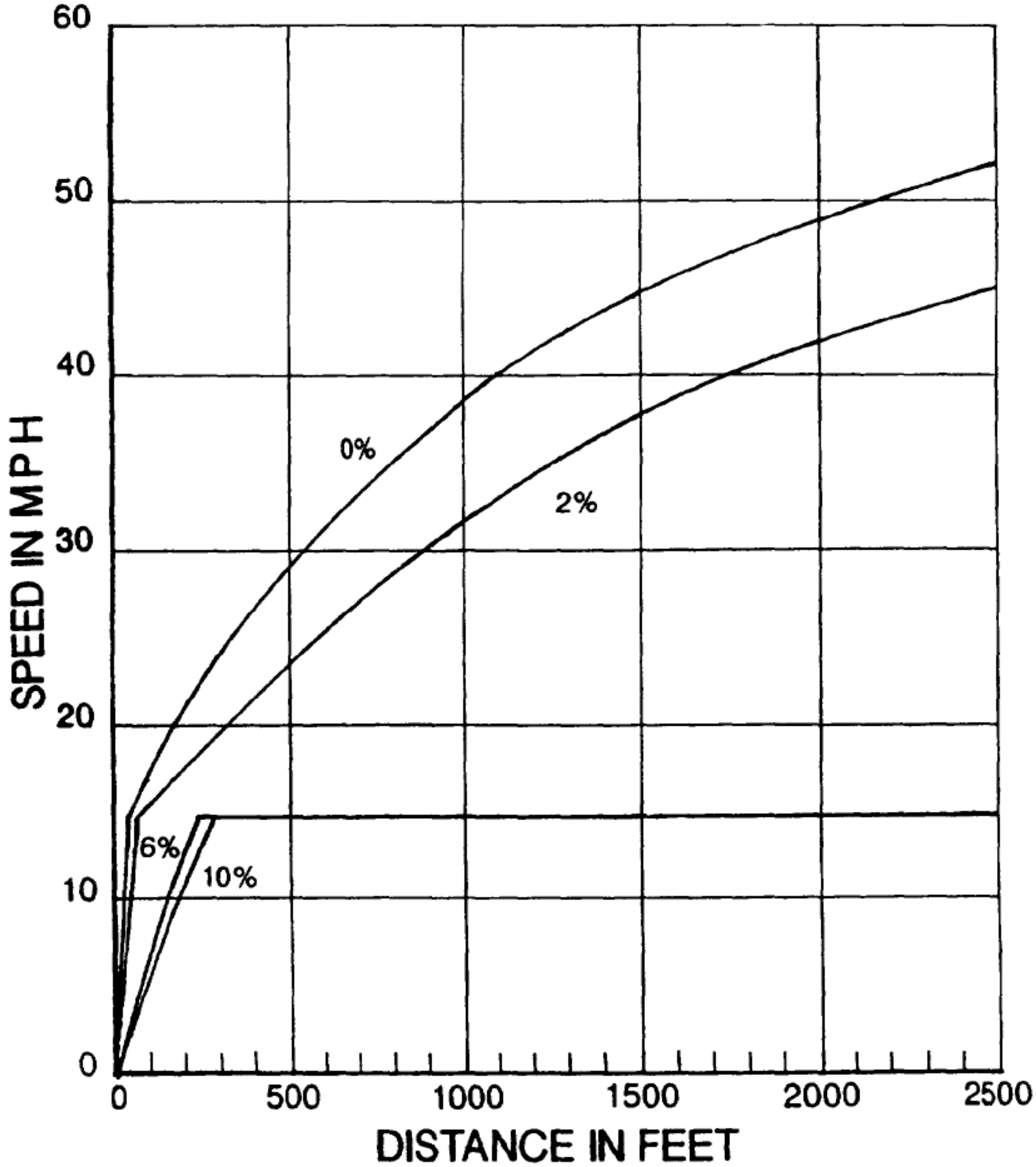


Figure 4 – Acceleration Characteristics of a 12,000 Pound Truck

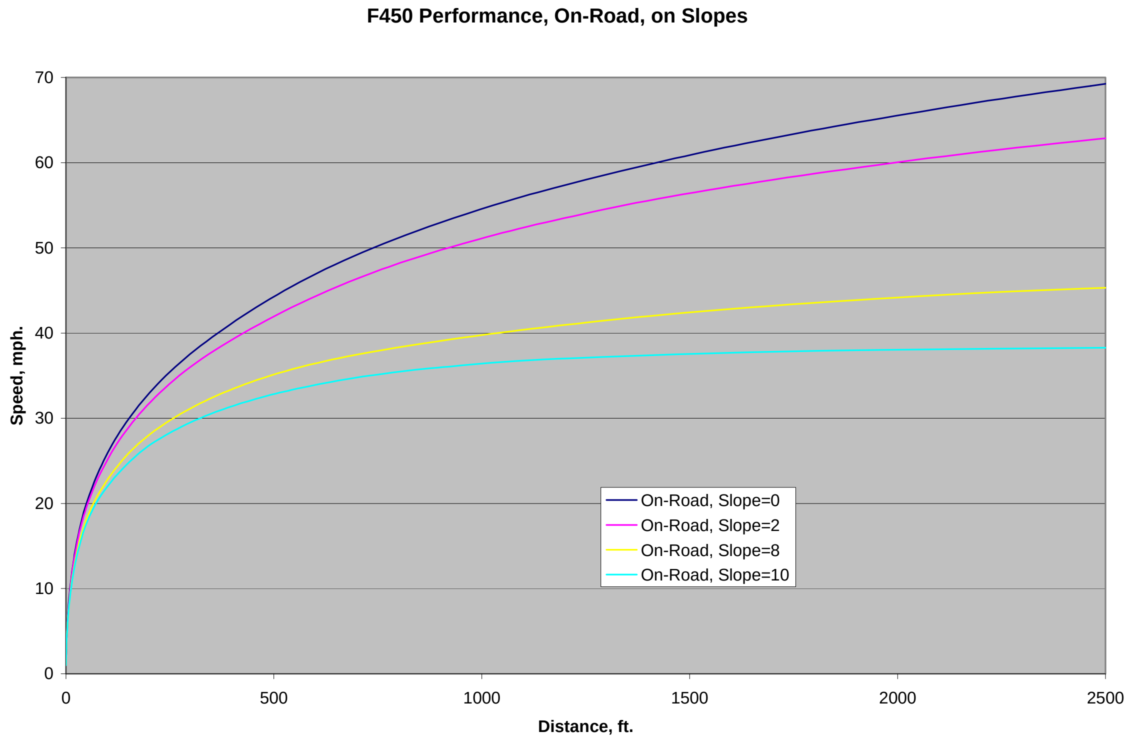
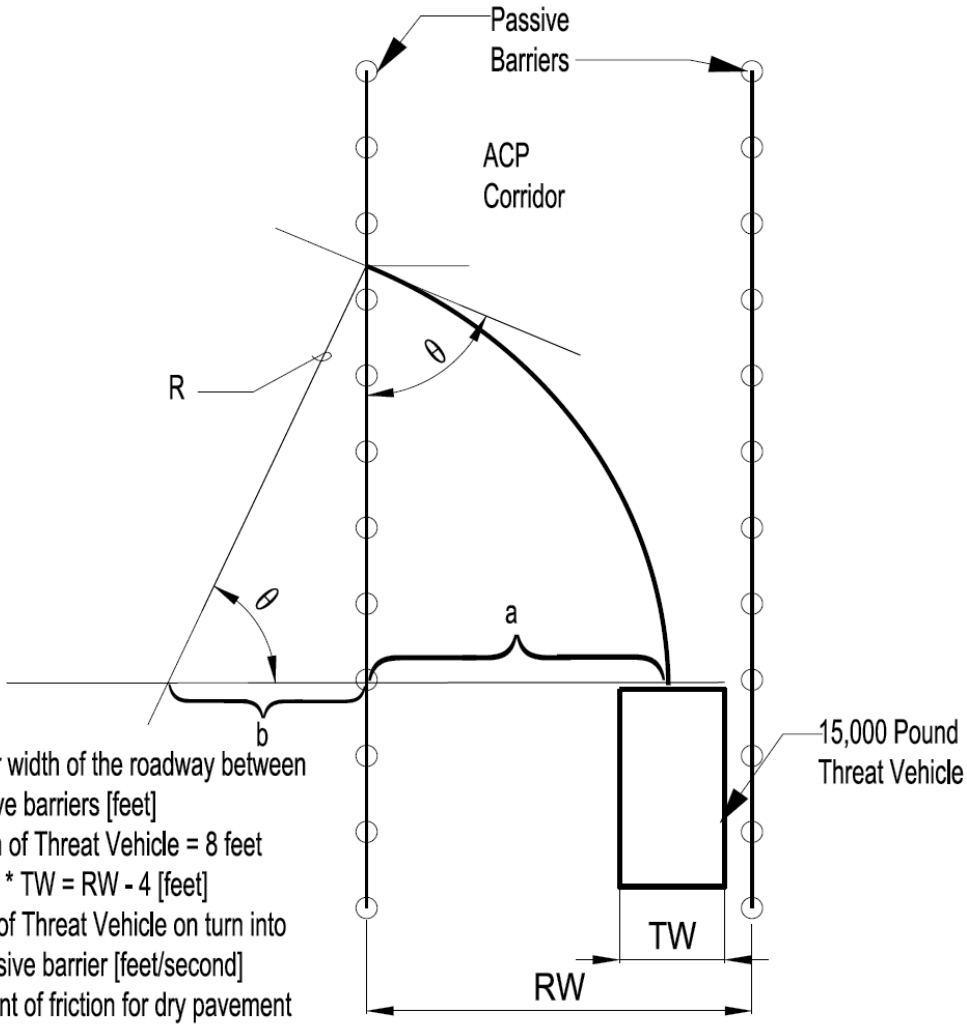



Figure 5 – Acceleration Characteristics of a Ford F450 with a 14,500 Pound Gross Vehicle Weight Rating (GVWR)




RW = Clear width of the roadway between passive barriers [feet]

TW = Width of Threat Vehicle = 8 feet

a = RW - ½ * TW = RW - 4 [feet]

V = Speed of Threat Vehicle on turn into the passive barrier [feet/second]

f = coefficient of friction for dry pavement and good tires = 0.75

g = acceleration of gravity = 32.2 feet/second/second

R = Minimum radius of Threat Vehicle's turn into the barrier to avoid spinning out at a speed of V [feet]

$$R = \frac{V^2}{f \cdot g}$$

b = R - a [feet]

θ = Impact angle of Threat Vehicle with barrier = ACos(b/R)

W = Weight of Threat Vehicle = 15,000 pounds

M = Mass of Threat Vehicle = W/g = 15,000/32.2 = 466 Slugs

KE = Component of the Threat Vehicle's kinetic energy that is perpendicular to the barrier upon impact. This energy is the required stopping capacity of the passive barrier.

$KE = ½ * M * (V*Sin(\theta))^2$ [foot-pounds]

## FIGURE 6

## THREAT VEHICLE IMPACT ANGLE ON A STRAIGHT ROADWAY

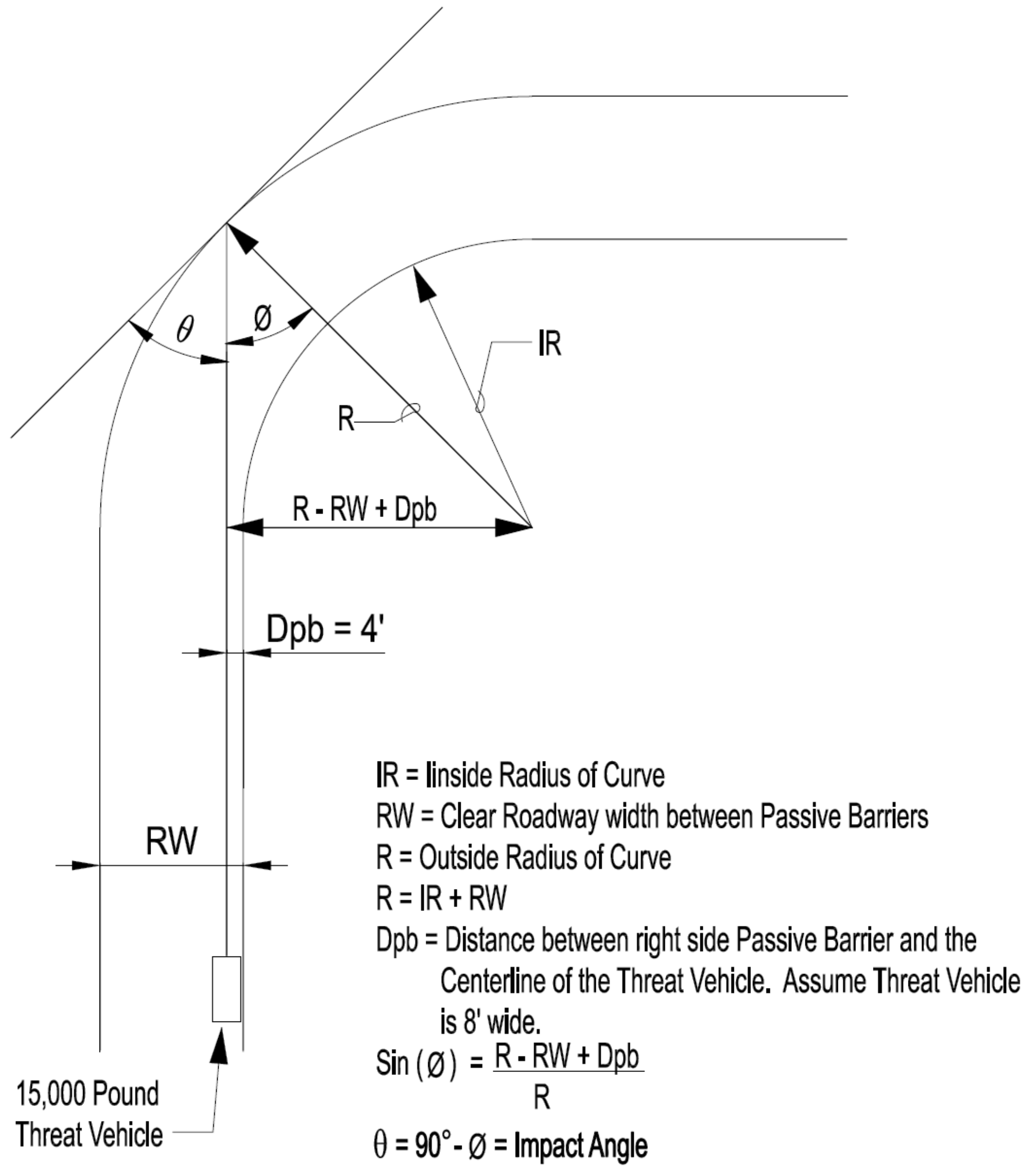



FIGURE 7

THREAT VEHICLE IMPACT ANGLE IN A CURVE

Attachment 1
Calculation Methods

A. Equations of Motion. Calculations showing that the threat scenarios will be defeated are based on the equations of motion, the most common of which are shown below:
   1. $V = V_o + a*T$
   2. $D = V_o*T + ½*a*T^2$
   3. $V^2=V_o^2+2*a*D$
   4. $D = (V^2-V_o^2)/(2*a)$
   5. $T = (-V_o+(V_o^2+2*a*D)^{1/2})/a$
      a. V=final speed (feet per second)
      b. $V_o$=initial speed (feet per second)
      c. D=distance (feet)
      d. T=time (seconds).
      e. a=acceleration or deceleration (feet/second$^2$)
         i. Acceleration: The Design Criteria (Appendix B) sets the maximum acceleration of the threat vehicle at a=11.3 feet/second$^2$.
         ii. Deceleration: The maximum deceleration rate of the threat vehicle ($a_d$) is calculated from the relationship $a_d$=f*g, where g is the acceleration of gravity (32.2 feet/second$^2$) and f is the friction factor. From page 122, Figure III-IA in “A Policy on Geometric Design of Highways and Streets 1990” from the American Association of State Highway and Transportation Officials (AASHTO), f=0.75 for dry pavement and good tires. Therefore, $a_d$=24.1 feet/second$^2$.

B. Spin-out Speed. The spin-out speed $V_s$ of a vehicle in a curve is:
   1. $V_s=(R*g*(f+e))^{1/2}$, where
      a. R is radius of the curve in feet,
      b. g is the acceleration of gravity (32.2 feet/second$^2$),
      c. f is the friction factor (0.75), and
      d. e is the super elevation of the roadway (from 0 to 0.04).

C. Accelerate and then Decelerate over Known Distance. To find the time for a vehicle to travel over a known distance D starting at a known initial speed Vi and ending at a known final speed $V_f$, use the following calculation method:

1. Calculate distances $d_1$ (which is the distance the vehicle will travel from the beginning of D to the point where it reaches a maximum speed) and $d_2$ (which is the distance vehicle will travel from the point of maximum speed to the end of D).
   a. $d_1=(V_f^2-V_i^2+2*a_d*D)/(2*a+2*a_d)$
   b. $d_2=D-d_1$
2. Calculate the maximum speed $V_m$ that the vehicle will reach before starting to decelerate. Recommend calculating $V_m$ using both of the equations below to verify accuracy of previous calculations:
   a. $V_m=(V_i^2+2*a*d_1)^{1/2}$
   b. $V_m=(V_f^2+2*a_d*d_2)^{1/2}$
3. Calculate $T_1$, $T_2$, and T; which are the times to go distances $d_1$, $d_2$, and D respectively.
   a. $T_1=(V_m-V_i)/a$
   b. $T_2=(V_m-V_f)/a_d$
   c. $T=T_1+T_2$

D. Range of Continuous Overspeed Detector. To find the required range of a continuous overspeed detector given the location and setting of the point overspeed detector immediately in front of it, use the following calculation method:
   1. Solve the following 3 simultaneous equations assuming the vehicle will pass the point overspeed detector at just under its setting and then start to accelerate toward the range of the continuous overspeed detector:
      a. $V_c =(V_p^2+2*a*D_{pc})$, Where:
         i. $V_p$ is the setting of the point overspeed detector.
         ii. $V_c$ is the speed the vehicle will attain when it reaches the beginning of the continuous overspeed detector's range.
         iii. $D_{pc}$ is the distance between the point overspeed detector and the beginning of the range of the continuous overspeed detector.
      b. $D_{cb}=V_c*t+½*a*t^2$, Where:
         i. $D_{cb}$ is the distance between the beginning of the range of the continuous overspeed detector and the final barrier and
         ii. t is the required delay time (5 seconds for the Presence Detection Safety System and 9 seconds for the Signs and Signals Safety System).

   c. $D_{pb}=D_{pc}+D_{cb}$, Where: $D_{pb}$ is the known distance from the point overspeed detector to the final barrier.

2. Solving these 3 equations for $D_{cb}$ results in a quadratic equation with the following parameters:
   a. $A=1/t^2$
   b. $B=a$
   c. $C=a^2*t^2/4-V_p^2-2*a*D_{pb}$
   d. $D_{cb}=(-B+(B^2-4*A*C)^{1/2})/(2*A)$
   e. $D_{ci}=D_{cb}-D_{ib}$, Where:
      i. $D_{ib}$ is the know distance between the ID Check Point and the final barrier.
      ii. $D_{ci}$ is the required distance between the beginning of the range of the continuous overspeed detector and the ID Check Point.  Dci is then the required range of the continuous overspeed detector.

# APPENDIX D

# ATTACHMENTS 2 THRU 19

(The actual Excel Spreadsheets are in a Separate File Folder)

**Attachment 2**
**Example - Signs &Signals, Straight Roadway, Limited Entry Speed**
**No Overspeed Detection**

| | **Assumptions** | | | | |
|---|---|---|---|---|---|
| | Assume that the ACP corridor is straight, but that there is a required turn or turns to get into the corridor, which limit vehicle speed to $V_e$ at the ACP entrance. | $V_e$ | 60 | mph | 88.0 f/s |
| | Also assume that the end of the turn is $D_{ei}$ feet in front of the ID Check Point. | $D_{ei}$ | 400 | feet | |
| | Delay time for S&S Safety System is t | t | 9 | sec | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | |

| **A** | **Threat Scenarios #1** | | | | |
|---|---|---|---|---|---|
| | **Since there is no overspeed detection, there is no Threat Scenario #2.** | | | | |
| | With no advanced overspeed detection, the Threat Vehicle enters the ACP at the spin-out speed of the turn and begins to accelerate. By the time it reaches the ID Check Point, it is traveling at $Vi'=(Ve^2+2*a*Dei)^{1/2}$ | Vi' | 129.55 | f/s | 88.3 mph |
| | If Vi is greater than 100 mph, use Vi=100 as the criteria limits the Threat Vehicle's speed through the ID Check Point to no more than 100 mph. | Vi | 129.55 | f/s | 88.3 mph |
| | In the worst case, ACP guards will not detect the Threat Vehicle until it passes the ID Check Point. The point of detection is then the ID Check Point with the Threat Vehicle traveling at an initial speed of $V_i$ | | | | |
| | The required distance $D_{ib}$ from the ID Check Point to the Barrier must be $D_{ib}=V_i*t+1/2*a*t^2$ | $D_{ib}$ | 1624 | feet | |

| **B** | **Threat Scenario #3** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}=1/2*a*t^2$ | $D_{ib}$ | 458 | feet | |

| **C** | **Threat Scenario #4** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 7.0 | sec | |
| | In the required delay time of 7 seconds, Threat Vehicle will travel $D_{tb}=V_d*t+1/2*a*t^2$ | $D_{tb}$ | 534 | feet | |
| | The distance between the ID Check Point and the end of the last turnaround is $D_{it}$ | Dit | 90.0 | feet | |
| | The required distance between the ID Check Point and barrier is $D_{ib}=D_{it}+D_{tb}$ | $D_{ib}$ | 624 | feet | |

| **D** | **Recommendations** | | | | |
|---|---|---|---|---|---|
| | Distances required for Threat Scenarios #3 & #4 are much less than for Threat Scenario #1. Place the barriers at least Dib feet (for Threat Scenario #1) from the ID Check Point. | $D_{ib}$ | 1624 | feet | |

**Attachment 3**

**Example - Signs & Signals, Straight Roadway, Limited Entry Speed**

**One Zone of Continuous Overspeed Detection**

| | **Assumptions** | | | | | |
|---|---|---|---|---|---|---|
| | Assume that the ACP corridor is straight, but that there is a required turn or turns to get into the corridor, which limit vehicle speed to $V_e$ at the ACP entrance. Enter Ve. | $V_e$ | 60 | mph | 88.0 | f/s |
| | Also assume that the ACP entrance is $D_{ei}$ feet in front of the ID Check Point. Enter Dei. | $D_{ei}$ | 500 | feet | | |
| | Delay time for S&S Safety System is t | t | 9 | sec | | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | | |

| **A** | **Threat Scenario #2** | | | | | |
|---|---|---|---|---|---|---|
| | Assume there is suffcient distance in the Response Zone to place the barrier at Dib feet beyond the ID Check Point. Install one zone of continuous overspeed detection immediately in front of the ID Check point. Set the alarm point at a speed Vcs to achieve the desired Dib. In order to avoid early detection, the Threat Vehicle will stay just under Vcs until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vcs. | | | | | |
| | Enter the desireable distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 1118 | feet | | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than $Vcs=(Dib-1/2*a*t^2)/t$ | $V_{cs}$ | 50.0 | mph | 73.4 | f/s |
| | The distance $D_{eb}$ from the ACP entrance to the final barrier is $D_{eb}=D_{ei}+D_{ib}$ | $D_{eb}$ | 1618 | feet | | |

| **B** | **Threat Scenarios #1 & #2** |
|---|---|
| | To find the required range of the continuous overspeed detector, assume the TV starts to accelerate from an initial speed of $V_e$ immediately after it enters the ACP. |
| | The speed of the TV as it reaches the beginning of the continuous overspeed zone is $V_z=(V_e^2+2*a*D_{ez})^{1/2}$, where $D_{ez}$ is the distance between the ACP entrance and the beginning of the range of the continuous overspeed detector. |
| | The distance between the beginning of the range of the continuous overspeed detector and the barrier ($D_{zb}$) must provide t seconds of delay, so $D_{zb}=V_z*t+1/2*a*t^2$ |
| | The distance between the ACP entrance and the beginning of the range of the continuous overspeed detector is $D_{ez}=D_{eb}-D_{zb}$ |
| | Solving these 3 equations for $D_{zb}$ gives the following quadratic parameters: |

| | | | | | | |
|---|---|---|---|---|---|---|
| | $A=1/t^2$ | A | 0.012 | | | |
| | B=a | B | 11.300 | | | |
| | $C=a^2*t^2/4-V_e^2-2*a*D_{eb}$ | C | -41725 | | | |
| | $D_{zb} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{zb}$ | 1437 | feet | | |
| | $D_{ez}=D_{eb}-D_{zb}$ | $D_{ez}$ | 181 | feet | | |
| | $V_z=(V_e^2+2*a*D_{ez})^{1/2}$ | $V_z$ | 109 | f/s | | |
| | The range of the continuous overspeed detector is $D_{zi}=D_{zb}-D_{ib}$ | $D_{zi}$ | 319 | feet | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **D** | **Threat Scenario #3** | | | | | |
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an initial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 458 | feet | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **E** | **Threat Scenario #4** | | | | | |
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 | f/s |
| | The required delay for Threat Scenario #4 is t | t | 7.0 | sec | | |
| | In the required delay time, Threat Vehicle could travel $D_{tb}=V_t*t+1/2*a*t_{2.}$ | $D_{tb}$ | 534 | feet | | |
| | Assume the distance between the ID Check Point and the end of the last turnaround is $D_{it.}$ | $D_{it}$ | 90.0 | feet | | |
| | The required distance between the ID Check Point and barrier is $D_{ib}(4)$=Dit+Dtb | $D_{ib}(4)$ | 624 | feet | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **F** | **Recommendations** | | | | | |
| | Distances $D_{ib}(3)$ and $D_{ib}(4)$ required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 1118 | feet | | |
| | Set continuous overspeed detector to reach from ID Check Point to a distance $D_{zi}$ feet in front of ID Check Point. | $D_{zi}$ | 319 | feet | | |
| | Set continuous overspeed detector(s) at $V_{cs}$ mph. | $V_{cs}$ | 50.0 | mph | | |

Note, if the range of the continuous overspeed zone needs to be reduced because of detector limitations or in order to reduce nuisance alarms (e.g., Dzi>400'), place a point overspeed detector at Dzi, set it at 10 mph over Vcs, and recalculate Dzi using the above procedure.

**Attachment 4**

**Example - Signs & Signals, Straight Roadway, Limited Entry Speed**

**Two Zones of Continuous Overspeed Detection**

| | **Assumptions** | | | | | |
|---|---|---|---|---|---|---|
| | Assume that the ACP corridor is straight, but that there is a required turn or turns to get into the corridor, which limit vehicle speed to $V_e$ at the ACP entrance. | $V_e$ | 60 | mph | 88.0 | f/s |
| | Also assume that the ACP entrance is $D_{ei}$ feet in front of the ID Check Point. | $D_{ei}$ | 500 | feet | | |
| | Delay time for S&S Safety System is t | t | 9 | sec | | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **A** | **Threat Scenario #2** | | | | | |
| | Assume the available distance Dib beyond the ID Check Point to place the barrier is limited. Install two zones of continuous overspeed detection in front of the ID Check point. Set the alarm point of the zone immediately in front of the ID Check Point (Zone 2) to Vc2 to achieve the availble Dib. Set the alarm point of the outer zone (Zone 1) at Vc2.<br>In order to avoid early detection, the Threat Vehicle will stay just under both Vc1 and Vc2 until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vc2. | | | | | |
| | Ener the available distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 854 | feet | | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than $Vc2=(Dib-1/2*a*t^2)/t$ | Vc2 | 30.0 | mph | 44.0 | f/s |
| | Set the Zone 1 detector 15 mph higher than the setting of the Zone 2 detector. | Vc1 | 45.0 | mph | 66.0 | f/s |
| | The range of the Zone 2 detector is then Dc2i=(Vc1-Vc2)*t | Dc2i | 198 | feet | | |
| | The distance $D_{eb}$ from the ACP entrance to the final barrier is $D_{eb}=D_{ei}+D_{ib}$ | $D_{eb}$ | 1354 | feet | | |

| | |
|---|---|
| **B** | **Threat Scenarios #1 & #2** |
| | To find the required range of the Zone 1 continuous overspeed detector, assume the TV starts to accelerate from an initial speed of $V_e$ immediately after it enters the ACP.<br>The speed of the TV as it reaches the beginning of the Zone 1 continuous overspeed zone is $V_z=(V_e^2+2*a*D_{ez})^{1/2}$, where $D_{ez}$ is the distance between the ACP entrance and the beginning of the range of the Zone 2 continuous overspeed detector.<br>The distance between the beginning of the range of the Zone 1 continuous overspeed detector and the barrier ($D_{zb}$) must provide t seconds of delay, so $D_{zb}=V_z*t+1/2*a*t^2$ |

| | | | | | |
|---|---|---|---|---|---|
| The distance between the ACP entrance and the beginning of the range of the Zone 1 continuous overspeed detector is $D_{ez}=D_{eb}-D_{zb}$ Solving these 3 equations for $D_{zb}$ gives the following quadratic parameters: | | | | | |
| $A=1/t^2$ | A | 0.012 | | | |
| B=a | B | 11.300 | | | |
| $C=a^2*t^2/4-V_p^2-2*a*D_{eb}$ | C | -35759 | | | |
| $D_{zb} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{zb}$ | 1305 | feet | | |
| $D_{ez}=D_{eb}-D_{zb}$ | $D_{ez}$ | 49 | feet | | |
| $V_z=(V_e^2+2*a*D_{ez})^{1/2}$ | $V_z$ | 94 | f/s | | |
| The distance between the beginning of the Zone 1 detectors range and ID Check Point is $D_{zi}=D_{zb}-D_{ib}$ | $D_{zi}$ | 451 | feet | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **D** | **Threat Scenario #3** | | | | | |
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an initial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 458 | feet | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **E** | **Threat Scenario #4** | | | | | |
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 | f/s |
| | The required delay for Threat Scenario #4 is t | t | 7.0 | sec | | |
| | In the required delay time, Threat Vehicle could travel $D_{tb}=V_t*t+1/2*a*t_{2.}$ | $D_{tb}$ | 534 | feet | | |
| | Assume the distance between the ID Check Point and the end of the last turnaround is $D_{it.}$ | $D_{it}$ | 90.0 | feet | | |
| | The required distance between the ID Check Point and barrier is $D_{ib}(4)$=Dit+Dtb | $D_{ib}(4)$ | 624 | feet | | |

| F | Recommendations | | | |
|---|---|---|---|---|
| | Distances Dib(3) and Dib(4) required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 854 | feet |
| | Set the Zone 2 continuous overspeed detector at Vc2. | Vc2 | 30.0 | mph |
| | Set the Zone 2 continuous overspeed detector to reach from the ID Check Point to Dc2i in front of the ID Check Point. | Dc2i | 198 | feet |
| | Set the Zone 1 continuous overspeed detector to reach from the beginning of the range of the Zone 2 continuous overspeed detector out to a distance Dc12 =Dzi-Dc2i. | Dc12 | 253 | feet |
| | The distance from the beginning of the Zone 1 detector's range to the ID Check Point is Dzi. | Dzi | 451 | feet |
| | Set The Zone 1 continuous overspeed detector(s) at $V_{c1}$ mph. | Vc1 | 45.0 | mph |

If the Zone 1 detectors are located at the ID Check Point, they must have a range of Dzi. For this case, If Dzi is less than 400 feet, point overspeed detectors are not required. However, if Dzi is greater than 400 feet for this case, place a point overspeed detector at Dzi, set it at 10 mph over Vc1, and recalculate Dzi using the above procedure.

**Attachment 5**

**Example - Signs &Signals, Straight Roadway, Unlimited Entry Speed**

**No Overspeed Detection**

| | **Assumptions** | | | | |
|---|---|---|---|---|---|
| | Because of the long, straight roadway running up to this ACP, the TV can attain an extremely high speed. Its speed approaching the ACP is limited only by the narrow lanes and traffic islands at the ID Check point. In order to successfully get through the ID Check point without hitting ID Check point features, the TV will limit its speed ($V_{imax}$) at the ID Check point to 100 mph. | $V_{imax}$ | 100 | mph | 146.7 f/s |
| | Delay time for S&S Safety System is t | t | 9 | sec | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | $f/s^2$ | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | $f/s^2$ | |

| **A** | **Threat Scenarios #1** | | | |
|---|---|---|---|---|
| | With no advanced overspeed detection, there is no Threat Scenario #2. In Threat Scenario #1, the Threat Vehicle begins its attack either inside or outside of the ACP at an initial high speed. However, the Threat Vehicle must slow down to a speed of $V_{imax}$ as it enters the ID Check Point islands. | | | |
| | In the worst case, ACP guards will not detect the Threat Vehicle until it passes the ID Check Point. The point of detection is then the ID Check Point with the Threat Vehicle traveling at an initial speed of $V_{imax}$. | | | |
| | The required distance $D_{ib}$ from the ID Check Point to the Barrier must be $D_{ib}=V_{imax}*t+1/2*a*t^2$ | $D_{ib}$ | 1778 | feet |

| **B** | **Threat Scenario #3** | | | |
|---|---|---|---|---|
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}=1/2*a*t^2$ | $D_{ib}$ | 458 | feet |

| **C** | **Threat Scenario #4** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 7.0 | sec | |
| | In the required delay time of 7 seconds, Threat Vehicle will travel $D_{tb}=V_d*t+1/2*a*t^2$ | $D_{tb}$ | 534 | feet | |
| | The distance between the ID Check Point and the end of the last turnaround is $D_{it}$ | Dit | 90.0 | feet | |
| | The required distance between the ID Check Point and barrier is $D_{ib}=D_{it}+D_{tb}$ | $D_{ib}$ | 624 | feet | |

| D | Recommendations | | |
|---|---|---|---|
| | Distances required for Threat Scenarios #3 & #4 are much less than for Threat Scenarios #1 & #2. Place the barriers at least Dib feet (for Threat Scenarios #1 & #2) from the ID Check Point. | $D_{ib}$ | 1778 feet |

**Attachment 6**

**Example - Signs & Signals, Straight Roadway, Unlimited Entry Speed**

**Two Point and One Zone of Continuous Overspeed Detection**

| | **Assumptions** | | | | |
|---|---|---|---|---|---|
| | Because of the long, straight roadway running up to this ACP, the Threat Vehicle (TV) can attain an extremely high speed. Its speed approaching the ACP is limited only by the narrow lanes and traffic islands at the ID Check point. In order to successfully get through the ID Check point without hitting ID Check point features, the TV must limit its speed at the ID Check point to $V_{imax}$. | $V_{imax}$ | 100 | mph | 146.7 f/s |
| | Delay time for S&S Safety System is t | t | 9 | sec | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | |

| **A** | **Threat Scenario #2** | | | | |
|---|---|---|---|---|---|
| | Assume there is suffcient distance in the Response Zone to place the barrier at Dib feet beyond the ID Check Point. Install one zone of continuous overspeed detection immediately in front of the ID Check point. Set the alarm point at a speed Vcs to achieve the desired Dib.<br>In order to avoid early detection, the Threat Vehicle will stay just under Vcs until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vcs. | | | | |
| | Enter the desireable distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 1118 | feet | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than $Vcs=(Dib-1/2*a*t^2)/t$ | $V_{cs}$ | 50.0 | mph | 73.4 f/s |

| **B** | **Threat Scenario #1** | | | | |
|---|---|---|---|---|---|
| | In Threat Scenario #1, the Threat Vehicle can enter the ACP at an extremely high speed, but must decelerate at some point to a speed of $V_{imax}$ as it enters the ID Check Point.<br>In order to contain the Threat Vehicle in Threat Scenario #1, the overspeed detector must detect the TV at a sufficient distance in front of the ID Check Point to achieve the required delay time.<br>The TV's speed at the barrier is $V_b=(V_{imax}{}^2+2*a*D_{ib})^{1/2}$ | $V_b$ | 216.3 | f/s | 147.5 mph |
| | The time it takes the TV to go from the ID Check point to the barrier is $t_{ib}=(V_b-V_{imax})/a$ | $t_{ib}$ | 6.16 | sec | |
| | The delay required from the point of detection to the ID Check point is $t_{di}=t-t_{ib}$, where t is the required delay time. | $t_{di}$ | 2.84 | sec | |

| | | | | |
|---|---|---|---|---|
| The fastest way the Threat Vehicle can reach the ID Check Point is by attaining a maximum speed at the point of detection and then decelerating to Vimax as it enters the ID Check Point islands. The maximum speed at the point of detection is $V_d=V_{imax}+a_d*t_{di}$ | $V_d$ | 215.1 | f/s | 146.7 mph |
| The distance Dpi between the point of detection and the ID Check point must be $D_{pi}=(V_d^2-V_{imax}^2)/(2*a_d)$ | $D_{pi}$ | 514 | feet | |
| Distance $D_{pi}$ is greater than the effective range of the continuous overspeed detector required for Threat Scenario #2 above. So, in addition to the continuous overspeed detector, a point overspeed detector is required at distance $D_{pi}$ from the ID Check Point. | | | | |
| Set the point overspeed detector at $V_p$. Ensure that $V_p$ is set at a high enough speed to limit the number of nuisance overspeed alarms. Enter Vp. | $V_p$ | 60 | mph | 88.0 f/s |
| The distance between the point overspeed detector and the barrier is $D_{pb}=D_{pi}+D_{ib}$ | $D_{pb}$ | 1632 | feet | |

| | | | | |
|---|---|---|---|---|
| **C** | **Threat Scenario #2** | | | |
| | To find the required range of the continuous overspeed detector, assume the TV passes the point overspeed detector at just under its setting so as not to be detected and then starts to accelerate.<br><br>The speed of the TV as it reaches the beginning of the continuous overspeed zone is $V_z=(V_p^2+2*a*D_{pz})^{1/2}$, where $D_{pz}$ is the distance between the point overspeed detector and the beginning of the range of the continuous overspeed detector.<br>The distance between the beginning of the range of the continuous overspeed detector and the barrier ($D_{zb}$) must provide t seconds of delay, so $D_{zb}=V_z*t+*1/2*a*t^2$<br>The distance between the point overspeed detector and the beginning of the range of the continuous overspeed detector is $D_{pz}=D_{pb}-D_{zb}$<br>Solving these 3 equations for $D_{zb}$ gives the following quadratic parameters:<br>$A=1/t^2$ | A | 0.012 | |
| | $B=a$ | B | 11.300 | |
| | $C=a^2*t^2/4-V_p^2-2*a*D_{pb}$ | C | -42032 | |
| | $D_{zb} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{zb}$ | 1443 | feet |
| | $D_{pz}=D_{pb}-D_{zb}$ | $D_{pz}$ | 188 | feet |
| | $V_z=(V_p^2+2*a*D_{pz})^{1/2}$ | $V_z$ | 110 | f/s |
| | The range of the continuous overspeed detector is $D_{zi}=D_{zb}-D_{ib}$ | $D_{zi}$ | 325 | feet |

The effective range of continuous overspeed detectors vary from about 250 feet to 500 feet, depending on the type used. Also, a long $D_{zi}$ may cause an excessive number of nuisance overspeed alarms.

If the required range ($D_{zi}$) needs to be reduced, locate a second point overspeed detector at a distance $D_{zi}$ from the ID Check Point and set it at $V_{p2}$. Recalculate the required range of the continous overspeed detector by assuming the Threat Vehicle will pass the second point overspeed detector at just under its setting of $V_{p2}$ and then start to accelerate.

| | | | | | |
|---|---|---|---|---|---|
| The distance from the second point overspeed detector to the barrier is $D_{p2b}=D_{zb}$ from above. | $D_{p2b}$ | 1443 | feet | | |
| The distance from the second point overspeed detector to the ID Check Point is $D_{p2i}=D_{p2b}-D_{ib}$. | $D_{p2i}$ | 325 | feet | | |
| Set the second point overspeed detector at a setting $V_{p2}$ that is high enough to limit the number of nuisance overspeed alarms. Enter Vp. | $V_{p2}$ | 55.0 | mph | 80.7 | f/s |
| The speed of the TV as it reaches the beginning of the continuous overspeed zone is now $V_z=(V_{p2}{}^2+2*a*D_{p2z})^{1/2}$, where $D_{p2z}$ is the distance between the second point overspeed detector and the beginning of the range of the continuous overspeed detector. The distance between the beginning of the range of the continuous overspeed detector and the barrier ($D_{zb}$) must provide t seconds of delay, so $D_{zb}=V_z*t+1/2*a*t^2$ The distance between the second point overspeed detector and the beginning of the range of the continuous overspeed detector is $D_{p2z}=D_{p2b}-D_{zb}$ Solving these 3 equations for $D_{zb}$ gives the following quadratic parameters: $A=1/t^2$ | A | 0.012 | | | |
| B=a | B | 11.300 | | | |
| $C=a^2*t^2/4-V_{p2}{}^2-2*a*D_{p2b}$ | C | -36543 | | | |
| $D_{zb} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{zb}$ | 1323 | feet | | |
| $D_{p2z}=D_{p2b}-D_{zb}$ | $D_{p2z}$ | 121 | feet | | |
| $V_z=(V_{p2}{}^2+2*a*D_{p2z})^{1/2}$ | $V_z$ | 96.1 | f/s | | |
| The range of the continuous overspeed detector is then $D_{zi}=D_{zb}-D_{ib}$ | $D_{zi}$ | 205 | feet | | |

| D | Threat Scenario #3 | | | | |
|---|---|---|---|---|---|
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 458 | feet | |

| E | Threat Scenario #4 | | | | |
|---|---|---|---|---|---|
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 7.0 | sec | |
| | In the required delay time of 7 seconds, Threat Vehicle will travel $D_{tb}=V_t*t+1/2*a*t^2$ | $D_{tb}$ | 534 | feet | |
| | The distance between the ID Check Point and the end of the last turnaround is $D_{it}$ | $D_{it}$ | 90.0 | feet | |
| | The required distance between the ID Check Point and barrier is $Dib(4)=D_{it}+D_{tb}$ | $D_{ib}(4)$ | 624 | feet | |

| F | Recommendations | | | |
|---|---|---|---|---|
| | Distances Dib(3) and Dib(4) required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 1118 | feet |
| | Locate the the first point overspeed detector(s) at $D_{pi}$ feet in front of the ID Check point. | $D_{pi}$ | 514 | feet |
| | Set the first point overspeed detector at $V_p$. | $V_p$ | 60 | mph |
| | Locate the second overspeed detector at $D_{p2i}$ feet in front of the ID Check Point. | $D_{p2i}$ | 325 | feet |
| | Set the second point overspeed detecor at $V_{p2}$. | $V_{p2}$ | 55 | mph |
| | Set continuous overspeed detector to reach from ID Check Point to a distance $D_{zi}$ feet in front of ID Check Point. | $D_{zi}$ | 205 | feet |
| | Set continuous overspeed detector(s) at $V_{cs}$ mph. | Vcs | 50.0 | mph |
| | Check that $D_{zi}$ is within the range of the selected continuous overspeed detectors. | | | |

Notes:

1. If the range of the continuous overspeed zone needs to be reduced because of detector limitations or in order to reduce nuisance alarms (e.g., Dzi>400'), install a second continuous overspeed detector. See Attachment 7 for calculation method.
2. If Dzi is less than 200', eliminate the second point overspeed detector and recalculate Dzi.

**Attachment 7**
**Example - Signs & Signals, Straight Roadway, Unlimited Entry Speed**
**Two Point and Two Zones of Continuous Overspeed Detection**

| | **Assumptions** | | | | | |
|---|---|---|---|---|---|---|
| | Because of the long, straight roadway running up to this ACP, the TV can attain an extremely high speed. Its speed approaching the ACP is limited only by the narrow lanes and traffic islands at the ID Check point. In order to successfully get through the ID Check point without hitting ID Check point features, the TV will limit its speed ($V_{imax}$) at the ID Check point to 100 mph. | $V_{imax}$ | 100 | mph | 146.7 | f/s |
| | Delay time for S&S Safety System is t | t | 9 | sec | | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | | |
| | In order to defeat the high speed threat scenarios, provide 2 continuous zones of overspeed detection and point overspeed detection at two points. | | | | | |

| **A** | **Threat Scenario #2** | | | | | |
|---|---|---|---|---|---|---|
| | Assume the available distance Dib beyond the ID Check Point to place the barrier is limited. Install two zones of continuous overspeed detection in front of the ID Check point. Set the alarm point of the zone immediately in front of the ID Check Point (Zone 2) to Vc2 to achieve the availble Dib. Set the alarm point of the outer zone (Zone 1) at Vc2.<br><br>In order to avoid early detection, the Threat Vehicle will stay just under both Vc1 and Vc2 until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vc2. | | | | | |
| | Ener the available distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 854 | feet | | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than $Vc2=(Dib-1/2*a*t^2)/t$ | Vc2 | 30.0 | mph | 44.0 | f/s |
| | Set the Zone 1 detector 15 mph higher than the setting of the Zone 2 detector. | Vc1 | 45.0 | mph | 66.0 | f/s |

| **B** | **Threat Scenario #1** | | | | | |
|---|---|---|---|---|---|---|
| | In Threat Scenario #1, the Threat Vehicle can enter the ACP at an extremely high speed, but must decelerate at some point to a speed of Vimax as it enters the ID Check Point.<br><br>In order to contain the Threat Vehicle in Threat Scenario #1, the overspeed detector must detect it at a sufficient distance in front of the ID Check Point to achieve the required delay time.<br><br>The TV's speed at the barrier is $V_b=(V_{imax}{}^2+2*a*D_{ib})^{1/2}$ | $V_b$ | 202.0 | f/s | 137.7 | mph |
| | The time it takes the TV to go from the ID Check point to the barrier is $t_{ib}=(V_b-V_{imax})/a$ | $t_{ib}$ | 4.90 | sec | | |

| | | | | | |
|---|---|---|---|---|---|
| | The delay required from the point of detection to the ID Check point is then $t_{di}=t-t_{ib}$, where t is the required delay time. | $t_{di}$ | 4.10 | sec | |
| | The fastest way the Threat Vehicle can reach the ID Check Point is by attaining a maximum speed at the point of detection and then decelerating to Vimax as it enters the ID Check Point islands. The maximum speed at the point detector is then $V_d=V_{imax}+a_d*t_{di}$ | $V_d$ | 245.5 | f/s | 167.4 mph |
| | The minimum distance $D_{pi}$ between the point of detection and the ID Check point must be $D_{pi}=(V_d^2-V_{imax}^2)/(2*a_d)$ | $D_{pi}$ | 804 | feet | |
| | Locate the point overspeed detector at Dpi feet in front of the ID Check Point and set it at $V_p$. Enter Vp. | $V_p$ | 60 | mph | 88.0 f/s |
| | The distance between the point overspeed detector and the barrier is $D_{pb}=D_{pi}+D_{ib}$ | $D_{pb}$ | 1658 | feet | |
| | | | | | |
| **C** | **Threat Scenario #2** | | | | |
| | The required range for the Zone 2 continuous overspeed detector is $D_{z2i}=(V_1-V_2)*t$ | $D_{z2i}$ | 198 | feet | |
| | To find the required range of the Zone 1 continuous overspeed detector, assume the TV passes the point overspeed detector at just under its setting so as not to be detected and then starts to accelerate.<br>The speed of the TV as it reaches the beginning of the range of the Zone 1 detector is $V_{z1}=(V_p^2+2*a*D_{pz1})^{1/2}$, where $D_{pz1}$ is the distance between the point overspeed detector and the beginning of the range of the Zone 1 detector.<br>The distance between the beginning of the range of the Zone 1 detector and the barrier ($D_{z1b}$) must provide t seconds of delay, so $D_{z1b}=V_{z1}*t+1/2*a*t_2$<br><br>The distance between the point overspeed detector and the beginning of the range of the Zone 1 detector is $D_{pz1}=D_{pb}-D_{z1b}$<br>Solving these 3 equations for $D_{z1b}$ gives the following quadratic parameters:<br>$A=1/t^2$ | A | 0.012 | | |
| | B=a | B | 11.300 | | |
| | $C=a^2*t^2/4-V_p^2-2*a*D_{pb}$ | C | -42636 | | |
| | $D_{z1b} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{z1b}$ | 1456 | feet | |
| | $D_{pz1}=D_{pb}-D_{z1b}$ | $D_{pz1}$ | 202 | feet | |
| | $V_{z1}=(V_p^2+2*a*D_{pz1})^{1/2}$ | $V_{z1}$ | 111 | f/s | |
| | The distance between the beginning of the range of the Zone 1 continuous overspeed detector and the ID Check Point is $D_{z1i}=D_{z1b}-D_{ib}$. | $D_{z1i}$ | 602 | feet | |
| | The range of the Zone 1 continuous overspeed detector is $D_{z12}=D_{z1i}-D_{z2i}$ | $D_{z12}$ | 404 | feet | |

| | | | | |
|---|---|---|---|---|
| Setting the range of the Zone 1 continuous overspeed detector out to $D_{zli}$ may cause an excessive number of nuisance alarms. Instead, locate a second point overspeed detector at $D_{zli}$ and set it at a higher speed ($V_{p2}$) to reduce nuisance alarms. Recalculate the required range of the Zone 1 continuous overspeed detector by assuming the Threat Vehicle will pass the second point overspeed detector at just under $V_{p2}$ before it starts to accelerate. The distance between the second point overspeed detector and the barrier is $D_{p2b}=D_{z1b}$ | $D_{p2b}$ | 1456 | feet | |
| The distance between the second point overspeed detector and the ID Check Point is $D_{p2i}=D_{p2b}-D_{ib}$ | $D_{p2i}$ | 602 | feet | |
| Set second point overspeed detector at $V_{p2.}$ Enter $V_{p2}$. | $V_{p2}$ | 50.0 | mph | 73.3 f/s |
| The speed of the TV as it reaches the beginning of the Zone 1 continuous overspeed zone becomes $V_z=(V_{p2}{}^2+2*a*D_{p2z})^{1/2}$, where $D_{p2z}$ is the distance between the second point overspeed detector and the beginning of the range of the Zone 1 continuous overspeed detector. The distance between the beginning of the range of the Zone 1 continuous overspeed detector and the barrier ($D_{z1b}$) must provide t seconds of delay, so $D_{z1b}=V_z*t+1/2*a*t^2$ The distance between the second point overspeed detector and the beginning of the range of the Zone 1 continuous overspeed detector is $D_{p2z}=D_{p2b}-D_{z1b}$ Solving these 3 equations for Dz1b gives the following quadratic parameters: $A=1/t^2$ | A | 0.012 | | |
| B=a | B | 11.300 | | |
| C=a^2*t^2/4-Vp2^2-2*a*Dp2b | C | -35703 | | |
| $D_{z1b} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{z1b}$ | 1303 | feet | |
| $D_{p2z}=D_{p2b}-D_{z1b}$ | $D_{p2z}$ | 153 | feet | |
| $V_z=(V_{p2}{}^2+2*a*D_{p2z})^{1/2}$ | $V_z$ | 94.0 | f/s | |
| The range of the Zone 1 continuous overspeed detector is then $D_{z1z2}=D_{z1b}-D_{ib}-D_{z2i}$ | $D_{z1z2}$ | 251 | feet | |
| The distance beween the beginning of the Zone 1 range to the ID Check Point is $D_{z1i}=D_{z1b}-D_{ib}$ | $D_{z1i}$ | 449 | feet | |

## D Threat Scenario #3

| | | | |
|---|---|---|---|
| Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 458 | feet |

## E Threat Scenario #4

| | | | | | |
|---|---|---|---|---|---|
| Threat Scenario #4 begins at the end of the last turn-around with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 | f/s |
| The required delay for Threat Scenario #4 is t | t | 7.0 | sec | | |
| In the required delay, Threat Vehicle could travel $D_{tb}=V_t*t+1/2*a*t^2$ | $D_{tb}$ | 534 | feet | | |
| Assume the distance between the ID Check Point and the end of the last turn-around is $D_{it.}$ | $D_{it}$ | 90 | feet | | |
| The required distance between the ID Check Point and barrier is $D_{ib}(4)=D_{it}+D_{tb}$ | $D_{ib}(4)$ | 624 | feet | | |

| F | Recommendations | | | |
|---|---|---|---|---|
| | Distances Dib(3) and Dib(4) required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 854 | feet |
| | Locate the first point overspeed detector at $D_{pi}$ feet in front of the ID Check Point. | $D_{pi}$ | 804 | feet |
| | Set the first overspeed detector at $V_{p.}$ | $V_p$ | 60 | mph |
| | Locate the second overspeed detector at $D_{p2i}$ feet in front of the ID Check Point. | $D_{p2i}$ | 602 | feet |
| | Set the second point overspeed detector at $V_{p2.}$ | $V_{p2}$ | 50 | mph |
| | Set the range of the Zone 1 continuous overspeed detector to $D_{z1z2}$. | $D_{z1z2}$ | 251 | feet |
| | Set the Zone 1 continuous overspeed detector at $Vc_1$ | $Vc_1$ | 45.0 | mph |
| | Set the range of the Zone 2 continuous overspeed detector at $D_{z2i.}$ | $D_{z2i}$ | 198 | feet |
| | Set the Zone 2 continuous overspeed detector at $Vc_{2.}$ | $Vc_2$ | 30.0 | mph |
| | Note the distance between the beginning of the Zone 1 continuous overspeed detector and the ID Check Point is $D_{z1i}=D_{z1b}-D_{ib}$ | $D_{z1i}$ | 449 | feet |
| | If the Zone 1 detector is located at the ID Check Point, the detector must have a range of $D_{z1i.}$ | | | |

Notes

1 The locations and settings of the overspeed detectors described above are necessary to limit the required distance between the ID Check Point and the barrier to Dib. However, these detector locations and settings may cause nuisance alarms. To minimize nuisance alarms, recommend that the Installation initiate a program to educate ACP users on the necessity to abide by posted speed limits and an enforcement program to punish motorist who exceed speed limits. Speed calming means ahead of the ID Check Point such as rumble strips should also be considered along with proper signage including variable message signs that display motorists actual speed along with the posted speed limit.

**Attachment 8**

**Example - Presence Detection, Straight Roadway, Limited Entry Speed**

**No Overspeed Detection**

| | **Assumptions** | | | | |
|---|---|---|---|---|---|
| | Assume that the ACP corridor is straight, but that there is a required turn or turns to get into the corridor, which limit vehicle speed to $V_e$ at the ACP entrance. | $V_e$ | 60 | mph | 88.0 f/s |
| | Also assume that the end of the turn is $D_{ei}$ feet in front of the ID Check Point. | $D_{ei}$ | 400 | feet | |
| | Delay time for S&S Safety System is t | t | 5 | sec | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | |

| **A** | **Threat Scenarios #1** | | | | |
|---|---|---|---|---|---|
| | **Since there is no overspeed detection, there is no Threat Scenario #2.** | | | | |
| | With no advanced overspeed detection, the Threat Vehicle enters the ACP at the spin-out speed of the turn and begins to accelerate. By the time it reaches the ID Check Point, it is traveling at $Vi'=(Ve^2+2*a*Dei)^{1/2}$ | Vi' | 129.55 | f/s | 88.3 mph |
| | If Vi is greater than 100 mph, use Vi=100 as the criteria limits the Threat Vehicle's speed through the ID Check Point to no more than 100 mph. | Vi | 129.55 | f/s | 88.3 mph |
| | In the worst case, ACP guards will not detect the Threat Vehicle until it passes the ID Check Point. The point of detection is then the ID Check Point with the Threat Vehicle traveling at an initial speed of $V_i$ | | | | |
| | The required distance $D_{ib}$ from the ID Check Point to the Barrier must be $D_{ib}=V_i*t+1/2*a*t^2$ | $D_{ib}$ | 789 | feet | |

| **B** | **Threat Scenario #3** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}=1/2*a*t^2$ | $D_{ib}$ | 141 | feet | |

| **C** | **Threat Scenario #4** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 3.0 | sec | |
| | In the required delay time of 7 seconds, Threat Vehicle will travel $D_{tb}=V_d*t+1/2*a*t^2$ | $D_{tb}$ | 161 | feet | |
| | The distance between the ID Check Point and the end of the last turnaround is $D_{it}$ | Dit | 90.0 | feet | |
| | The required distance between the ID Check Point and barrier is $D_{ib}=D_{it}+D_{tb}$ | $D_{ib}$ | 251 | feet | |

| D | Recommendations | | |
|---|---|---|---|
| | Distances required for Threat Scenarios #3 & #4 are much less than for Threat Scenario #1. Place the barriers at least Dib feet (for Threat Scenario #1) from the ID Check Point. | $D_{ib}$ | 789 feet |

**Attachment 9**

**Example - Presence Detection, Straight Roadway, Limited Entry Speed**

**One Zone of Continuous Overspeed Detection**

| **Assumptions** | | | | | |
|---|---|---|---|---|---|
| Assume that the ACP corridor is straight, but that there is a required turn or turns to get into the corridor, which limit vehicle speed to $V_e$ at the ACP entrance. Enter Ve. | $V_e$ | 50 | mph | 73.3 | f/s |
| Also assume that the ACP entrance is $D_{ei}$ feet in front of the ID Check Point. Enter Dei. | $D_{ei}$ | 600 | feet | | |
| Delay time for S&S Safety System is t | t | 5 | sec | | |
| Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | | |
| TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | | |

| **A** | **Threat Scenario #2** | | | | | |
|---|---|---|---|---|---|---|
| | Assume there is suffcient distance in the Response Zone to place the barrier at Dib feet beyond the ID Check Point. Install one zone of continuous overspeed detection immediately in front of the ID Check point. Set the alarm point at a speed Vcs to achieve the desired Dib.<br>In order to avoid early detection, the Threat Vehicle will stay just under Vcs until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vcs. | | | | | |
| | Enter the desireable distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 508 | feet | | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than $Vcs=(Dib-1/2*a*t^2)/t$ | $V_{cs}$ | 50.0 | mph | 73.4 | f/s |
| | The distance $D_{eb}$ from the ACP entrance to the final barrier is $D_{eb}=D_{ei}+D_{ib}$ | $D_{eb}$ | 1108 | feet | | |

| **B** | **Threat Scenarios #1 & #2** |
|---|---|
| | To find the required range of the continuous overspeed detector, assume the TV starts to accelerate from an initial speed of $V_e$ immediately after it enters the ACP.<br>The speed of the TV as it reaches the beginning of the continuous overspeed zone is $V_z=(V_e^2+2*a*D_{ez})^{1/2}$, where $D_{ez}$ is the distance between the ACP entrance and the beginning of the range of the continuous overspeed detector.<br>The distance between the beginning of the range of the continuous overspeed detector and the barrier ($D_{zb}$) must provide t seconds of delay, so $D_{zb}=V_z*t+1/2*a*t^2$<br>The distance between the ACP entrance and the beginning of the range of the continuous overspeed detector is $D_{ez}=D_{eb}-D_{zb}$<br>Solving these 3 equations for $D_{zb}$ gives the following quadratic parameters: |

| | | | | |
|---|---|---|---|---|
| $A=1/t^2$ | A | 0.040 | | |
| $B=a$ | B | 11.300 | | |
| $C=a^2*t^2/4-V_e^2-2*a*D_{eb}$ | C | -29621 | | |
| $D_{zb} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{zb}$ | 731 | feet | |
| $D_{ez}=D_{eb}-D_{zb}$ | $D_{ez}$ | 377 | feet | |
| $V_z=(V_e^2+2*a*D_{ez})^{1/2}$ | $V_z$ | 118 | f/s | |
| The range of the continuous overspeed detector is $D_{zi}=D_{zb}-D_{ib}$ | $D_{zi}$ | 223 | feet | |

| D | Threat Scenario #3 | | | |
|---|---|---|---|---|
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an initial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 141 | feet |

| E | Threat Scenario #4 | | | | | |
|---|---|---|---|---|---|---|
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 | f/s |
| | The required delay for Threat Scenario #4 is t | t | 3.0 | sec | | |
| | In the required delay time, Threat Vehicle could travel $D_{tb}=V_t*t+1/2*a*t_{2.}$ | $D_{tb}$ | 161 | feet | | |
| | Assume the distance between the ID Check Point and the end of the last turnaround is $D_{it.}$ | $D_{it}$ | 90.0 | feet | | |
| | The required distance between the ID Check Point and barrier is $D_{ib}(4)$=Dit+Dtb | $D_{ib}(4)$ | 251 | feet | | |

| F | Recommendations | | | |
|---|---|---|---|---|
| | Distances $D_{ib}(3)$ and $D_{ib}(4)$ required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 508 | feet |
| | Set continuous overspeed detector to reach from ID Check Point to a distance $D_{zi}$ feet in front of ID Check Point. | $D_{zi}$ | 223 | feet |
| | Set continuous overspeed detector(s) at $V_{cs}$ mph. | $V_{cs}$ | 50.0 | mph |

Note, if the range of the continuous overspeed zone needs to be reduced because of detector limitations or in order to reduce nuisance alarms (e.g., Dzi>400'), place a point overspeed detector at Dzi, set it at 10 mph over Vcs, and recalculate Dzi using the above procedure.

**Attachment 10**

**Example - Presence Detection, Straight Roadway, Limited Entry Speed**

**Two Zones of Continuous Overspeed Detection**

| | **Assumptions** | | | | |
|---|---|---|---|---|---|
| | Assume that the ACP corridor is straight, but that there is a required turn or turns to get into the corridor, which limit vehicle speed to $V_e$ at the ACP entrance. | $V_e$ | 50 | mph | 73.3 f/s |
| | Also assume that the ACP entrance is $D_{ei}$ feet in front of the ID Check Point. | $D_{ei}$ | 600 | feet | |
| | Delay time for S&S Safety System is t | t | 5 | sec | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | |

| **A** | **Threat Scenario #2** | | | | |
|---|---|---|---|---|---|
| | Assume the available distance Dib beyond the ID Check Point to place the barrier is limited. Install two zones of continuous overspeed detection in front of the ID Check point. Set the alarm point of the zone immediately in front of the ID Check Point (Zone 2) to Vc2 to achieve the availble Dib. Set the alarm point of the outer zone (Zone 1) at Vc2.<br>In order to avoid early detection, the Threat Vehicle will stay just under both Vc1 and Vc2 until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vc2. | | | | |
| | Ener the available distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 361 | feet | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than $Vc2=(Dib-1/2*a*t^2)/t$ | Vc2 | 30.0 | mph | 44.0 f/s |
| | Set the Zone 1 detector 15 mph higher than the setting of the Zone 2 detector. | Vc1 | 45.0 | mph | 66.0 f/s |
| | The range of the Zone 2 detector is then Dc2i=(Vc1-Vc2)*t | Dc2i | 110 | feet | |
| | The distance $D_{eb}$ from the ACP entrance to the final barrier is $D_{eb}=D_{ei}+D_{ib}$ | $D_{eb}$ | 961 | feet | |

| **B** | **Threat Scenarios #1 & #2** |
|---|---|
| | To find the required range of the Zone 1 continuous overspeed detector, assume the TV starts to accelerate from an initial speed of $V_e$ immediately after it enters the ACP. |
| | The speed of the TV as it reaches the beginning of the Zone 1 continuous overspeed zone is $V_z=(V_e^2+2*a*D_{ez})^{1/2}$, where $D_{ez}$ is the distance between the ACP entrance and the beginning of the range of the Zone 2 continuous overspeed detector. |
| | The distance between the beginning of the range of the Zone 1 continuous overspeed detector and the barrier ($D_{zb}$) must provide t seconds of delay, so $D_{zb}=V_z*t+1/2*a*t^2$ |

| | | | | | |
|---|---|---|---|---|---|
| | The distance between the ACP entrance and the beginning of the range of the Zone 1 continuous overspeed detector is $D_{ez}=D_{eb}-D_{zb}$<br>Solving these 3 equations for $D_{zb}$ gives the following quadratic parameters: | | | | |
| | $A=1/t^2$ | A | 0.040 | | |
| | $B=a$ | B | 11.300 | | |
| | $C=a^2*t^2/4-V_p^2-2*a*D_{eb}$ | C | -26298 | | |
| | $D_{zb} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{zb}$ | 682 | feet | |
| | $D_{ez}=D_{eb}-D_{zb}$ | $D_{ez}$ | 279 | feet | |
| | $V_z=(V_e^2+2*a*D_{ez})^{1/2}$ | $V_z$ | 108 | f/s | |
| | The distance between the beginning of the Zone 1 detectors range and ID Check Point is $D_{zi}=D_{zb}-D_{ib}$ | $D_{zi}$ | 321 | feet | |

| | | | | | |
|---|---|---|---|---|---|
| **D** | **Threat Scenario #3** | | | | |
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an initial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 141 | feet | |

| | | | | | |
|---|---|---|---|---|---|
| **E** | **Threat Scenario #4** | | | | |
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 3.0 | sec | |
| | In the required delay time, Threat Vehicle could travel $D_{tb}=V_t*t+1/2*a*t_{2.}$ | $D_{tb}$ | 161 | feet | |
| | Assume the distance between the ID Check Point and the end of the last turnaround is $D_{it.}$ | $D_{it}$ | 90.0 | feet | |
| | The required distance between the ID Check Point and barrier is $D_{ib}(4)$=Dit+Dtb | $D_{ib}(4)$ | 251 | feet | |

| | | | | | |
|---|---|---|---|---|---|
| **F** | **Recommendations** | | | | |
| | Distances Dib(3) and Dib(4) required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 361 | feet | |
| | Set the Zone 2 continuous overspeed detector at Vc2. | Vc2 | 30.0 | mph | |
| | Set the Zone 2 continuous overspeed detector to reach from the ID Check Point to Dc2i in front of the ID Check Point. | Dc2i | 110 | feet | |
| | Set the Zone 1 continuous overspeed detector to reach from the beginning of the range of the Zone 2 continuous overspeed detector out to a distance Dc12 =Dzi-Dc2i. | Dc12 | 211 | feet | |
| | The distance from the beginning of the Zone 1 detector's range to the ID Check Point is Dzi. | Dzi | 321 | feet | |
| | Set The Zone 1 continuous overspeed detector(s) at $V_{c1}$ mph. | Vc1 | 45.0 | mph | |

Note, if Dzi is less than 400 feet, point overspeed detectors are not required. If Dzi is greater than 400 feet, place a point overspeed detector at Dzi, set it at 10 mph over Vcs, and recalculate Dzi using the above procedure.

**Attachment 11**
**Example - Presence Detection, Straight Roadway, Unlimited Entry Speed**
**No Overspeed Detection**

| | **Assumptions** | | | | |
|---|---|---|---|---|---|
| | Because of the long, straight roadway running up to this ACP, the TV can attain an extremely high speed. Its speed approaching the ACP is limited only by the narrow lanes and traffic islands at the ID Check point. In order to successfully get through the ID Check point without hitting ID Check point features, the TV will limit its speed ($V_{imax}$) at the ID Check point to 100 mph. | $V_{imax}$ | 100 | mph | 146.7 f/s |
| | Delay time for S&S Safety System is t | Time t | 5 | sec | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | $f/s^2$ | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | $f/s^2$ | |

| **A** | **Threat Scenarios #1** | | | | |
|---|---|---|---|---|---|
| | With no advanced overspeed detection, there is no Threat Scenario #2. In Threat Scenario #1, the Threat Vehicle begins its attack either inside or outside of the ACP at an initial high speed. However, the Threat Vehicle must slow down to a speed of $V_{imax}$ as it enters the ID Check Point islands. | | | | |
| | In the worst case, ACP guards will not detect the Threat Vehicle until it passes the ID Check Point. The point of detection is then the ID Check Point with the Threat Vehicle traveling at an initial speed of $V_{imax}$. The required distance $D_{ib}$ from the ID Check Point to the Barrier must be $D_{ib}=V_{imax}*t+1/2*a*t^2$ | $D_{ib}$ | 875 | feet | |

| **B** | **Threat Scenario #3** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}=1/2*a*t^2$ | $D_{ib}$ | 141 | feet | |

| **C** | **Threat Scenario #4** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 3.0 | sec | |
| | In the required delay time of 7 seconds, Threat Vehicle will travel $D_{tb}=V_d*t+1/2*a*t^2$ | $D_{tb}$ | 161 | feet | |
| | The distance between the ID Check Point and the end of the last turnaround is $D_{it}$ | Dit | 90.0 | feet | |
| | The required distance between the ID Check Point and barrier is $D_{ib}=D_{it}+D_{tb}$ | $D_{ib}$ | 251 | feet | |

| D | Recommendations | | |
|---|---|---|---|
| | Distances required for Threat Scenarios #3 & #4 are much less than for Threat Scenarios #1 & #2.  Place the barriers at least Dib feet (for Threat Scenarios #1 & #2) from the ID Check Point. | $D_{ib}$ | 875 feet |

**Attachment 12**

**Example - Presence Detection, Straight Roadway, Unlimited Entry Speed**

**One Zone of Continuous Overspeed Detection**

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Assumptions** | | | | | |
| | Because of the long, straight roadway running up to this ACP, the Threat Vehicle (TV) can attain an extremely high speed. Its speed approaching the ACP is limited only by the narrow lanes and traffic islands at the ID Check point. In order to successfully get through the ID Check point without hitting ID Check point features, the TV must limit its speed at the ID Check point to $V_{imax}$. | $V_{imax}$ | 100 | mph | 146.7 | f/s |
| | Delay time for S&S Safety System is t | t | 5 | sec | | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **A** | **Threat Scenario #2** | | | | | |
| | Assume there is suffcient distance in the Response Zone to place the barrier at Dib feet beyond the ID Check Point. Install one zone of continuous overspeed detection immediately in front of the ID Check point. Set the alarm point at a speed Vcs to achieve the desired Dib.<br>In order to avoid early detection, the Threat Vehicle will stay just under Vcs until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vcs. | | | | | |
| | Enter the desireable distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 508 | feet | | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than Vcs=(Dib-1/2*a*t$^2$)/t | $V_{cs}$ | 50.0 | mph | 73.4 | f/s |

| B | **Threat Scenario #1** | | | | |
|---|---|---|---|---|---|
| | In Threat Scenario #1, the Threat Vehicle can enter the ACP at an extremely high speed, but must decelerate at some point to a speed of $V_{imax}$ as it enters the ID Check Point. | | | | |
| | In order to contain the Threat Vehicle in Threat Scenario #1, the overspeed detector must detect the TV at a sufficient distance in front of the ID Check Point to achieve the required delay time. | | | | |
| | The TV's speed at the barrier is $V_b=(V_{imax}^2+2*a*D_{ib})^{1/2}$ | $V_b$ | 181.6 | f/s | 123.8 mph |
| | The time it takes the TV to go from the ID Check point to the barrier is $t_{ib}=(V_b-V_{imax})/a$ | $t_{ib}$ | 3.09 | sec | |
| | The delay required from the point of detection to the ID Check point is $t_{di}=t-t_{ib}$, where t is the required delay time. | $t_{di}$ | 1.91 | sec | |
| | The fastest way the Threat Vehicle can reach the ID Check Point is by attaining a maximum speed at the point of detection and then decelerating to Vimax as it enters the ID Check Point islands. The maximum speed at the point of detection is $V_d=V_{imax}+a_d*t_{di}$ | $V_d$ | 192.6 | f/s | 131.3 mph |
| | The distance Dpi between the point of detection and the ID Check point must be $D_{pi}=(V_d^2-V_{imax}^2)/(2*a_d)$ | $D_{pi}$ | 323 | feet | |
| | The range of the continuous overspeed detector is then $D_{zi}=D_{pi}$ | $D_{zi}$ | 323 | feet | |

| D | **Threat Scenario #3** | | | |
|---|---|---|---|---|
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 141 | feet |

| E | **Threat Scenario #4** | | | | |
|---|---|---|---|---|---|
| | Threat Scenario #4 begins at the end of the last turnaround with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 3.0 | sec | |
| | In the required delay time of 7 seconds, Threat Vehicle will travel $D_{tb}=V_t*t+1/2*a*t^2$ | $D_{tb}$ | 161 | feet | |
| | The distance between the ID Check Point and the end of the last turnaround is $D_{it}$ | $D_{it}$ | 90.0 | feet | |
| | The required distance between the ID Check Point and barrier is Dib(4)=$D_{it}+D_{tb}$ | $D_{ib}(4)$ | 251 | feet | |

| F | Recommendations | | | |
|---|---|---|---|---|
| | Distances Dib(3) and Dib(4) required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 508 | feet |
| | Set continuous overspeed detector to reach from ID Check Point to a distance $D_{zi}$ feet in front of ID Check Point. | $D_{zi}$ | 323 | feet |
| | Set continuous overspeed detector(s) at $V_{cs}$ mph. | Vcs | 50.0 | mph |
| | $D_{zi}$ is within the range of most continuous overspeed detectors. | | | |

Note, if the range of the continuous overspeed zone needs to be reduced because of detector limitations or in order to reduce nuisance alarms (e.g., Dzi>400'), install a point or a second continuous overspeed detector. See Attachments 6 and 13 respectively for calculation method.

**Attachment 13**

**Example - Presence Detection, Straight Roadway, Unlimited Entry Speed**

**One Point and Two Zones of Continuous Overspeed Detection**

| | **Assumptions** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Because of the long, straight roadway running up to this ACP, the TV can attain an extremely high speed. Its speed approaching the ACP is limited only by the narrow lanes and traffic islands at the ID Check point. In order to successfully get through the ID Check point without hitting ID Check point features, the TV will limit its speed ($V_{imax}$) at the ID Check point to 100 mph. | $V_{imax}$ | 100 | mph | 146.7 | f/s |
| | Delay time for S&S Safety System is t | t | 5 | sec | | |
| | Threat Vehicle acceleration rate is a | a | 11.3 | f/s/s | | |
| | TV deceleration is $a_d$ | $a_d$ | 24.1 | f/s/s | | |
| | In order to defeat the high speed threat scenarios, provide 2 continuous zones of overspeed detection and point overspeed detection at one point. | | | | | |

| **A** | **Threat Scenario #2** | | | | | |
|---|---|---|---|---|---|---|
| | Assume the available distance Dib beyond the ID Check Point to place the barrier is limited. Install two zones of continuous overspeed detection in front of the ID Check point. Set the alarm point of the zone immediately in front of the ID Check Point (Zone 2) to Vc2 to achieve the availble Dib. Set the alarm point of the outer zone (Zone 1) at Vc2.<br><br>In order to avoid early detection, the Threat Vehicle will stay just under both Vc1 and Vc2 until it reaches the ID Check Point and then it will start to accelerate. Point of detection is the ID Check Point with the Threat Vehicle traveling at a speed of Vc2. | | | | | |
| | Ener the available distance $D_{ib}$ from the ID Check point to the Barrier: | $D_{ib}$ | 361 | feet | | |
| | In order to travel distance Dib in the required time delay of t seconds, the Threat Vehicle's speed at the ID Check Point must be no greater than $Vc2=(Dib-1/2*a*t^2)/t$ | Vc2 | 30.0 | mph | 44.0 | f/s |
| | Set the Zone 1 detector 15 mph higher than the setting of the Zone 2 detector. | Vc1 | 45.0 | mph | 66.0 | f/s |

| | | | | | | |
|---|---|---|---|---|---|---|
| **B** | **Threat Scenario #1** | | | | | |
| | In Threat Scenario #1, the Threat Vehicle can enter the ACP at an extremely high speed, but must decelerate at some point to a speed of Vimax as it enters the ID Check Point.<br>In order to contain the Threat Vehicle in Threat Scenario #1, the overspeed detector must detect it at a sufficient distance in front of the ID Check Point to achieve the required delay time.<br>The TV's speed at the barrier is $V_b=(V_{imax}{}^2+2*a*D_{ib})^{1/2}$ | $V_b$ | 172.2 | f/s | 117.4 | mph |
| | The time it takes the TV to go from the ID Check point to the barrier is $t_{ib}=(V_b-V_{imax})/a$ | $t_{ib}$ | 2.26 | sec | | |
| | The delay required from the point of detection to the ID Check point is then $t_{di}=t-t_{ib}$, where t is the required delay time. | $t_{di}$ | 2.74 | sec | | |
| | The fastest way the Threat Vehicle can reach the ID Check Point is by attaining a maximum speed at the point of detection and then decelerating to Vimax as it enters the ID Check Point islands.<br>The maximum speed at the point detector is then $V_d=V_{imax}+a_d*t_{di}$ | $V_d$ | 212.6 | f/s | 145.0 | mph |
| | The minimum distance $D_{pi}$ between the point of detection and the ID Check point must be $D_{pi}=(V_d{}^2-V_{imax}{}^2)/(2*a_d)$ | $D_{pi}$ | 491 | feet | | |
| | Locate the point overspeed detector at Dpi feet in front of the ID Check Point and set it at $V_{p. \text{ Enter Vp.}}$ | $V_p$ | 60 | mph | 88.0 | f/s |
| | The distance between the point overspeed detector and the barrier is $D_{pb}=D_{pi}+D_{ib}$ | $D_{pb}$ | 852 | feet | | |
| | | | | | | |
| **C** | **Threat Scenario #2** | | | | | |
| | The required range for the Zone 2 continuous overspeed detector is $D_{z2i}=(V_1-V_2)*t$ | $D_{z2i}$ | 110 | feet | | |
| | To find the required range of the Zone 1 continuous overspeed detector, assume the TV passes the point overspeed detector at just under its setting so as not to be detected and then starts to accelerate.<br>The speed of the TV as it reaches the beginning of the range of the Zone 1 detector is $V_{z1}=(V_p{}^2+2*a*D_{pz1})^{1/2}$, where $D_{pz1}$ is the distance between the point overspeed detector and the beginning of the range of the Zone 1 detector.<br>The distance between the beginning of the range of the Zone 1 detector and the barrier ($D_{z1b}$) must provide t seconds of delay, so $D_{z1b}=V_{z1}*t+1/2*a*t_2$<br>The distance between the point overspeed detector and the beginning of the range of the Zone 1 detector is $D_{pz1}=D_{pb}-D_{z1b}$<br>Solving these 3 equations for $D_{z1b}$ gives the following quadratic parameters:<br>$A=1/t^2$ | A | 0.040 | | | |
| | B=a | B | 11.300 | | | |
| | $C=a^2*t^2/4-V_p{}^2-2*a*D_{pb}$ | C | -26212 | | | |
| | $D_{z1b} = (-B+(B^2-4*A*C)^{1/2})/(2*A)$ | $D_{z1b}$ | 680 | feet | | |
| | $D_{pz1}=D_{pb}-D_{z1b}$ | $D_{pz1}$ | 172 | feet | | |
| | $V_{z1}=(V_p{}^2+2*a*D_{pz1})^{1/2}$ | $V_{z1}$ | 108 | f/s | | |
| | The distance between the beginning of the range of the Zone 1 continuous overspeed detector and the ID Check Point is $D_{z1i}=D_{z1b}-D_{ib.}$ | $D_{z1i}$ | 319 | feet | | |

| | | | | | |
|---|---|---|---|---|---|
| | The range of the Zone 1 continuous overspeed detector is $D_{z12}=D_{z1i}-D_{z2i}$ | $D_{z12}$ | 209 | feet | |
| **D** | **Threat Scenario #3** | | | | |
| | Threat Scenario 3 begins at the ID Check Point with the Threat Vehicle traveling at an intial speed of 0 mph. In the required delay time, Threat Vehicle will travel $D_{ib}(3)=1/2*a*t^2$ | $D_{ib}(3)$ | 141 | feet | |
| **E** | **Threat Scenario #4** | | | | |
| | Threat Scenario #4 begins at the end of the last turn-around with the Threat Vehicle traveling at an initial velocity of $V_t$=25mph. | $V_t$ | 25.0 | mph | 36.7 f/s |
| | The required delay for Threat Scenario #4 is t | t | 3.0 | sec | |
| | In the required delay, Threat Vehicle could travel $D_{tb}=V_t*t+1/2*a*t^2$ | $D_{tb}$ | 161 | feet | |
| | Assume the distance between the ID Check Point and the end of the last turn-around is $D_{it.}$ | $D_{it}$ | 90 | feet | |
| | The required distance between the ID Check Point and barrier is $D_{ib}(4)=D_{it}+D_{tb}$ | $D_{ib}(4)$ | 251 | feet | |
| **F** | **Recommendations** | | | | |
| | Distances Dib(3) and Dib(4) required for Threat Scenarios #3 & #4 respectively are less than the Dib selected above. Place barrier a minimum distance of Dib from the ID Check Point. | $D_{ib}$ | 361 | feet | |
| | Locate the point overspeed detector at $D_{pi}$ feet in front of the ID Check Point. | $D_{pi}$ | 491 | feet | |
| | Set the point overspeed detector at $V_{p.}$ | $V_p$ | 60 | mph | |
| | Set the range of the Zone 1 continuous overspeed detector to $D_{z1z2}$. | $D_{z12}$ | 209 | feet | |
| | Set the Zone 1 continuous overspeed detector at $Vc_1$ | $Vc_1$ | 45.0 | mph | |
| | Set the range of the Zone 2 continuous overspeed detector at $D_{z2i.}$ | $D_{z2i}$ | 110 | feet | |
| | Set the Zone 2 continuous overspeed detector at $Vc_{2.}$ | $Vc_2$ | 30.0 | mph | |
| | Note the distance between the beginning of the Zone 1 continuous overspeed detector and the ID Check Point is $D_{z1i.}$ | $D_{z1i}$ | 319 | feet | |
| | If the Zone 1 detector is located at the ID Check Point, the detector must have a range of $D_{z1i.}$ | | | | |

Notes

1

The locations and settings of the overspeed detectors described above are necessary to limit the required distance between the ID Check Point and the barrier to Dib. However, these detector locations and settings may cause nuisance alarms. To minimize nuisance alarms, recommend that the Installation initiate a program to educate ACP users on the necessity to abide by posted speed limits and an enforcement program to punish motorist who exceed speed limits. Speed calming means ahead of the ID Check Point such as rumble strips should also be considered along with proper signage including variable message signs that display motorists actual speed along with the posted speed limit.

Attachment 14

Example - Curve in Response Zone, Signs and Signals Safety System

No Overspeed Detection

| Parameters of the ACP: | | | | | |
|---|---|---|---|---|---|
| Curve in the Response Zone with a inside radius IR = | IR | 130 | feet | | |
| Roadway Width is RW= | RW | 50 | feet | | |
| Curve Angle in degrees: CA = | CA | 90 | deg | | |
| Radius of threat vehicle path is (see Note 1) R=(IR+3)+(RW-6)/(1-cos(CA/2)) | R | 282 | feet | | |
| Spinout speed in curve = $V_c$=(R*g*(f+s))^0.5, where g=32.2f/s/s, f=0.75, and s=0.03. | $V_c$ | 84.2 | f/s | 57.404 | mph |
| Signs and Signals Safety System where required delay time = | t | 9 | sec | | |
| Acceleration of Threat Vehicle: a = | a | 11.3 | f/s/s | | |
| Deceleration of Threat Vehicle: $a_d$ = | $a_d$ | 24.1 | f/s/s | | |
| Distance from ID Check Point to end of last Turn-around: $D_{it}$ | $D_{it}$ | 90 | feet | | |
| Distance from ID Check Point to curve: $D_{iv}$ | $D_{iv}$ | 225 | feet | | |
| Distance from beginning of the TV's path in the turn to the beginning of the curve: X=(RW-6)*Sin(CA/2)/(1-Cos(CA/2)) | X | 106 | feet | | |
| Distance from ID Check Point to beginning of TV's path in the curve: $D_{ic}$=$D_{iv}$-X (see Note 1) | $D_{ic}$ | 119 | feet | | |

| Threat Scenarios #1 and #2: | |
|---|---|
| For the high speed threat scenarios (TS #1&#2) with no advanced overspeed detection, the point of detection is the ID Check Point. | |
| Path of the vehicle from the point of detection is as follows: | |
| ID Check Point to beginning of TV's path in the curve: $D_{ic}$ | $D_{ic}$ |
| Distance of TV's path through curve: $D_c$ | $D_c$ |
| End of TV's path in the curve to final barriers: $D_{cb}$ | $D_{cb}$ |
| Given $D_{ic}$ and $D_c$, determine required length of $D_{cb}$ to defeat threat. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Maximum speed of Threat Vehicle in the curve ($V_c$) from above | $V_c$ | 84.2 | f/s | | | |
| $V_i$=maximum speed of threat vehicle at the ID Check Point to be able to decelerate to $V_c$ at beginning of curve = $(V_c^2+2*a_d*D_{ic})^{1/2}$ | $V_i$ | 77.2 | mph | 113.2 | f/s | |
| Time for TV to travel from ID Check Point (point of detection) to the curve is $T_{ic}=(V_i-V_c)/a_d$ | $T_{ic}$ | 1.2 | sec | | | |
| Distance thru curve: $d_c = 2*\pi*R*CA/360$ | $d_c$ | 443 | feet | | | |
| Time to go thru curve: $t_c = d_c/V_c$ | $t_c$ | 5.3 | sec | | | |
| Additional time required to delay Threat Vehicle for $T_d$ seconds: $t_r = t-T_{ic}-t_c$ | $t_r$ | 2.5 | sec | | | |
| Additional straight line distance required to delay Threat Vehicle for $t_r$ seconds: $D_{cb}=V_c*t_r+1/2*a*t_r^2$ | $D_{cb}$ | 249 | feet | | | |
| Required distance between ID Check Area and the final barrier: $D_{ib}=D_{ic}+d_c+D_{cb}$ | $D_{ib}$ | 811 | feet | | | |

| Threat Scenario #3: |
|---|
| In this Threat Scenario, The threat vehicle's initial speed at the point of detection (ID Check point) is $V_o$=0 mph, so this scenario is a less case than Threat Scenarios 1&2 above where $V_i$ is much higher. |

| Threat Scenario #4: | | | | | |
|---|---|---|---|---|---|
| In this Threat Scenario, the threat vehicle is detected at the end of the last Turn-around traveling at the ACP speed limit ($V_o$=25mph). | $V_o$ | 25 | mph | 36.7 | f/s |
| Since the guards have identified this vehicle as a possible threat, guard reaction time is reduced from 3 to 1 seconds and the overall delay time is reduced from 9 to 7 seconds. | t | 7 | sec | | |
| The distance from the end of the last Turn-around to the beginning of TV's path in the Curve is $D_{tc}=D_{ic}-D_{it}$ | $D_{tc}$ | 29 | feet | | |

| | | | |
|---|---|---|---|
| The threat vehicle will start to accelerate at end of the Turn-around from a speed of $V_o$ to a maximum speed ($V_m$) and then decelerate to the curve's spinout speed $V_c$ at the entrance to the curve. | $V_c$ | 84.2 | f/s |
| Distance from end of Turn-around to get to point where Threat Vehicle speed is $V_m$: $d_1$ | $d_1$ | | |
| Distance for Threat Vehicle to decelerate from the point where its speed is Vm to the beginning of the curve: $d_2 = d_{tc} - d_1$ | $d_2$ | | |
| Time to travel $d_1$: $t_1$ | $t_1$ | | |
| Time to travel $d_2$: $t_2$ | $t_2$ | | |
| Distance thru curve: $d_c = 2*\pi*R*CA/360$ | $d_c$ | | |
| Time to go thru curve: $t_c = d_c/V_c$ | $t_c$ | | |
| Additional time required to delay Threat Vehicle for $T_d$ seconds: $t_r = T_d-t_1-t_2-t_c$ | $t_r$ | | |
| Additional straight line distance to go in $t_r$ seconds: $D_{cb}=V_c*t_r+1/2*a*t_r^2$ | $D_{cb}$ | | |

| Solution Method: | | | |
|---|---|---|---|
| $V_m^2=V_o^2+2*a*d_1$ | | | |
| $V_m^2=V_c^2+2*a_d*d_2$ | | | |
| $V_o^2+2*a*d_1=V_c^2+2*a_d*d_2$ | | | |
| $d_2=D_{tc}-d_1$ | | | |
| $2*a*d_1-2*a_d*(D_{tc}-d_1)=V_c^2-V_o^2+2*a_d*d$ | | | |
| $d_1=(V_c^2-V_o^2+2*a_d*D_{tc})/(2*a+2*a_d)=$ | $d_1$ | 101 | feet |
| $d_2=D_{tc}-d_1=$ | $d_2$ | -72 | feet |
| $V_m=(V_o^2+2*a*d_1)^{1/2}=$ | $V_m$ | 60.2 | f/s |
| $V_m=(V_c^2+2*a_d*d_2)^{1/2}=$ | $V_m$ | 60.2 | f/s |
| $t_1=(V_m-V_o)/a=$ | $t_1$ | 2.08 | sec |
| $t_2=(V_m-V_c)/a_d=$ | $t_2$ | -1.00 | sec |
| $d_c=2*\pi*R*CA/360$ | $d_c$ | 443 | feet |
| $t_c=d_c/V_c$ | $t_c$ | 5.27 | sec |
| $t_{ic}=t_c+t_1+t_2>t$, so TS#4 is contained | $t_{ic}$ | 6.35 | sec |

| Summary | | | |
|---|---|---|---|
| Distance between ID Check Point and Curve, Div= | $D_{iv}$ | 225 | feet |
| Distance between the beginning of the TV's path in the curve and the beginning of the curve: X | X | 106 | feet |
| Distance through the TV's path in the Curve, $d_c$ | $d_c$ | 443 | feet |
| Distance between end of TV's path in the Curve and barrier, $D_{cb}$= | $D_{cb}$ | 249 | feet |
| Distance between ID Check Point and barrier, $D_{ib}$= | $D_{ib}$ | 811 | feet |

| Notes: | |
|---|---|
| 1 | See Figure 7 - Path of Threat Vehicle in a Curve/Turn |
| 2 | In order to reduce Dcb, overspeed detection can be provided in front of the ID Check Point. See example in Attachment 8. |

Attachment 15

Example - Turn in Response Zone, Signs and Signals Safety System Point and One Zone of Continuous Overspeed Detection

ACP has a turn in the Response Zone that is beyond the ID Check Point.

| Parameters of the ACP | | | | |
|---|---|---|---|---|
| $D_{it}$ = Distance between ID Check Point and beginning of the turn. | $D_{it}$ | 400 | feet | |
| X = Distance between the beginning of the TV's path in the turn and beginning of the turn, X=(RW-6)*Sin(CA/2)/(1-Cos(CA/2)). (see Note 1) | X | 63 | feet | |
| $D_{ic}$ = Distance between ID Check Point and beginning of the TV's path in the turn: $D_{ic}=D_{it}-X$ | $D_{ic}$ | 336.6 | feet | |
| Inside radius of turn = IR | IR | 130 | feet | |
| Roadway width through turn = RW | RW | 26 | feet | |
| Turn Angle of turn = CA | CA | 70 | deg | |
| Radius of threat vehicle path is (see Note 1) R=(IR+3)+(RW-6)/(1-cos(CA/2)) | R | 243 | feet | |
| Spinout speed in turn = $V_c$=(R*g*(f+s))^0.5, where g=32.2f/s/s, f=0.75, and s=0.03. | $V_c$ | 78.1 | f/s | |
| a=TV acceleration rate = | a | 11.3 | f/s/s | |
| $a_d$=TV deceleration rate = | $a_d$ | 24.1 | f/s/s | |
| t=required time delay | t | 9 | s | |

| Threat Scenario #2 | | | | |
|---|---|---|---|---|
| Do Threat Scenario #2 first to determine time for Threat Vehicle to go from ID Check Point to turn ($T_{ic}$). | | | | |
| In TS#2, TV will begin attack at the ID Check Point and start to accelerate to a maximum speed $V_m$ between the Check Point and the turn and then start to decelerate to $V_c$ as it enters the turn. | | | | |
| $V_i$ = TV speed at ID Check Point (point of detection), which is the setting of the continuous overspeed detector = | $V_i$ | 35 | mph | 51.3 f/s |
| $V_m^2=V_i^2+2*a*d_1$, where $d_1$ is the distance between the ID Check Point and the point where the TV reaches $V_m$. | | | | |
| $V_m^2=V_c^2+2*a_d*d_2$, where $d_2$ is the distance between the turn and the point where the TV reaches $V_m$. | | | | |
| $D_{ic}=d_1+d_2$ | | | | |
| Combining the above three equations in terms of $d_1$: | | | | |
| $d_1=(V_c^2-V_i^2+2*a_d*D_{ic})/(2*a+2*a_d)$ | $d_1$ | 278 | feet | |
| $d_2=D_{ic}-d_1$ | $d_2$ | 59 | feet | |

| | | | |
|---|---|---|---|
| $V_m=(V_i^2+2*a*d_1)^{1/2}$ | $V_m$ | 94.4 f/s | |
| $V_m=(V_c^2+2*a_d*d_2)^{1/2}$ | $V_m$ | 94.4 f/s | |
| $t_1$=time to go distance $d_1=(V_m-V_i)/a$ | $t_1$ | 3.81 sec | |
| $t_2$=time to go distance $d_2=(V_m-V_c)/a_d$ | $t_2$ | 0.68 sec | |
| $T_{ic}=t_1+t_2$ | $T_{ic}$ | 4.49 sec | |
| The remaining time delay ($t-T_{ic}$) must be achieved in the turn and in the straight roadway distance between the end of the turn and barrier. | | | |

| Threat Scenario #1 | | | |
|---|---|---|---|
| Determine distance between point overspeed detector (which is the point of detection for TS#1) and the turn. | | | |
| In TS#1, TV enters ACP at high speed, however, at some point it must start to decelerate to reach speed $V_c$ at the beginning of the turn. | | | |
| The point overspeed detector must be placed at a distance from the turn to be able to detect the TV in the same amount of time as the TV was detected in TS#2 from the point of detection to the beginning of the turn. This time is $T_{ic}$ for TS#2 above. | | | |
| In the worst case, the TV will be decelerating at this point, so its speed is $V_p=V_c+a_d*T_{ic}$. | $V_p$ | 186.3 f/s | 127.1 mph |
| Distance between the point overspeed detector and the turn is $D_{pc}=V_p*T_{ic}-1/2*a_d*T_{ic}^2$ | $D_{pc}$ | 594 feet | |
| Distance between the point overspeed detector and the ID Check Point is $D_{pi}=D_{pc}-D_{ic}$ | $D_{pi}$ | 257 feet | |

| Threat Scenario #2 | | | |
|---|---|---|---|
| Determine the range of the continuous overspeed detector ($D_{zi}$) | | | |
| The other attack option in TS#2 is that the TV will pass the point overspeed detector at just under its setting (Vp) and then begin to accelerate. The continuous OS detector will detect this attack at the beginning of its range of coverage. | $V_p$ | 55 mph | 80.7 f/s |
| From the point OS Detector, the TV will begin to accelerate from a speed of $V_p$ to a speed of $V_m$ and then start to decelerate in order to get to a speed of $V_c$ at the entrance to the turn. | | | |
| $V_m^2=V_p^2+2*a*d_1$ | | | |
| $V_m^2=V_c^2+2*a_d*d_2$ | | | |
| Also, $D_{pc}=d_1+d_2$ | | | |

| | | | |
|---|---|---|---|
| Combining the above 3 equations in terms of $d_1$: $d_1=(V_c^2-V_p^2+2*a_d*D_{pc})/(2*a+2*a_d)$ | $d_1$ | 399 | feet |
| $d_2=D_{pc}-d_1$ | $d_2$ | 195 | feet |
| $V_m=(V_p^2+2*a*d_1)^{1/2}$ | $V_m$ | 125 | f/s |
| $V_m=(V_c^2+2*a_d*d_2)^{1/2}$ | $V_m$ | 125 | f/s |
| $t_1=(V_m-V_p)/a$ | $t_1$ | 3.88 | sec |
| $t_2=(V_m-V_c)/a_d$ | $t_2$ | 1.93 | sec |
| $T_{pc}=t_1+t_2$ | $T_{pc}$ | 5.81 | sec |
| The time it takes the TV to go from the beginning of the continuous OS detector (point of detection) to the turn must be no greater than $T_{ic}$ calculated for TS#2 above. | | | |
| The time it takes the TV to go from the point OS detector to the beginning of the continuous OS detector's zone is then $T_{pz}=T_{pc}-T_{ic}$ | $T_{pz}$ | 1.32 | sec |
| The speed of the TV at the beginning of the continuous OS detector's zone is then $V_z=V_p+a*T_{pz}$ | $V_z$ | 95.6 | f/s |
| Distance between point OS detector and the beginning of the continuous OS detector's zone is then $D_{pz}=V_p*T_{pz}+1/2*a*T_{pz}^2$ | $D_{pz}$ | 116 | feet |
| Length of continuous OS detector's zone is $D_{zi}=D_{pi}-D_{pz}$ | $D_{zi}$ | 141 | feet |
| | | | |
| Distance in turn is $D_c=2*\pi*R*CA/360$ | $D_c$ | 296 | feet |
| The time to get through the turn is $T_c=D_c/V_c$ | $T_c$ | 3.80 | sec |
| Remaining delay time required is $T_r=t-T_{ic}-T_c$ | $T_r$ | 0.71 | sec |
| Straight line distance required from the end of the TV's path in the turn to the barriers is $D_{cb}=V_c*T_r+1/2*a*T_r^2$ | $D_{cb}$ | 58 | feet |
| Required distance between the ID Check Point and barrier is $D_{ib}=D_{ic}+D_c+D_{cb}$ | $D_{ib}$ | 691 | feet |

| Threat Scenario #3 |
|---|
| In TS#3, TV begins attack at ID Check Point at a speed of 0 mph. This is a much less case than TS#2, which also begins at the ID Check Point but at a much higher speed. |
| TS#3 can be ignored in this example. |

| Threat Scenario #4 | | | | | |
|---|---|---|---|---|---|
| In Threat Scenario #4, the TV begins the attack at the end of the last Turn-around, which is a distance $D_{it}$ from the ID Check Point. | $D_{it}$ | 90 | feet | |
| Delay time TS#4 is t= | t | 7 | sec | |
| Distance between the end of the last Turn-around, which is the point of detection, and the turn is $D_{tc}=D_{ic}-D_{it}$ | $D_{tc}$ | 246.6 | feet | |
| At the end of the last Turn-around, TV will begin to accelerate from an initial speed of $V_t$=25mph to a maximum speed of $V_m$ and then start to decelerate to $V_c$ as it enters the turn. | $V_t$ | 25 | mph | 36.7 f/s |
| $V_m^2=V_t^2+2*a*d_1$ | | | | |
| $V_m^2=V_c^2+2*a_d*d_2$ | | | | |
| $D_{tc}=d_1+d_2$ | | | | |
| Combining the above 3 equations in terms of $d_1$: $d_1=(V_c^2-V_t^2+2*a_d*D_{tc})/(2*a+2*a_d)$ | $d_1$ | 234.9 | feet | |
| $d_2=D_{tc}-d_1$ | $d_2$ | 11.64 | feet | |
| $V_m=(V_t^2+2*a*d_1)^{1/2}$ | $V_m$ | 81.57 | f/s | |
| $V_m+(V_c^2+2*a_d*d_2)^{1/2}$ | $V_m$ | 81.57 | f/s | |
| $t_1=(V_m-V_t)/a$ | $t_1$ | 3.974 | sec | |
| $t_2=(V_m-V_c)/a_d$ | $t_2$ | 0.146 | sec | |
| $T_{tc}=t_1+t_2$ | $T_{tc}$ | 4.12 | sec | |
| Time for TV to go through turn is $T_c$ from above. | $T_c$ | 3.80 | sec | |
| Time for TV to go from end of last Turn-around to end of turn is $T_{tec}=T_{tc}+T_c$ | $T_{tec}$ | 7.92 | sec | |
| Since $T_{tec}$ is greater than the required delay time t, TS#4 is contained. | | | | |
| **Summary** | | | | |
| Distance between ID Check Point and turn, $D_{it}$= | $D_{it}$ | 400 | feet | |
| Distance between the beginning of the TV's path in the turn and the beginning of the turn, X | X | 63 | feet | |
| Distance between end of turn and Barrier, $D_{cb}$= | $D_{cb}$ | 58 | feet | |
| Distance between ID Check Point and barrier, $D_{ib}$= | $D_{ib}$ | 691 | feet | |
| Distance between point overspeed detector and the ID Check Point, $D_{pi}$ | $D_{pi}$ | 257 | feet | |
| Setting of the point overspeed detector, $V_p$ | $V_p$ | 55 | mph | |
| Range of the continuous overspeed detector, $D_{zi}$ | $D_{zi}$ | 141 | feet | |
| Setting of the continuous overspeed detector, $V_i$ | $V_i$ | 35 | mph | |
| **Notes:** | | | | |
| 1 See Figure 7 - Path of Threat Vehicle in a Curve/Turn. | | | | |

Attachment 16

Example - Curve in Response Zone, Presence Detection Safety System

No Speed Detection

| Parameters of the ACP: | | | |
|---|---|---|---|
| Curve in the Response Zone with a inside radius IR = | IR | 130 | feet |
| Roadway Width is RW= | RW | 26 | feet |
| Curve Angle in degrees: CA = | CA | 70 | deg |
| Radius of threat vehicle path is (see Note 1) R=(IR+3)+(RW-6)/(1-cos(CA/2)) | R | 243 | feet |
| Spinout speed in curve = $V_c$=(R*g*(f+s))^0.5, where g=32.2f/s/s, f=0.75, and s=0.03. | $V_c$ | 78.1 | f/s |
| Length of Threat Vehicle path through the curve is $D_c$=2*π*R*CA/360 | $D_c$ | 296 | feet |
| Time for Threat Vehicle to traverse the curve is $T_c=D_c/V_c$ | $T_c$ | 3.8 | sec |
| Signs and Signals Safety System where required delay time = | t | 5 | sec |
| Acceleration of Threat Vehicle: a = | a | 11.3 | f/s/s |
| Deceleration of Threat Vehicle: $a_d$ = | $a_d$ | 24.1 | f/s/s |
| Distance from ID Check Point to end of last Turn-around: $D_{it}$ | $D_{it}$ | 90 | feet |
| Distance from ID Check Point to beginning of the curve: $D_{iv}$ | $D_{iv}$ | 100 | feet |
| Distance from the beginning of the TV's path in the curve and the beginning of the curve: X=(RW-6)*sin(CA/2)/(1-cos(CA/2)) (Note 1) | X | 63 | feet |
| Distance from ID Check Point to beginning of TV's path in the curve: $D_{ic}=D_{iv}$-X | $D_{ic}$ | 37 | feet |

| Threat Scenarios #1 and #2: | |
|---|---|
| For the high speed threat scenarios (TS #1&#2) with no advanced overspeed detection, the point of detection is the ID Check Point. | |
| Path of the vehicle from the point of detection is as follows: | |
| ID Check Point to beginning of curve: $D_{ic}$ | $D_{ic}$ |
| Distance through curve: $D_c$ | $D_c$ |

| | | | | | |
|---|---|---|---|---|---|
| End of curve to final barriers: $D_{cb}$ | $D_{cb}$ | | | | |
| Given $D_{ic}$ and $D_c$, determine required length of $D_{cb}$ to defeat threat. | | | | | |
| Maximum speed of Threat Vehicle in the curve ($V_c$) from above | $V_c$ | 78.1 | f/s | | |
| $V_i$=maximum speed of threat vehicle at the ID Check Point to be able to decelerate to Vc at beginning of curve = $(V_c^2+2*a_d*D_{ic})^{1/2}$ | $V_i$ | 60.4 | mph | 88.6 | f/s |
| Time for TV to travel from ID Check Point (point of detection) to the curve is $T_{ic}=(V_i-V_c)/a_d$ | $T_{ic}$ | 0.4 | sec | | |
| Distance thru curve: $d_c = 2*\pi*R*CA/360$ | $d_c$ | 296.4 | feet | | |
| Time to go thru curve = $d_c/V_c$ | $t_c$ | 3.797 | sec | | |
| Additional time required to delay Threat Vehicle for $T_d$ seconds: $t_r = t-T_{ic}-t_c$ | $t_r$ | 0.8 | sec | | |
| Additional straight line distance required to delay Threat Vehicle for tr seconds: $D_{cb}=V_c*t_r+1/2*a*t_r^2$ | $D_{cb}$ | 63 | feet | | |
| Required distance between ID Check Area and the final barrier: $D_{ib}=D_{ic}+d_c+D_{cb}$ | $D_{ib}$ | 395.9 | feet | | |

| Threat Scenario #3: |
|---|
| In this Threat Scenario, The threat vehicle's initial speed at the point of detection (ID Check point) is $V_o$=0 mph, so this scenario is a less case than Threat Scenarios 1&2 above where $V_i$ is much higher. |

| Threat Scenario #4: | | | | | |
|---|---|---|---|---|---|
| In this Threat Scenario, the threat vehicle is detected at the end of the last Turn-around traveling at the ACP speed limit ($V_o$=25mph). | $V_o$ | 25 | mph | 36.7 | f/s |
| Since the guards have identified this vehicle as a possible threat, guard reaction time is reduced from 3 to 1 seconds and the overall delay time is reduced 2 seconds. | t | 3 | sec | | |

| |
|---|
| Since the time delay in the curve ($t_c$) is greater than the required time delay, Threat Scenario #4 will be defeated. |

| Summary | | | |
|---|---|---|---|
| Distance between ID Check Point and beginning of curve, Dic | Div | 100 | feet |
| Distance between beginning of TV's path in the curve and the beginning of the curve, X | X | 63 | feet |
| Distance between ID Check Point and Curve, $D_{ic}$= | $D_{ic}$ | 37 | feet |
| Distance between end of Curve and Barrier, $D_{cb}$= | $D_{cb}$ | 63 | feet |
| Distance between ID Check Point and barrier, $D_{ib}$= | $D_{ib}$ | 396 | feet |

| Notes: | |
|---|---|
| 1 | See Figure 7 - Path of Threat Vehicle in a Curve/Turn |
| 2 | For the Presence Detection Safety System, most of the required delay can be achieved in a properly selected curve. Advance speed detection should, therefore, not be necessary. |

Attachment 17

Example - Curve in Approach Zone, Signs and Signals Safety System

No Speed Detection

| Parameters of the ACP: | | | | | |
|---|---|---|---|---|---|
| The approach roadway to the ACP corridor has a turn into the ACP corridor with a radius of R = | IR | 65 | feet | | |
| Roadway width is RW = | RW | 26 | feet | | |
| Curve Angle of turn is CA= | CA | 90 | deg | | |
| Radius of threat vehicle path is (see Note 1) R=(IR+3)+(RW-6)/(1-cos(CA/2)) | R | 136 | feet | | |
| Spinout speed in curve = $V_c$=(R*g*(f+s))^0.5, where g=32.2f/s/s, f=0.75, and s=0.03. See Note 2. | $V_c$ | 58.5 | f/s | 39.9 | mph |
| Signs and Signals Safety System where required delay time is t = | t | 9 | sec | | |
| Acceleration of Threat Vehicle: a = | a | 11.3 | f/s/s | | |
| Distance from the end of the turn to the ID Check Point: $D_{ti}$ = | $D_{ti}$ | 50 | feet | | |
| No advanced speed detection. | | | | | |

| Threat Scenarios 1&2 - High Speed Attacks | | | | | |
|---|---|---|---|---|---|
| The maximum speed in the turn is $V_t$= (See Notes 2 & 3) | $V_t$ | 58.5 | f/s | 39.9 | mph |
| The Threat Vehicle will start to accelerate from the end of the turn and will continue to accelerate to the barrier. | | | | | |
| The worst case point of detection is the ID Check Point at which point the TV will be traveling at $V_d=(V_t^2+2*a*D_{ti})^{1/2}$ | $V_d$ | 67.5 | f/s | | |
| The required distance between the ID Check Point and the barrier is $D_{ib}=V_d*t+1/2*a*t^2$ | $D_{ib}$ | 1065 | feet | | |

| Threat Scenario #3 - Covert at ID Check point. | | | | | |
|---|---|---|---|---|---|
| TV begins attack at ID Check Point, where it is immediately detected by the ID Check guard. TV's speed at the point of detection is $V_d$=0 f/s. | $V_d$ | 0 | mph | 0.0 | f/s |
| Total distance Threat Vehicle can travel from the point of detection (ID Check point) in the required t seconds of delay is $D_{ib}$ $= V_d*t+1/2*a*t^2$ | $D_{ib}(3)$ | 458 | feet | | |

| | | | |
|---|---|---|---|
| $D_{ib}$ for Threat Scenario #3 is considerably smaller than $D_{ib}$ calculated above for Threat Scenarios 1&2, so use $D_{ib}$ for Threat Scenarios 1&2. | | | |

| Threat Scenario #4 - Covert at end of last Turn around. | | | |
|---|---|---|---|
| Threat vehicle begins attack at the end of the last Turn at which point it is immediately detected by ID Check guards. The TV's speed at the point of detection is the ACP speed limit, so $V_d$=25 mph. | $V_d$ | 25 mh | 36.7 f/s |
| Since TV has been identified by guards as suspect, guard reaction time to initiate EFO is reduced from 3 to 1 seconds, thus reducing overall delay time to t = 7 seconds | t | 7 sec | |
| The distance between the ID Check point and the end of the last Turn around is $D_{it}$. | $D_{it}$ | 90 feet | |
| Total distance Threat Vehicle can travel from the point of detection (end of last Turn around) in the required t seconds of delay is $D_{tb}$ = $V_d*t+1/2*a*t^2$ | $D_{tb}$ | 534 feet | |
| Required distance from ID Check Point to the barrier to defeat Threat Scenario #4 is $D_{ib}$ = $D_{it}+D_{tb}$ | $D_{ib}(4)$ | 624 feet | |
| $D_{ib}$ for Threat Scenario #4 is considerably smaller than $D_{ib}$ calculated above for Threat Scenarios 1&2, so use the $D_{ib}$ calculated for Threat Scenarios 1&2. | | | |

| Summary | | |
|---|---|---|
| To defeat TS 1&2, a large distance $D_{ib}$ is required. Even with the fairly tight turning radius in this example, the turn in the Approach Zone does not significantly reduce the required distance $D_{ib}$. See note 3. | Dib | 1065 feet |

| Notes: | |
|---|---|
| 1 | See Figue 7 - Path of Threat Vehicle in a Curve/Turn. |
| 2 | If $V_c$ > 35 mph, the turn has little value in providing delay. Use examples for Straight Approach to ACP Corridor. |

3

In order to be effective, Approach Zone speed management features must have narrow lanes and must be brought up fairly close to the ID Check Point, which will help keep the Threat Vehicle's speed low at the ID Check Point (point of detection). This is not possible at a multi-lane, high volume gate, but may be possible at a low volume, single entry lane gate.

**Attachment 18**

**Example - Serpentine at beginning of Response Zone, Signs and Signals Safety**

| **Parameters of the ACP:** | | | | | |
|---|---|---|---|---|---|
| Serpentine at beginning of Response Zone with spacing between barriers (s) | s | 55 | feet | | |
| Number of barriers in serpentine is N. Note, the minimum number of barriers to make a serpentine is 3. | N | 3 | | | |
| Roadway Width is RW= | RW | 26 | feet | | |
| From Figure 9, The spinout speed in a Serpentine with s spacing between barriers is $V_s$ = s/2 mph | $V_s$ | 40.3 | f/s | 27.5 | mph |
| Signs and Signals Safety System where required delay time = | t | 9 | sec | | |
| Acceleration of Threat Vehicle: a = | a | 11.3 | f/s/s | | |
| Deceleration of Threat Vehicle: $a_d$ = | $a_d$ | 24.1 | f/s/s | | |
| Distance from ID Check Point to end of last Turn-around: $D_{it}$ | $D_{it}$ | 90 | feet | | |
| Distance from ID Check Area to serpentine is $D_{is}$= | $D_{is}$ | 95 | feet | | |

| **Threat Scenarios #1 and #2:** | | | | | |
|---|---|---|---|---|---|
| For the high speed threat scenarios (TS #1&#2) with no advanced overspeed detection, the point of detection is the ID Check Point.<br>Path of the Threat Vehicle (TV) from the point of detection is as follows:<br>ID Check Point to beginning of the serpentine: $D_{is}$ | $D_{is}$ | | | | |
| Distance through serpentine: $D_s$ | $D_s$ | | | | |
| End of serpentine to final barriers: $D_{cb}$ | $D_{cb}$ | | | | |
| Given $D_{is}$ and $D_s$, determine required length of $D_{cb}$ to defeat threat.<br>Maximum speed of Threat Vehicle in the serpentine ($V_s$) from above | $V_s$ | 40.3 | f/s | | |
| $V_i$=maximum speed of threat vehicle at the ID Check Point to be able to decelerate to $V_s$ at beginning of curve = $(V_s^2+2*a_d*D_{is})^{1/2}$ | $V_i$ | 53.7 | mph | 78.8 | f/s |

| | | | | | |
|---|---|---|---|---|---|
| Time for TV to travel from ID Check Point (point of detection) to the serpentine is $T_{is}=(V_i-V_s)/a_d$ | $T_{is}$ | 1.6 | sec | | |
| Distance thru serpentine: $D_s=s*(N-1)$ | $D_s$ | 110 | feet | | |
| Time to go thru serpentine = $D_s/V_s$ | $t_s$ | 2.727 | sec | | |
| Additional time required to delay Threat Vehicle for Td seconds: tr = t-Tis-ts | $t_r$ | 4.7 | sec | | |
| Additional straight line distance required to delay Threat Vehicle for tr seconds: $D_{cb}=V_s*t_r+1/2*a*t_r^2$ | $D_{cb}$ | 312 | feet | | |
| Required distance between ID Check Point and the final barrier: $D_{ib}=D_{is}+D_s+D_{cb}$ | $D_{ib}$ | 517 | feet | | |

| | | | | | |
|---|---|---|---|---|---|
| **Threat Scenario #3:** | | | | | |
| In this Threat Scenario, The threat vehicle's initial speed at the point of detection (ID Check point) is $V_o$=0 mph, so this scenario is a less case than Threat Scenarios 1&2 above where $V_i$ is much higher. | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Threat Scenario #4:** | | | | | |
| In this Threat Scenario, the threat vehicle is detected at the end of the last Turn-around traveling at the ACP speed limit ($V_o$=25mph). | $V_o$ | 25 | mph | 36.7 | f/s |
| Since the guards have identified this vehicle as a possible threat, guard reaction time is reduced from 3 to 1 seconds and the overall delay time is reduced from 9 to 7 seconds. | t | 7 | sec | | |
| The time to go through the serpentine (ts) plus the time to go from the end of the serpentine to the final barriers (tr) is greater than the required time delay t, so Threat Scenario #4 is contained. | ts+tr | 7.4 | sec | | |

| | | | |
|---|---|---|---|
| **Summary** | | | |
| Distance between ID Check Point and serpentine, $D_{is}$= | $D_{is}$ | 95 | feet |
| Distance through serpentine, $D_s$ | $D_s$ | 110 | feet |
| Distance between end of Curve and barrier, $D_{cb}$= | $D_{cb}$ | 312 | feet |
| Distance between ID Check Point and barrier, $D_{ib}$= | $D_{ib}$ | 517 | feet |

| **Notes:** | |
|---|---|
| 1 | In order to reduce $D_{cb}$, the serpentine can be extended with additional barriers. See |
| 2 | A serpentine requires a two lane roadway to develop. The serpentine essentially reduces the two lane roadway to one lane. Designers must consider the effect of using serpentines on traffic volumes through the ACP. |

**Attachment 19**
**Example - Serpentine throughout the Response Zone, Signs and Signals Safety System**
**No Overspeed Detection**

| **Parameters of the ACP:** | | | | | |
|---|---|---|---|---|---|
| Serpentine in Response Zone with spacing between barriers of s = | s | 55 | feet | | |
| Determine N = the required number of barriers in the serpentine. Note, the minimum number of barriers to make a serpentine is 3. | N | ? | | | |
| Roadway Width is RW= | RW | 26 | feet | | |
| From Figure 9, the spinout speed in a Serpentine with s spacing between barriers is $V_s$ = s/2 | $V_s$ | 40.3 | f/s | 27.5 | mph |
| Signs and Signals Safety System where required delay time = | t | 9 | sec | | |
| Acceleration of Threat Vehicle: a = | a | 11.3 | f/s/s | | |
| Deceleration of Threat Vehicle: $a_d$ = | $a_d$ | 24.1 | f/s/s | | |
| Distance from ID Check Point to end of last Turn-around: $D_{it}$ | $D_{it}$ | 90 | feet | | |
| Distance from ID Check Area to serpentine is $D_{is}$= | $D_{is}$ | 100 | feet | | |

| **Threat Scenarios #1 and #2:** | | | | | |
|---|---|---|---|---|---|
| For the high speed threat scenarios (TS #1&#2) with no advanced overspeed detection, the point of detection is the ID Check Point. | | | | | |
| Path of the vehicle from the point of detection is as follows: | | | | | |
| ID Check Point to beginning of the serpentine: $D_{is}$ | $D_{is}$ | | | | |
| Distance through serpentine: $D_s$ | $D_s$ | | | | |
| End of curve to final barriers: $D_{cb}$ | $D_{cb}$ | | | | |
| | | | | | |
| Given $D_{ic}$ and $D_s$, determine required length of $D_{cb}$ to defeat threat. | | | | | |
| Maximum speed of Threat Vehicle in the serpentine ($V_s$) from above | $V_s$ | 40.3 | f/s | | |
| $V_i$=maximum speed of threat vehicle at the ID Check Point to be able to decelerate to $V_c$ at beginning of curve = $(V_s^2+2*a_d*D_{is})^{1/2}$ | $V_i$ | 54.7 | mph | 80.3 | f/s |
| Time for TV to travel from ID Check Point (point of detection) to the serpentine is $T_{is}=(V_i-V_s)/a_d$ | $T_{is}$ | 1.66 | sec | | |
| Determine additional delay time required, $t_a=t-T_{is}$ | $t_a$ | 7.34 | sec | | |

| | | | |
|---|---|---|---|
| Determine the approximate length of the serpentine required to get $t_a$ seconds of delay, $D_a=V_s*t_a$ | $D_a$ | 296 | feet |
| Determine the number of barriers required in the serpentine, N'=Da/s +1 | N' | 6.4 | |
| Use N = | N | 6 | |
| Determine actual length of serpentine, $D_s=(N-1)*s$ | Ds | 275 | feet |
| Time for TV to travel through serpentine is $t_s=D_s/V_s$ | $t_s$ | 6.82 | sec |
| Additional straight line distance between the last serpentine barrier and the final active barrier must a minimum of s feet. $D_{sb}$= | $D_{sb}$ | 55 | feet |
| Time for TV to travel distance $D_{sb}$ is $T_{sb}=(-V_s+(V_s^2+2*a*D_{sb})^{1/2})/a$ | $T_{sb}$ | 1.17 | sec |
| Total time delay is $T_d=T_{is}+t_s+T_{sb}$ | $T_d$ | 10.2 | sec |

| **Threat Scenario #3:** |
|---|
| In this Threat Scenario, The threat vehicle's initial speed at the point of detection (ID Check point) is $V_o$=0 mph, so this scenario is a less case than Threat Scenarios 1&2 above where $V_i$ is much higher. |

| **Threat Scenario #4:** | | | | | |
|---|---|---|---|---|---|
| In this Threat Scenario, the threat vehicle is detected at the end of the last Turn-around traveling at the ACP speed limit (Vo=25mph). | $V_o$ | 25 | mph | 0 | f/s |
| Since the guards have identified this vehicle as a possible threat, guard reaction time is reduced from 3 to 1 seconds and the overall delay time is reduced from 9 to 7 seconds. | t | 7 | sec | | |
| The time delay through the Serpentine is $t_s$ = | $t_s$ | 6.82 | sec | | |
| Time from last serpentine barrier to final active barrier, $T_{sb}$ = | $T_{sb}$ | 1.17 | sec | | |
| Since $t_s+T_{sb}$>than the required time delay of 7 seconds, TS#4 will be contained by the serpentine calculated for TS's 1&2 above. | | | | | |

| Summary | | | |
|---|---|---|---|
| Distance between ID Check Point and Serpentine, $D_{is}$ = | $D_{is}$ | 100 | feet |
| Number of passive barriers in the Serpentine is N= | N | 6 | |
| Distance through serpentine is $D_s$= | $D_s$ | 275 | feet |
| Distance from last serpentine barrier to final active barrier is $D_{sb}$ | $D_{sb}$ | 55 | feet |
| Distance from ID Check Point to final barriers is $D_{ib}=D_{is}+D_s+D_{sb}$ | $D_{ib}$ | 430 | feet |

# APPENDIX E

# COST ESTIMATES

**Note: Costs reflect Contract Cost, mid point of construction Sep 2009, and area cost factor of 1.0**

ACP Parameters - Estimate below is based on Dwg C3.02 of the Army ACP Standard Design/Criteria. See the Standard Design/Criteria for complete design requirements and procedures. The approach zone and response zone distances are based on two point over speed detectors and 2 zones of continuous over speed detection.

| | | | | |
|---|---|---|---|---|
| ACP Corridor - Length = Dacp | 1,650 | feet | | |
| Approach Zone (AZ)- feet | 690 | feet | Pavement Width in feet - | 48 |
| Access Control Zone (ACZ) - feet | 165 | feet | Pavement Width in feet - | 48 |
| Response Zone (RZ) - feet | 795 | feet | Pavement Width in feet - | 48 |

Median between inbound & outbound lanes varies from 24' to 8' near final barriers.

| | | |
|---|---|---|
| Roadway Perimeter = 4*(AZ+ACZ+RZ) | 6,600 | feet |
| Roadway Area = (AZ+ACZ+RZ)*Width | 79,200 | sq-ft |
| Number of Inbound Lanes | 2 | |
| Number of Outbound Lanes | 2 | |

One Gatehouse, two Guard Booths, and one Pedestrian Guard Booth per Dwgs A1.05 and A1.09.

One Visitors Control Center per Dwg A1.01 (3 processor)

| | | |
|---|---|---|
| Parking Area - (140'*66') | 9,300 | sq-ft |
| Parking Perimeter = 2*(140'+66') | 412 | feet |

One Search Building per Dwg A1.07.

| | | | |
|---|---|---|---|
| VCC & Search Area Roads - | 220 | feet | 12 Width - feet |
| Area - | 2,640 | sq-ft | |
| Perimeter - | 440 | feet | |
| Active Vehicle Barriers (AVB) | 4 | ea | |

Point Speed Detection in Inbound and Outbound Lanes at 1650 feet in front of AVBs.

Two zone Continuous Speed Detection on both Inbound Lanes in Approach & Access Control Zones.

Wrong-way Detection at two locations in both Outbound Lanes.

| | Description | Quantity | Unit | Per Unit Price | Total Price | | |
|---|---|---|---|---|---|---|---|
| Buildings | | | | | | | |
| | Gatehouse - 50'-4"x16'-8" See Dwg A1.05 | 840 | sq-ft | $428.18 | $359,670 | | |
| | Guard Booth - Prefab, See Dwg A1.09 | 2 | ea | $50,000.00 | $100,000 | | |
| | Guard Booth Pedestrian - See Dwg A1.09 | 1 | ea | $70,000.00 | $70,000 | | |
| | Overwatch Position - See Dwg A1.09 | 1 | ea | $50,000.00 | $50,000 | | |
| | Visitors Control Center 3 processor - 40' x 62', See Dwg A1.01 | 2,480 | sq-ft | $273.74 | $678,878 | Note 8 | |
| | Visitors Control Center 3 processor - 40' x 62', hardened for 50' standoff. | 2,480 | sq-ft | $293.89 | | Note 8 | |
| | Visitors Control Center 6 processor - 40' x 74', See Dwg A1.03 | 2,960 | sq-ft | $260.65 | | Note 8 | |
| | Visitors Control Center 6 processor - 40' x 74', hardened for 50' standoff. | 2,960 | sq-ft | $280.65 | | Note 8 | |
| | Search Building with Pkg Scanner & Metal Detector - 30'x40', See Dwg A1.07 | 1,200 | sq-ft | $304.00 | $364,800 | Note 1 | |
| | Search Building w/o Pkg Scanner & Metal Detector - 25'x26', See Dwg A1.08 | 650 | sq ft | $304.00 | | Note 1 | |
| | I.D. Check Area Canopy - 64'x69', See Dwg A1.10 | 4,416 | sq-ft | $100.26 | $442,738 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Search Area Canopy - Passenger Vehicles - 24'x60', See Dwg A1.11 | 1,440 | sq-ft | $89.04 | $128,212 | | |
| | Search Area Canopy - Trucks - 26'x80', See Dwg A1.11 | 2,080 | sq-ft | $80.11 | $166,639 | | |
| Equipment | | | | | | | |
| | Active Vehicle Barrier w EFO - NO Operation | 4 | ea | $79,000.00 | $316,000 | Note 2 | |
| | Active Vehicle Barrier w/o EFO - NC Operation | | | $73,500.00 | | Note 3 | |
| | Crash Beam Barrier w EFO - NO Operation | | | $63,000.00 | | Note 2 | |
| | Crash Beam Barrier w/o EFO - NC Operation | | | $52,500.00 | | Note 3 | |
| | Active Vehicle Barrier Control System (AVBCS) - includes Traffic Controller Unit, Barrier Control Panels, Vehicle presence detectors, & UPS | 1 | ea | $70k + $10k * Barrier + $10k * Guard Booth | $110,000.00 | | |
| | Traffic signals | 1 | lump sum | $70,000.00 | $70,000.00 | Note 4 | |
| | Electronic Security System (ESS) - includes PLC/CPU, GH Control Console, Alarm Panels, IDS, Duress, Tamper, & Event Recorder | 1 | ea | $53k+$5k * Barrier+5k*guard booths & overwatch | $93,000.00 | Note 7 | |
| | CCTV | 1 | ea | $120,000.00 | $120,000 | | |
| | Point Overspeed Detection in both Inbound and Outbound Lanes | | | $5k+$3K * (Lin + Lout) | $17,000.00 | | |
| | Wrong-way Detection in 2 locations (loc) on Outbound Lanes | 2 | loc | $5k+$3K * loc * Lout | $17,000.00 | | |
| | Continuous Overspeed Detection - One Zone | | | $10k+$10k*Lin | $30,000.00 | Note 5 | |
| | Continuous Overspeed Detection - Two Zones | | | $10k+$21k*Lin | | Note 5 | |
| | Crash Beam Barrier w Rem Controls (Corridor) | 0 | ea | $63,000.00 | $0 | Note 6 | |
| | Fence Gate - non-crash rated (per leaf) | 4 | ea | $1,800.00 | $7,200 | | |
| | Traffic Arms | 2 | ea | $8,400.00 | $16,800 | | |
| | Diesel Generator & Swgr | 1 | ea | $83,263.00 | $83,263 | | |
| Sitework | | | | | | | |
| | FE 6 fence | 0 | lf | $50.00 | $0 | | |
| | Passive cable barriers along corridor (K4 rated triple cable system) and FE-6 fence (Length is 2*Dacp + extra length around search area - length of higher capacity barriers.) | 2,400 | lf | $175.00 | $420,000 | | |
| | Passive Barriers along Corridor (K8 vehicle rated fence w/dual cables) | 800 | lf | $228.00 | $182,400 | | |
| | FE6 fence with 2 each 3/4" cables with deadmen (based on 200 foot spacing between deadmen) | 0 | lf | $158.00 | $0 | | |
| | K12 concrete barrier w/FE 6 fence | 0 | lf | $608.00 | $0 | | |
| | K12 cable vehicle barrier system w/FE 6 fence | 0 | lf | $350.00 | $0 | | |
| | Elec Power, conduit, and communications | 1 | lot | $139,125.00 | $139,125 | | |
| | Exterior Lighting along Roadway Perimeters | 2,502 | lf | $95.00 | $237,690 | | |
| | Barrier Overwatch Pad & Jct Box | 0 | ea | $5,600.00 | $0 | | |
| | Guard Booth Crash Barrier | 2 | ea | $4,860.00 | $9,720 | | |
| | Landscaping | 1 | ls | $5,570.00 | $5,570 | | |
| | Obscuration screening | 90 | lf | $34.00 | $3,060 | | |
| Roadwork | | | | | | | |
| | Pavement - Roadways in AZ+ACZ+RZ | 79,200 | sq-ft | $18.00 | $1,425,600 | | |
| | Pavement - VCC Parking Area | 9,300 | sq-ft | $18.00 | $167,400 | | |
| | Pavement - VCC & Search Area Roadways | 2,640 | sq-ft | $18.00 | $47,520 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Curb and gutter - (Roadway & Parking Perimeters) | 7,452 | lf | $28.00 | $208,656 | | |
| | Pavement - 4' wide sidewalk (lf) | 1,650 | lf | $13.00 | $21,450 | | |
| | Signs & Pavement Markings (ls) | | | $3.5k + $2.5k * (Lin+Lout) | $13,500 | | |
| | Raised Island for Guard Booth | 1 | ea | $5,570.00 | $5,570 | | |
| | | | | | | | |
| | | | | Total Cost | $6,128,460 | | |

Notes:

1 Select appropriate type of search building; typically there is only one search building per ACP.

2 Active Barrier for normally open operation, e.g., SDDC's Signs and Signals or Presence Detection Safety Systems. Capable of blocking one traffic lane.

3 Active Barrier for normally closed operation, e.g., SDDC's Normally Closed Safety System. Capable of blocking one traffic lane.

4 Traffic signals based on 4 lanes, no intersection (as shown on dwg C3.02). Two poles w/arms and three signal heads each (two on the arms and one on each pole). The controller cost is included with the AVB control system.

5 Select no, one, or two zones of continuous overspeed detection.

6 Corridor barriers are remotely operated from Gatehouse and do not have an EFO mode. They can be used for access to limited use areas from the ACP corridor (e.g., utility access roadway).

7 When interfacing ACP alarms with the Installation's Central Security Monitoring System, include interface costs only and eliminate cost for a seperate ESS PLC/CPU.

8 If required, select appropriate size of VCC and VCC parking area based on expected visitor requirements.

# APPENDIX F

# ELECTRICAL LOADS

## APPENDIX F

## ELECTRICAL DATA

| LOCATION | DESCRIPTION | SECTION OF "ACP CRITERIA FROM OPMG" | UTILITY | EMER GEN | UPS | QTY | VOLT AMPS | Utility Connected | DEMAND | Utility Demand |
|---|---|---|---|---|---|---|---|---|---|---|
| APPROACH ZONE | UPPER APPROACH ZONE LIGHTING FIXTURE | 22.a | YES | YES | | 4 | 460 | 1,840 | YES | 1,840 |
| APPROACH ZONE | UPPER APPROACH ZONE LIGHTING FIXTURE | 22.a | YES | YES | | 10 | 288 | 2,880 | YES | 2,880 |
| APPROACH ZONE | UPPER APPROACH ZONE SPEED DETECTION | 28.g.4 | YES | YES | YES | 1 | 1,200 | 1,200 | YES | 1,200 |
| APPROACH ZONE | UPPER APPROACH ZONE WRONG WAY DETECTION | 28.g.4 | YES | YES | YES | 1 | 1,200 | 1,200 | YES | 1,200 |
| SECONDARY ISLAND | | | YES | YES | YES | 1 | 1,200 | 1,200 | YES | 1,200 |
| SECONDARY ISLAND | OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| SECONDARY ISLAND | LANE-2 LEFT OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| SECONDARY ISLAND | LANE-3 LEFT OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| SECONDARY ISLAND | LANE-4 LEFT OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| SECONDARY ISLAND | OVERHEIGHT DETECTION | 29.d | YES | YES | | 1 | 240 | 240 | YES | 240 |
| ACCESS CONTROL ZONE | CAMERA - LANE 1 DRIVER, VEHICLE, AND GUARD | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - LANE 1 LICENSE | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - LANE 2 DRIVER, VEHICLE, AND GUARD | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - LANE 2 LICENSE | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - LANE 3 DRIVER, VEHICLE, AND GUARD | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - LANE 3 LICENSE | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - LANE 4 DRIVER, VEHICLE, AND GUARD | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - LANE 4 LICENSE | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - PEDESTRIAN AND GUARD | K9 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | CAMERA - UPPER APPROACH ZONE | 23 | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| ACCESS CONTROL ZONE | GUARD BOOTH-1 COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| ACCESS CONTROL ZONE | GUARD BOOTH-1 EXTERIOR RECEPTACLE | 14.c | YES | YES | | 2 | 600 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-1 GENERAL RECEPTACLE | 14.d | YES | YES | | 2 | 180 | 360 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-1 HVAC | 14.b | YES | YES | | 1 | 93 | 93 | YES | 93 |

| LOCATION | DESCRIPTION | SECTION OF "ACP CRITERIA FROM OPMG" | UTILITY | EMER GEN | UPS | QTY | VOLT AMPS | Utility Connected | DEMAND | Utility Demand |
|---|---|---|---|---|---|---|---|---|---|---|
| ACCESS CONTROL ZONE | GUARD BOOTH-1 INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 240 | 240 | YES | 240 |
| ACCESS CONTROL ZONE | GUARD BOOTH-1 LIGHTING FIXTURE | 14 | YES | YES | | 1 | 73.6 | 74 | YES | 74 |
| ACCESS CONTROL ZONE | GUARD BOOTH-2 COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| ACCESS CONTROL ZONE | GUARD BOOTH-2 EXTERIOR RECEPTACLE | 14.c | YES | YES | | 2 | 600 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-2 GENERAL RECEPTACLE | 14.d | YES | YES | | 2 | 180 | 360 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-2 HVAC | 14.b | YES | YES | | 1 | 93 | 93 | YES | 93 |
| ACCESS CONTROL ZONE | GUARD BOOTH-2 INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 240 | 240 | YES | 240 |
| ACCESS CONTROL ZONE | GUARD BOOTH-2 LIGHTING FIXTURE | 14 | YES | YES | | 1 | 73.6 | 74 | YES | 74 |
| ACCESS CONTROL ZONE | GUARD BOOTH-3 COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| ACCESS CONTROL ZONE | GUARD BOOTH-3 EXTERIOR RECEPTACLE | 14.c | YES | YES | | 2 | 600 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-3 GENERAL RECEPTACLE | 14.d | YES | YES | | 2 | 180 | 360 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-3 HVAC | 14.b | YES | YES | | 1 | 93 | 93 | YES | 93 |
| ACCESS CONTROL ZONE | GUARD BOOTH-3 INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 240 | 240 | YES | 240 |
| ACCESS CONTROL ZONE | GUARD BOOTH-3 LIGHTING FIXTURE | 14 | YES | YES | | 1 | 73.6 | 74 | YES | 74 |
| ACCESS CONTROL ZONE | GUARD BOOTH-4 COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| ACCESS CONTROL ZONE | GUARD BOOTH-4 EXTERIOR RECEPTACLE | 14.c | YES | YES | | 2 | 600 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-4 GENERAL RECEPTACLE | 14.d | YES | YES | | 2 | 180 | 360 | | 0 |
| ACCESS CONTROL ZONE | GUARD BOOTH-4 HVAC | 14.b | YES | YES | | 1 | 93 | 93 | YES | 93 |
| ACCESS CONTROL ZONE | GUARD BOOTH-4 INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 240 | 240 | YES | 240 |
| ACCESS CONTROL ZONE | GUARD BOOTH-4 LIGHTING FIXTURE | 14 | YES | YES | | 1 | 73.6 | 74 | YES | 74 |
| ACCESS CONTROL ZONE | ID CHECK AREA CANOPY LIGHTING FIXTURE | 22b | YES | YES | | 22 | 250 | 5,500 | YES | 5,500 |
| ACCESS CONTROL ZONE | LANE-1 RIGHT OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | LANE-1 TRAFFIC ARM | 29.a | YES | YES | YES | 1 | 760 | 760 | | 0 |
| ACCESS CONTROL ZONE | LANE-2 RIGHT OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | LANE-2 TRAFFIC ARM | 29.a | YES | YES | YES | 1 | 760 | 760 | | 0 |
| ACCESS CONTROL ZONE | LANE-3 RIGHT OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | LANE-3 TRAFFIC ARM | 29.a | YES | YES | YES | 1 | 760 | 760 | | 0 |
| ACCESS CONTROL ZONE | LANE-4 RIGHT OVERHEIGHT SIGN | 29.d | YES | YES | | 1 | 1,200 | 1,200 | | 0 |

| LOCATION | DESCRIPTION | SECTION OF "ACP CRITERIA FROM OPMG" | UTILITY | EMER GEN | UPS | QTY | VOLT AMPS | Utility Connected | DEMAND | Utility Demand |
|---|---|---|---|---|---|---|---|---|---|---|
| ACCESS CONTROL ZONE | LANE-4 TRAFFIC ARM | 29.a | YES | YES | YES | 1 | 760 | 760 | | 0 |
| ACCESS CONTROL ZONE | PEDESTRIAN GUARD BOOTH COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| ACCESS CONTROL ZONE | PEDESTRIAN GUARD BOOTH EXTERIOR RECEPTACLE | 14.c | YES | YES | | 2 | 600 | 1,200 | | 0 |
| ACCESS CONTROL ZONE | PEDESTRIAN GUARD BOOTH GENERAL RECEPTACLE | 14.d | YES | YES | | 2 | 180 | 360 | | 0 |
| ACCESS CONTROL ZONE | PEDESTRIAN GUARD BOOTH HVAC | 14.b | YES | YES | | 1 | 541 | 541 | YES | 541 |
| ACCESS CONTROL ZONE | PEDESTRIAN GUARD BOOTH INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 240 | 240 | YES | 240 |
| ACCESS CONTROL ZONE | PEDESTRIAN GUARD BOOTH LIGHTING FIXTURE | 14 | YES | YES | | 3 | 73.6 | 221 | YES | 221 |
| ACCESS CONTROL ZONE | UPPER ACCESS CONTROL ZONE LIGHTING FIXTURES | 22.b | YES | YES | | 7 | 460 | 3,220 | YES | 3,220 |
| ACCESS CONTROL ZONE | UPPER ACCESS CONTROL ZONE LIGHTING FIXTURES | 22.b | YES | YES | | 3 | 288 | 864 | YES | 864 |
| GATEHOUSE | ACTIVE BARRIER CONTROL PANEL | 20.f | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | CAMERA - ID CHECK AREA | 23.b | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| GATEHOUSE | GATEHOUSE CCTV DIGITAL VIDEO RECORDER | 23.e&f | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | GATEHOUSE CCTV MONITOR | 23.e&f | YES | YES | YES | 2 | 216 | 432 | YES | 432 |
| GATEHOUSE | GATEHOUSE CCTV MULTIPLEXER | 23.e&f | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | GATEHOUSE CCTV SWITCH | 23.e&f | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | GATEHOUSE COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| GATEHOUSE | GATEHOUSE COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| GATEHOUSE | GATEHOUSE DURESS CONTROL PANEL | 20.f | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | GATEHOUSE EXTERIOR RECEPTACLES | 13.g | YES | YES | | 1 | 600 | 600 | | 0 |
| GATEHOUSE | GATEHOUSE EXTERIOR RECEPTACLES | 13.g | YES | YES | | 1 | 600 | 600 | | 0 |
| GATEHOUSE | GATEHOUSE EXTERIOR RECEPTACLES | 13.g | YES | YES | | 1 | 600 | 600 | | 0 |
| GATEHOUSE | GATEHOUSE EXTERIOR RECEPTACLES | 13.g | YES | YES | | 1 | 600 | 600 | | 0 |
| GATEHOUSE | GATEHOUSE GENERAL RECEPTACLES | 13.h | YES | YES | | 3 | 180 | 540 | | 0 |
| GATEHOUSE | GATEHOUSE GENERAL RECEPTACLES | 13.h | YES | YES | | 3 | 180 | 540 | | 0 |

| LOCATION | DESCRIPTION | SECTION OF "ACP CRITERIA FROM OPMG" | UTILITY | EMER GEN | UPS | QTY | VOLT AMPS | Utility Connected | DEMAND | Utility Demand |
|---|---|---|---|---|---|---|---|---|---|---|
| GATEHOUSE | GATEHOUSE HAND DRYER | | YES | YES | | 1 | 1,200 | 1,200 | YES | 1,200 |
| GATEHOUSE | GATEHOUSE HVAC | 13.b | YES | YES | | 1 | 2,400 | 2,400 | YES | 2,400 |
| GATEHOUSE | GATEHOUSE INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | GATEHOUSE LIGHTING FIXTURE | 13 | YES | YES | | 11 | 73.6 | 810 | YES | 810 |
| GATEHOUSE | GATEHOUSE EXTERIOR LIGHTING | 13 | YES | YES | | 1 | 300 | 300 | YES | 300 |
| GATEHOUSE | GATEHOUSE FIRE ALARM PANEL | | YES | YES | | 1 | 400 | 400 | YES | 400 |
| GATEHOUSE | GATEHOUSE OVERHEIGHT CONTROL PANEL | 29 | YES | YES | | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | GATEHOUSE SPEED CONTROL PANEL | | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| GATEHOUSE | GATEHOUSE WATER COOLER | 13.c | YES | YES | | 1 | 325 | 325 | YES | 325 |
| GATEHOUSE | GATEHOUSE WRONG WAY CONTROL PANEL | | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| EMER GENERATOR | EMER GEN LUBE & COOLANT HEATERS | | YES | YES | | 2 | 500 | 1,000 | YES | 1,000 |
| RESPONSE ZONE AND FINAL BARRIER | ACTIVE BARRIER-1 | 20.a | YES | YES | YES | 1 | 3,640 | 3,640 | | 0 |
| RESPONSE ZONE AND FINAL BARRIER | ACTIVE BARRIER-2 | 20.a | YES | YES | YES | 1 | 3,640 | 3,640 | | 0 |
| RESPONSE ZONE AND FINAL BARRIER | ACTIVE BARRIER-3 | 20.a | YES | YES | YES | 1 | 3,640 | 3,640 | | 0 |
| RESPONSE ZONE AND FINAL BARRIER | ACTIVE BARRIER-4 | 20.a | YES | YES | YES | 1 | 3,640 | 3,640 | | 0 |
| RESPONSE ZONE AND FINAL BARRIER | AVB CONTROL UNIT HEATERS | | YES | YES | | 2 | 2,000 | 4,000 | YES | 4,000 |
| RESPONSE ZONE AND FINAL BARRIER | CAMERA - ACTIVE BARRIERS AND OVERWATCH | 23.a | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| RESPONSE ZONE AND FINAL BARRIER | UPPER RESPONSE ZONE AND BARRIER LIGHTING FIXTURE | 22.a | YES | YES | | 5 | 460 | 2,300 | YES | 2,300 |
| RESPONSE ZONE AND FINAL BARRIER | UPPER RESPONSE ZONE AND BARRIER LIGHTING FIXTURE | 22.a | YES | YES | | 6 | 288 | 1,728 | YES | 1,728 |
| RESPONSE ZONE AND FINAL BARRIER | UPPER RESPONSE ZONE SIGN | 20.f | YES | YES | YES | 2 | 1200 | 2,400 | | 0 |
| RESPONSE ZONE AND FINAL BARRIER | UPPER RESPONSE ZONE TRAFFIC ARM | 29.a | YES | YES | YES | 2 | 760 | 1,520 | | 0 |
| OVERWATCH POSITION | OVERWATCH BUILDING COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| OVERWATCH POSITION | OVERWATCH BUILDING GENERAL RECEPTACLES | 18.a.3 | YES | YES | | 4 | 180 | 720 | | 0 |
| OVERWATCH POSITION | OVERWATCH BUILDING HVAC | 18.a.2 | YES | YES | | 1 | 434 | 434 | YES | 434 |
| OVERWATCH POSITION | OVERWATCH BUILDING INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 240 | 240 | YES | 240 |

| LOCATION | DESCRIPTION | SECTION OF "ACP CRITERIA FROM OPMG" | UTILITY | EMER GEN | UPS | QTY | VOLT AMPS | Utility Connected | DEMAND | Utility Demand |
|---|---|---|---|---|---|---|---|---|---|---|
| OVERWATCH POSITION | OVERWATCH BUILDING LIGHTING FIXTURE | 18 | YES | YES | | 3 | 73.6 | 221 | YES | 221 |
| VISITOR CONTROL CENTER | LIGHTING FIXTURE | 21 | YES | YES | | 3 | 288 | 864 | YES | 864 |
| VISITOR CONTROL CENTER | LIGHTING FIXTURE | 21 | YES | YES | | 4 | 460 | 1,840 | YES | 1,840 |
| VISITOR CONTROL CENTER | VCC COFFEE MAKER | | YES | YES | | 1 | 1680 | 1,680 | YES | 1,680 |
| VISITOR CONTROL CENTER | VCC COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| VISITOR CONTROL CENTER | VCC COMPUTER | 25 | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| VISITOR CONTROL CENTER | VCC COMPUTER | 21.d | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| VISITOR CONTROL CENTER | VCC COMPUTER | 21.d | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| VISITOR CONTROL CENTER | CAMERA - WAITING AREA | | YES | YES | YES | 2 | 70 | 140 | YES | 140 |
| VISITOR CONTROL CENTER | CAMERA - PROCESSING AREA | | YES | YES | YES | 2 | 70 | 140 | YES | 140 |
| VISITOR CONTROL CENTER | CAMERA - PARKING AREA | | YES | YES | YES | 2 | 70 | 140 | YES | 140 |
| VISITOR CONTROL CENTER | VCC EXTERIOR RECEPTACLE | 21 | YES | YES | | 1 | 600 | 600 | | 0 |
| VISITOR CONTROL CENTER | VCC GENERAL RECEPTACLES | 21 | YES | YES | | 3 | 180 | 540 | | 0 |
| VISITOR CONTROL CENTER | VCC GENERAL RECEPTACLES | 21 | YES | YES | | 3 | 180 | 540 | | 0 |
| VISITOR CONTROL CENTER | VCC GENERAL RECEPTACLES | 21 | YES | YES | | 3 | 180 | 540 | | 0 |
| VISITOR CONTROL CENTER | VCC GENERAL RECEPTACLES | 21 | YES | YES | | 3 | 180 | 540 | | 0 |
| VISITOR CONTROL CENTER | VCC GENERAL RECEPTACLES | 21 | YES | YES | | 3 | 180 | 540 | | 0 |
| VISITOR CONTROL CENTER | VCC GENERAL RECEPTACLES | 21 | YES | YES | | 3 | 180 | 540 | | 0 |
| VISITOR CONTROL CENTER | VCC HAND DRYER | | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| VISITOR CONTROL CENTER | VCC HAND DRYER | | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| VISITOR CONTROL CENTER | VCC HAND DRYER | | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| VISITOR CONTROL CENTER | VCC HVAC | 21 | YES | YES | | 1 | 4652 | 4,652 | YES | 4,652 |
| VISITOR CONTROL CENTER | VCC INTRUSION DETECTION PANEL | 26.b | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| VISITOR CONTROL CENTER | VCC LIGHTING FIXTURE | | YES | YES | | 27 | 73.6 | 1,987 | YES | 1,987 |
| VISITOR CONTROL CENTER | VCC MICROWAVE OVEN | | YES | YES | | 1 | 1550 | 1,550 | | 0 |
| VISITOR CONTROL CENTER | VCC REFRIGERATOR | | YES | YES | | 1 | 528 | 528 | YES | 528 |
| VISITOR CONTROL CENTER | VCC WATER COOLER | 21.g | YES | YES | | 1 | 325 | 325 | YES | 325 |

| LOCATION | DESCRIPTION | SECTION OF "ACP CRITERIA FROM OPMG" | UTILITY | EMER GEN | UPS | QTY | VOLT AMPS | Utility Connected | DEMAND | Utility Demand |
|---|---|---|---|---|---|---|---|---|---|---|
| SEARCH AREA AND OFFICE | CAMERA - GUARD, DRIVER, AND VEHICLE OF POV SEARCH | 23.a&c | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| SEARCH AREA AND OFFICE | CAMERA - SEARCH | 23.a&c | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| SEARCH AREA AND OFFICE | LIGHTING FIXTURE | 22.b | YES | YES | | 16 | 288 | 4,608 | YES | 4,608 |
| SEARCH AREA AND OFFICE | LIGHTING FIXTURE | 22.b | YES | YES | | 1 | 460 | 460 | YES | 460 |
| SEARCH AREA AND OFFICE | POV SEARCH TRAFFIC ARM | | YES | YES | YES | 1 | 760 | 760 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH AREA CANOPY LIGHTING FIXTURE | 22.b | YES | YES | | 45 | 250 | 11,250 | YES | 11,250 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE ACCESS CONTROL CONTROL PANEL | 22.b | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE COFFEE MAKER | | YES | YES | | 1 | 1,680 | 1,680 | YES | 1,680 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE COMPUTER | 17.m | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE COMPUTER | 17.m | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE COMPUTER | 17.m | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE COMPUTER | 17.h | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE COMPUTER | 17.h | YES | YES | YES | 1 | 816 | 816 | YES | 816 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE GENERAL RECEPTACLES | 17.i | YES | YES | | 3 | 180 | 540 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE GENERAL RECEPTACLES | 17.i | YES | YES | | 3 | 180 | 540 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE GENERAL RECEPTACLES | 17.i | YES | YES | | 3 | 180 | 540 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE GENERAL RECEPTACLES | 17.i | YES | YES | | 3 | 180 | 540 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE GENERAL RECEPTACLES | 17.i | YES | YES | | 3 | 180 | 540 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE GENERAL RECEPTACLES | 17.i | YES | YES | | 3 | 180 | 540 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE HAND DRYER | | YES | YES | | 1 | 1,200 | 1,200 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE HVAC | 17.a | YES | YES | | 1 | 4,652 | 4,652 | YES | 4,652 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE LIGHTING FIXTURE | 17 | YES | YES | | 27 | 73.6 | 1,987 | YES | 1,987 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE METAL DETECTOR | 17.k | YES | YES | | 1 | 600 | 600 | | 0 |

| LOCATION | DESCRIPTION | SECTION OF "ACP CRITERIA FROM OPMG" | UTILITY | EMER GEN | UPS | QTY | VOLT AMPS | Utility Connected | DEMAND | Utility Demand |
|---|---|---|---|---|---|---|---|---|---|---|
| SEARCH AREA AND OFFICE | SEARCH OFFICE MIRCOWAVE OVEN | 17.g | YES | YES | | 1 | 1550 | 1,550 | | 0 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE REFRIGERATOR | 17.G | YES | YES | | 1 | 528 | 528 | YES | 528 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE TAMPER SWITCH CONTROL PANEL | | YES | YES | YES | 1 | 600 | 600 | YES | 600 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE WATER COOLER | 17.g | YES | YES | | 1 | 325 | 325 | YES | 325 |
| SEARCH AREA AND OFFICE | SEARCH OFFICE X RAY | 17.K | YES | YES | | 1 | 600 | 600 | | 0 |
| COMMERCIAL VEHICLE SEARCH AREA | CAMERA - GUARD, DRIVER, & VEHICLE OF TRUCK SEARCH | 23.a&c | YES | YES | YES | 1 | 70 | 70 | YES | 70 |
| COMMERCIAL VEHICLE SEARCH AREA | LIGHTING FIXTURE | 22.b&c | YES | YES | | 9 | 288 | 2,592 | YES | 2,592 |
| COMMERCIAL VEHICLE SEARCH AREA | LIGHTING FIXTURE | 22.b&c | YES | YES | | 11 | 460 | 5,060 | YES | 5,060 |
| COMMERCIAL VEHICLE SEARCH AREA | TRUCK SEARCH TRAFFIC ARM | 29 | YES | YES | YES | 1 | 760 | 760 | | 0 |
| CARGO AND VEHICLE INSPECTION SYSTEM AREA | CARGO AND VEHICLE INSPECTION SYSTEM | | YES | | | 1 | 100,000 | 100,000 | YES | 100,000 |
| | | | | | | | Total | 264,942 | | 204,122 |

| UTILITY/GENERATOR/UPS | TOTAL CONNECTED VA | TOTAL DEMAND VA |
|---|---|---|
| UTILITY | 264,942 | 204,122 |
| GENERATOR | 164,942 | 104,122 |
| UPS | 50,454 | 27,414 |

Note: The above totals do not include spare capacity for future expansion.

# APPENDIX G

# PRESENCE DETECTION SAFETY SCHEME

## Symbols for Traffic Control Layouts

Note: Sheets show a typical 4-lane divided roadway on a straight section. Similar controls would exist for a two-lane, two-way roadway. In the 4-lane divided examples, median and shoulder guardrail or longitudinal barriers are assumed to be in place (not shown). The primary objective is to show traffic control devices on a conceptual layout.

In all situations, lane barrier curbs exist instead of pavement markings shown. The detailed sheet shows a 3 lane inbound roadway with the barrier islands. Roadway islands need to separate lanes for security, control, barrier signal operations, and placement of signs, signals, and beam sensors. Under roadway drainage must be designed with the roadway islands.

or — Symbol for barrier to deploy up from lane or across roadway.

— Red In-Roadway Lights that flash red when barrier is activated. For use when barriers do not contain lights at activation.

— Red zone quadrupole inductive loop detector (6’ X L’), with L being 6 feet beyond Stop line to 4 feet in advance of active barrier that provides input to the lane barrier signal operation.

— Queue quadrupole loop detector (6’ X 20’) about 80 feet inbound from checkpoint to provide lane barrier signal preemption capability for a preset time to clear the pocket of secured vehicles between the queue loop detector and signal Stop line.

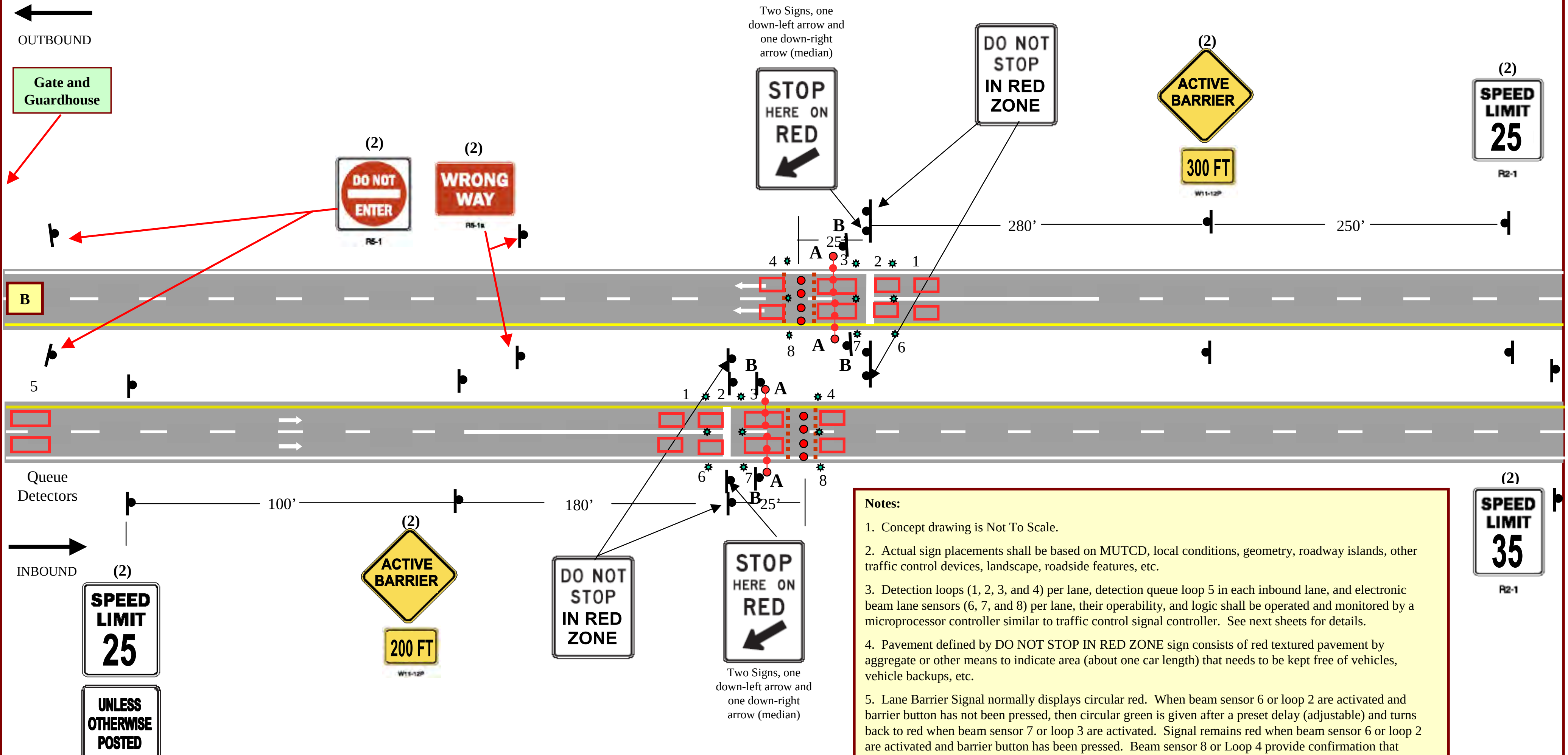
— One or more induction loop detectors that provide input to the microprocessor controller for lane barrier signal operations for the following functions: (1) One or more loops extending back from Stop line that detect presence of vehicles at or near Stop line, and (2) loop that provides input confirmation that vehicle has cleared the active barrier.

— Post mounted sign on shoulder, lane island, or in median.

— Traffic Gate Arm in the down horizontal position with flashing red lights when barrier deployment command has been initiated by guard pressing a button or by other automated means.

— Electronic beam lane sensors that provide input to the lane barrier signal operation for low metal-mass vehicles such as scooters, motorcycles, mopeds and bicycles.

# SDDCTEA Recommended Concept Plan for Lane Barrier Signal Operation (Limited Real Estate Response Zone)




**B –** Logic, Video, and other Detection methods and alarms are available to detect a vehicle traveling the wrong direction (in on out-bound side) with automatic traffic control devices response such as vertically aligned, red beacons (not shown above) start alternating flash on the DO NOT ENTER and WRONG WAY signs prior to outbound barriers being fully deployed from guard response.

**Notes:**

1. Concept drawing is Not To Scale.
2. Actual sign placements shall be based on MUTCD, local conditions, geometry, roadway islands, other traffic control devices, landscape, roadside features, etc.
3. Detection loops (1, 2, 3, and 4) per lane, detection queue loop 5 in each inbound lane, and electronic beam lane sensors (6, 7, and 8) per lane, their operability, and logic shall be operated and monitored by a microprocessor controller similar to traffic control signal controller. See next sheets for details.
4. Pavement defined by DO NOT STOP IN RED ZONE sign consists of red textured pavement by aggregate or other means to indicate area (about one car length) that needs to be kept free of vehicles, vehicle backups, etc.
5. Lane Barrier Signal normally displays circular red. When beam sensor 6 or loop 2 are activated and barrier button has not been pressed, then circular green is given after a preset delay (adjustable) and turns back to red when beam sensor 7 or loop 3 are activated. Signal remains red when beam sensor 6 or loop 2 are activated and barrier button has been pressed. Beam sensor 8 or Loop 4 provide confirmation that vehicles have cleared the red zone prior to barrier deployment.
6. Detection loop 5 shall preempt the microprocessor controller for a preset time (adjustable) after it detects vehicle presence for 15 seconds (adjustable). The preset preemption time is the time required to clear the number of guard approved vehicles stopped between the Stop line and Queue loop detector 5.

# SDDCTEA Recommended Concept Plan for Lane Barrier Signal Operation (Limited Real Estate Response Zone)

**Basic Layout Operation:**

1. Road users warned of **ACTIVE BARRIER** and distance (Advance Warning Sign).

2. Motorists come to complete stop at the **Lane Barrier Signal** that normally displays a circular red at 24" Thermoplastic Stop Line. Military Police shall periodically monitor motorists compliance with the lane barrier signal and stopping at Stop line on the circular red and prior to red zone. Red zone is red textured pavement or other acceptable means.

3. Motorists told **ONE VEHICLE PER GREEN** (Regulatory Sign below **Lane Barrier Signal**). If barrier button has not been pressed, the green signal is given when detection loops 1 or 2 detect presence for 2 seconds (adjustable) or lane sensor number 6 beam has been broken (with adjustable delay). Lane control signal reverts back to normally red after loop 3 is activated or after beam sensor 7 is broken. All times shall be adjustable.

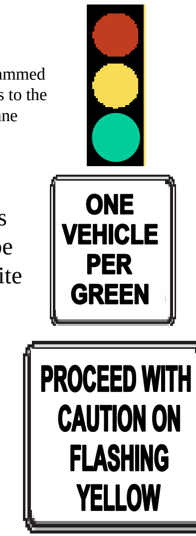
4. Steady green LED lights at the guardhouse shall indicate the satisfactory operation of each individual loop detector and beam sensor. Similarly, LED light(s) shall flash red for the specific loop or beam sensor that fails or is offline with the microprocessor controller. The lane barrier signal operation shall safeguard innocent road users at the active barriers.

5. Upon guard activation of lane barrier, lane control signal shall "hold" circular red. Traffic Gate Arm is flashed and lowered after delay. Active barriers shall not deploy until after loops 3 and 4 are cleared of vehicles and after beam sensors 8 has cleared following an adjustable delay after beam sensor 7 activation. See beam sensor and loop table.

6. Use red color pavement (aggregate instead of paint) from 2 feet forward of the Stop line to 10 feet beyond the pop-up barrier. Install **DO NOT STOP IN RED ZONE** Sign (Regulatory).

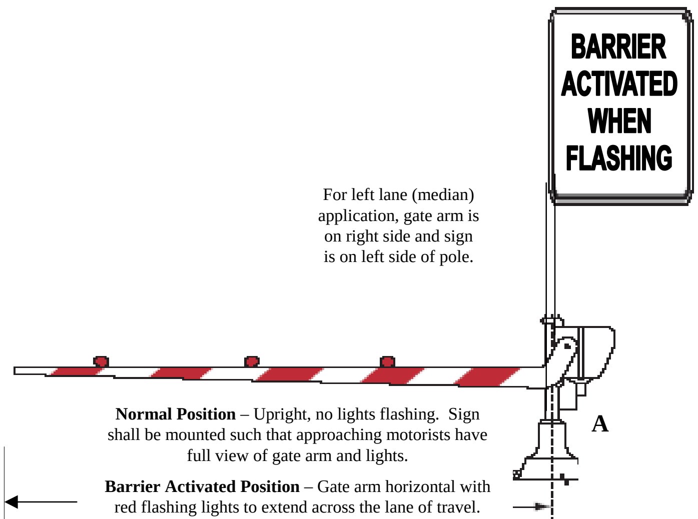
7. The following controls prevent vehicles extending into red zone: (1) Normally **Red Lane Barrier Signal**, (2) Stop Line, (3) **DO NOT STOP IN RED ZONE**, and (4) Traffic Gate Arm location.

3-Section Programmed Visibility Signals to the applicable lane




B

**Static Signs –** Signs below signal shall be black legend on white background.




For left lane (median) application, gate arm is on right side and sign is on left side of pole.

A

**Normal Position** – Upright, no lights flashing. Sign shall be mounted such that approaching motorists have full view of gate arm and lights.

**Barrier Activated Position** – Gate arm horizontal with red flashing lights to extend across the lane of travel.

Operation shall be similar to Railroad Crossings except as modified herein.

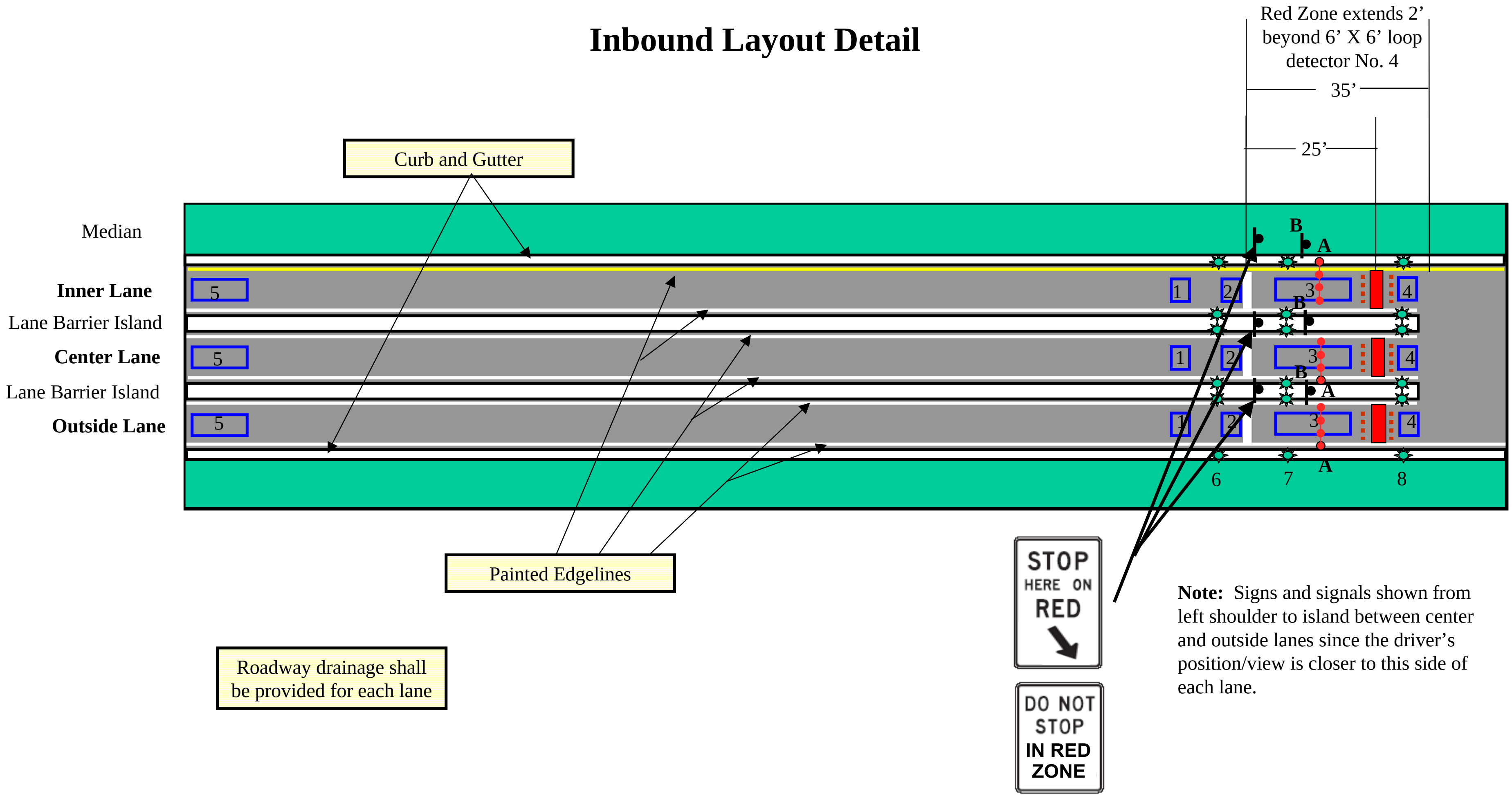
3-Section Programmed Visibility Signals to the applicable lane


B

**Electronic Blank-out Signs –** If electronic blank-out signs are used, then legend shall be white on a black or opaque background. The ONE VEHICLE PER GREEN sign shall illuminate message only when the circular red and green operate in the "metering for security" mode. If blank-out, the PROCEED WITH CAUTION ON FLASHING YELLOW sign shall be modified to PROCEED WITH CAUTION. The latter message shall illuminate only when the circular yellow is flashing. Circular yellow is used for (1) Queue Preemption to clear approved vehicles in a backup, (2) system start-up, (3) low-threat conditions, and (4) other situations per the Commanding Officer.

**SDDCTEA Recommended Concept Plan for Lane Barrier Signal Operation (Limited Real Estate Response Zone)**

# Inbound Layout Detail




**Note:** Signs and signals shown from left shoulder to island between center and outside lanes since the driver's position/view is closer to this side of each lane.

# SDDCTEA Recommended Concept Plan for Lane Barrier Signal Operation (Limited Real Estate Response Zone)

| Barrier Activated Regard-less of Reason T=0 | Signal Color Time After Activation, T = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 | SAFETY CONTROLS (separately for each lane) | | | | | | | Barrier Status |
|---|---|---|---|---|---|---|---|---|---|
| | | Vehicle Presence on Loop (L) or Beam Sensor Broken (BB) | | | Automatic Gate | | Barrier Lights | | |
| | | L – 1 & 2 or BB – 6 | L – 3 or BB – 7 | L – 4 or BB – 8 | Lights | Arm | Pavement or Barrier | Post Mounted | |
| | Normal State | - | - | - | Dark | Upright | Dark | Dark | Down |
| X | Red (hold), 0 | N | N | N | FR | Start Down | FR | R | Start Up |
| | Red (hold), 1 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 2 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 3 | Y or N | N | N | FR | Down | FR | R | Up |
| X | Red (hold), 0 | N | N | Y | FR | Upright | FR | R | Down |
| | Red (hold), 1 | Y or N | N | N | FR | Start Down | FR | R | Start Up |
| | Red (hold), 2 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 3 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 4 | Y or N | N | N | FR | Down | FR | R | UP |
| X | Red (hold), 0 | N | Y | Y | FR | Upright | Dark | Dark | Down |
| | Red (hold), 1 | Y or N | N | Y | FR | Upright | FR | R | Down |
| | Red (hold), 2 | Y or N | N | N | FR | Start Down | FR | R | Start Up |
| | Red (hold), 3 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 4 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 5 | Y or N | N | N | FR | Down | FR | R | Up |
| X | Red (hold), 0 | Y | Y | Y or N | Dark | Upright | Dark | Dark | Down |
| | Red (hold), 1 | Y or N | Y | Y or N | Dark | Upright | Dark | Dark | Down |
| | Red (hold), 2 | Y or N | Y or N | Y | FR | Upright | Dark | Dark | Down |
| | Red (hold), 3 | Y or N | N | Y | FR | Upright | FR | R | Down |
| | Red (hold), 4 | Y or N | N | N | FR | Start Down | FR | R | Start Up |
| | Red (hold), 5 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 6 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 7 | Y or N | N | N | FR | Down | FR | R | Up |
| | | | | | | | | | |

**Loop Detector and Signal Operation:**

1. Loops 1, 2, 3, 4, and 5 shall operate in the presence mode. Loop No. 5 operates as a queue detector.

2. Barrier Close Suppression Logic – When guards initiate a barrier “Emergency Fast Operate” command to close the barriers, each barrier’s “close” circuit will be suppressed until the Lane Control Signal in that barrier’s lane is circular red and loop detectors 3 and 4 and break beam sensors 7 and 8 in that barrier’s lane do not detect a vehicle. In the case of break beam 7, the logic will include an adjustable time delay after break beam 7 drops out to hold the suppression circuit for the time delay. This time delay will allow a small vehicle (e.g., a bicycle), which may not have been detected by the loops, to proceed safely beyond the barrier if the barrier “Emergency Fast Operate” command was initiated right after the bicycle passed break beam 7. See “Loop Detection and Beam Sensor Priority Control During Preemption” table next sheet.

3. The microprocessor controller shall meet NEMA standards for timing, preemption, and detector capabilities. The basic operation is lane metering for threat response of each lane separately (having barrier island) with two preemption capabilities:

a.) Normal Operation – Normal operation is circular red signal in each lane with a circular green given after an adjustable delay on loops 1 and 2 (typically just enough for the vehicle to come to a complete stop) or beam sensor 6 is broken. The signal reverts back to red when loop 3 detects presence or beam sensor 7 is broken.

b.) Barrier Deployment Preemption – Barrier deployment preemption is initiated by gatehouse or checkpoint guards pressing a button. Lane barrier signals are preempted for lane barrier deployment according to the logic shown in the table.

c.) Queue Preemption during Peak Demand Periods – Queue detector preemption is initiated after loop 5 detects constant presence for a preset adjustable time (for example 15 seconds). Lane barrier signal shall go to flashing yellow for a preset time to clear vehicles between loop 5 and the Stop line. After the preset (adjustable) preemption time expires, the signal shall time 4 seconds of steady circular yellow before going to circular red, and then to standard lane barrier signal metering operation.

d.) Barrier Deployment During Queue Preemption – If guards initiate the “Emergency Fast Operate” command during queue preemption, the lane control signal shall change from flashing “Yellow” to solid “Yellow” for 3 seconds and then to solid “Red” for 2 second. When lane barrier signal is red (hold), the sequence shall follow “Clear to Barrier Preemption” shown in the chart. The barrier “close” circuit shall be suppressed in accordance with the table and clearance sequence chart.

## SDDCTEA Recommended Concept Plan for Lane Barrier Signal Operation (Limited Real Estate Response Zone)

**Cont.**

| Barrier Activated Regard-less of Reason T=0 | Signal Color Time After Activation, T = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 | SAFETY CONTROLS | | | | | | | Barrier Status |
|---|---|---|---|---|---|---|---|---|---|
| | | Vehicle Presence on Loop (L) or Beam Sensor Broken (BB) | | | Automatic Gate | | Barrier Lights | | |
| | | L – 1 & 2 or BB – 6 | L – 3 or BB – 7 | L – 4 or BB – 8 | Lights | Arm | Pavement or Barrier | Post Mounted | |
| | Normal State | - | - | - | Dark | Upright | Dark | Dark | Down |
| X | Green, 0 | Y | Y or N | Y or N | Dark | Upright | Dark | Dark | Down |
| | Red (hold), 1 | Y or N | Y | Y or N | Dark | Upright | Dark | Dark | Down |
| | Red (hold), 2 | Y or N | Y or N | Y | FR | Upright | Dark | Dark | Down |
| | Red (hold), 3 | Y or N | N | Y | FR | Upright | FR | R | Down |
| | Red (hold), 4 | Y or N | N | N | FR | Start Down | FR | R | Start Up |
| | Red (hold), 5 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 6 | Y or N | N | N | FR | Going Down | FR | R | Going Up |
| | Red (hold), 7 | Y or N | N | N | FR | Down | FR | R | Up |
| | | | | | | | | | |

**Cont.**

**Loop Detector and Signal Operation:**

4. System Safety Check prior to Barrier Deployment – The microprocessor controller shall check both operational status and detection status of L-3, L-4, BB-7, and BB-8 prior to its "Start Up" deployment. Under no circumstance will the lane barrier deploy when one or more detectors is (are) not operational, is (are) off line with system, or have a call.

## Loop Detection and Beam Sensor Priority Control During Preemption

| Loop | Break Beam Sensor | Likely Signature | Governs Microprocessor Timing/Clearance prior to Barrier Deployment |
|---|---|---|---|
| Presence on 3 | Beam 7 broken | Motor vehicle | Loop Governs |
| No call on 3 | Beam 7 broken | Bicycle, Moped, scooter, etc. | Beam Sensor 7 governs and times 3 seconds passage (adjustable) after beam 7 reconnects. Additional breaks of beam 7 resets passage time. If Beam 8 is not broken within 5 seconds (adjustable), the call is assumed false (bird, animal, leaf, weather, etc.) and the barrier deploys. |
| Presence on 4 | Beam 8 broken | Motor Vehicle | Loop Governs |
| No call on 4 | Beam 8 broken following Beam 7 | Bicycle, Moped, scooter, etc. | Beam 8 Governs and times one second passage (adjustable) after each beam 8 reconnects. Additional breaks of beam 8 resets passage time. |
| No call on 4 | Beam 8 broken following no breaks of Beam 7 | False Call (bird, animal, leaf,weather, etc.) | Beam 8 Governs and times one second passage (adjustable) after each beam 8 reconnects. Additional breaks of beam 8 resets passage time of one second. |

## SDDCTEA Recommended Concept Plan for Lane Barrier Signal Operation (Limited Real Estate Response Zone)

| Control | Normal Operation Signal Control by Detection System | | | Clear to Barrier Preemption | Clear 1 from Barrier Preemption | Clear 2 from Barrier Preemption | Clear to Queue Preemption | Clear 1 from Queue Preemption to Normal Ops | Clear 2 from Queue Preemption to Normal Ops | Clear 1 from Queue Preemption to Barrier Preempt | Clear 2 from Queue Preemption to Barrier Preempt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No activation on Loops 1 and 2 or BB 6 | Activation on Loops 1 and 2 or BB 6 and after set delay | Activation on Loop 3 or BB 7 regardless of activation on Loops 1 and 2 or BB6 | Traffic held at Stop line. Activations on Loops 3 or 4 or BB 7 or 8 holds barrier from deployment. | Activation on Loops 1 and 2 or BB 6. Traffic held at Stop line. | Activation on Loops 1 and 2 or BB 6. Traffic held at Stop line. | Loop 5 activated by vehicle occupancy greater than preset time, say 15 seconds (adjustable) | Automatic 3 seconds yellow clearance | All red for 2 seconds before return to Normal Operation | Automatic 3 seconds yellow clearance | Traffic held at Stop line. Activations on Loops 3 or 4 or BB 7 or 8 holds barrier from deployment. |
| Signal | | | | (Red Hold) | (Red Hold) | (Red Hold) | Flashing Yellow | Steady Yellow | | Steady Yellow | (Red Hold) |
| Signs<br>ONE VEHICLE PER GREEN<br>PROCEED WITH CAUTION ON FLASHING YELLOW | Static Signs or Electronic Blank-out<br>ONE VEHICLE PER GREEN | | | Static Signs or Electronic Blank-out | Static Signs or Electronic Blank-out | Static Signs or Electronic Blank-out | Static Signs or Electronic Blank-out<br>PROCEED WITH CAUTION | Static Signs or Electronic Blank-out | Static Signs or Electronic Blank-out<br>ONE VEHICLE PER GREEN | Static Signs or Electronic Blank-out | Static Signs or Electronic Blank-out |
| Barrier Safety Controls | Gate Arm – Up<br>Gate Lights – Dark<br>Barrier Lights – Dark | | | Gate Arm – See Table<br>Gate Lights – See Table<br>Barrier Lights – See Table<br>Barrier – See Table | Gate Arm – Down<br>Gate Lights – FR<br>Barrier Lights – FR<br>Barrier – Going Down/retracting | Gate Arm – Going Up<br>Gate Lights – FR<br>Barrier Lights – Dark<br>Barrier – Down/ retracted | Gate Arm – Up<br>Gate Lights – Dark<br>Barrier Lights – Dark<br>Barrier – Down/ retracted | Gate Arm – Up<br>Gate Lights – Dark<br>Barrier Lights – Dark<br>Barrier – Down/ retracted | Gate Arm – Up<br>Gate Lights – Dark<br>Barrier Lights – Dark<br>Barrier – Down/ retracted | Gate Arm – Up<br>Gate Lights – FR<br>Barrier Lights – Dark<br>Barrier – Down/ retracted | Gate Arm – Going Down<br>Gate Lights – FR<br>Barrier Lights – FR<br>Barrier – See Table |