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From: Commander, Naval Facilities Engineering Command, Engineering and Innovation and Criteria Office (EICO)
To: Distribution

Subj: INTERIM TECHNICAL GUIDANCE (ITG) 03-03, ENTRY CONTROL FACILITIES

Ref: (a) Interim Technical Guidance (ITG) 03-03, Entry Control Facilities
(b) Department of Defense Directive 2000.12, DOD Combating Terrorism Program of Apr 1999
(c) Department of Defense Handbook 2000.12H, Protection of Personnel and Activities against Acts of Terrorism and Related Political Turbulence of Feb 93,
(d) Department of Defense Instruction 2000.16, DOD Antiterrorism Standards, 14 Jun 2001
(e) OPNAVINST 5530.14C, Department of the Navy Physical Security, Dec 98 with Change 2 dated 01 May 2001
(f) OPNAVINST 3300.55 Navy Combating Terrorism Program Standards, 3 Feb 2000
(g) Unified Facilities Criteria (UFC) 4-010-01, DOD Minimum Antiterrorism Standards for Buildings, 31 Jul 2002

1. **Purpose.** Reference (a) provides the Naval Facilities Engineering Command (NAVFAC) interim technical guidance (ITG) for entry control facilities (ECF) to ensure the proper level of access control into naval installations. This ITG provides guidance for establishing new ECFs, or for modifying existing ECFs. From a force protection requirements standpoint, full implementation of the ITG is optimal; however, other factors including siting limitations, installation threat levels and criticality, and affordability must factor into any project, using appropriate risk management approaches.

2. **Background.** Entry Control Facilities are the front line of defense against potential terrorist attack. Following recent terrorist attacks, there has been an increased desire to ensure that Naval Installations are adequately secure from unauthorized access while at the same time maximizing vehicular traffic flow. References (b) through (d) provide the DOD general antiterrorism (AT) policy and standards. Reference (e) identifies the requirements for installation access and circulation control and specifies that each installation or separate activity Commanding Officer must clearly define the access control measures required to safeguard facilities and ensure accomplishment of the mission. Reference (e) also establishes the policies related to installation access and circulation control. Among the policies, it is specified that the procedures to control access to installations shall include using a defense-in-depth concept and establish positive access control measures at entry control points to installations. Reference (f) and (g), provide the Navy Combating Terrorism Program and minimum AT standards for buildings.

3. **Technical Guidance.** Reference (a) provides interim technical guidance for planning and design of entry control facilities. Reference (a) can be found on the NAVFAC Engineering Innovation and Criteria Office (EICO) website at http://criteria.navfac.navy.mil/. Click on "Publications", then Interim Technical Guidance.

4. **Action.** Use reference (a) for the planning, design and construction of entry control facilities. The Naval Facilities Engineering Commands Engineering Innovation and Criteria Office (EICO) is currently coordinating with other DOD components to develop reference (a) into a Unified Facilities Criteria (UFC) document to provide planning, design, construction, operations, and maintenance criteria for DOD components and participating organizations having military construction responsibilities.

5. **Coordination.** Reference (a) has been coordinated with Commander, Naval Operations (CNO, N46), Commander, Fleet Forces Command (CFFC), Naval Criminal Investigative Service (NCIS), Headquarters, United States Marine Corps (HQ, USMC), NAVFAC Engineering Field Divisions (EFD) and Engineering Field Activities (EFA); Navy Public Works Centers (PWC); Naval Facilities Engineering Services Center (NFESC).

6. **Points of Contact.**

The NAVFAC Engineering Innovation and Criteria Office (EICO) can provide assistance in clarifying Navy Antiterrorism (AT), physical security criteria, and design and construction criteria for specific projects. Technical assistance in evaluating and interpreting AT physical security criteria for site specific customer requirements can be provided upon request. Contact the following for specific questions regarding reference (a):

a. For clarification or additional criteria information related to this subject, please contact Mr. John J. Lynch, P.E., NAVFAC EICO, 757-322-4207, DSN 262-4207, or e-mail lynchjj@efdlant.navfac.navy.mil.

b. For clarification or additional technical information related to this subject, please contact Mr. Brian Crowder, P.E., LANTDIV NAVFACENGCOM, 757-322-4228, DSN 2621-4228 or e-mail crowderbr@efdlant.navfac.navy.mil.

R. David Curfman

R. D. CURFMAN
By direction

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ITG 03-03

Interim Technical Guidance (ITG) Entry Control Facilities

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1 Introduction

1.1 Entry Control Facility Mission and Priorities

Entry control facilities (ECFs) ensure the proper level of access control for all DOD personnel, visitors, and commercial traffic to an installation. The objective of an ECF is to secure the installation from unauthorized access and intercept contraband while maximizing vehicular traffic flow (7, 6). There are several components that are required for an ECF to properly perform this function. These components can be prioritized as follows (7, 6):

1. **Security**
2. **Safety**
3. **Capacity**
4. **Image**

1.1.1 Security

The first objective of an ECF is to maintain perimeter security for the installation (7, 6). As discussed in the J34 "ATFP Installation Planning Template", many security experts suggest installations should focus first on threats that can be mitigated at the first line of defense – the installation perimeter. Entry Control Facilities and the access control they provide are extremely important to defense-in-depth and effective risk mitigation. In accordance with DOD O-2000.12-H, the security measures employed during Force Protection Condition (FPCON) Bravo must be capable of being maintained for weeks without causing undue hardship, affecting operational capability, or aggravating relations with local authorities. Therefore, an ECF must be capable of supporting the security measures employed during Force Protection Condition (FPCON) Bravo, including any Random Anti-terrorism Measures employed in accordance with the installation Anti-Terrorism Plan (7, 6). In addition, the facility must support operations at increased FPCONs for shorter durations, including 100% vehicle inspections (7, 6).

1.1.2 Safety

The layout and construction of the ECF should properly address the working environment of security personnel to ensure a safe working area (7, 7). This includes providing proper shelter from inclement weather or attack and providing protection from vehicular impact.

1.1.3 Capacity

While the priority of the ECF is to maintain a proper level of security, the facility should also maximize the flow of traffic (7, 7). Congestion at the ECF causes delay for personnel and creates a safety hazard that negatively effects installation operations.

1.1.4 Image

Since the ECF is the first facility encountered by personnel or visitors entering an installation, it is imperative that the facility reflects the appropriate image and aesthetic character.

1.2 Purpose of Guidance

This guidance is intended to facilitate the design of Entry Control Facilities. Entry Control Facilities are the front line of defense against potential terrorist attack. There has been increased scrutiny of both procedural and infrastructure issues at entry control points after recent terrorist attacks. Many existing design references discuss important design considerations, but none include information concerning the latest developments in technology that may be employed in the near future to reduce manpower and insure adequate security. This guidance identifies design features necessary to ensure infrastructure constructed today will have the flexibility to support future technologies and presents a unified approach to the design of entry control facilities. The examples provided in this design guidance will need to be modified and adapted as appropriate to satisfy installation specific constraints. The design guidance is not intended to address procedural issues such as tactics and techniques.

1.3 Scope and Use of Guidance

The guidance pertaining to entry control facilities (ECFs) is intended for primary and secondary ECFs of an installation. A limited-use ECF, which is open only occasionally, would not require the same level of infrastructure. Therefore, for a limited-use ECF, incorporate the elements of design discussed in this guidance as appropriate.

Commanders, security personnel, and design architects and engineers are the intended users of this document. Technical information considered generally known to professional architects or engineers or readily available in existing technical references has not been included.

2 Existing Requirements and Guidance

2.1 DOD Requirements

DOD 5200.8-R requires DOD Components to determine the necessary access control based on the requirements of a developed physical security program. It also requires the evaluation of automated entry control systems or access devices, where necessary. Emergency planning is specified to include establishment of a system for positive identification of personnel and equipment authorized to enter and exit the installation and maintenance of adequate physical barriers that will be deployed to control access to the installation.

2.2 OPNAV Requirements

OPNAV 5530.14C Chapter 5 identifies the requirements for installation access and circulation control. Section 0500.b specifies that each installation or separate activity Commanding Officer must clearly define the access control measures required to safeguard facilities and ensure accomplishment of the mission. Section 0501 establishes the policies related to installation access and circulation control. Among the policies it is specified that the procedures to control access to installations shall include using a defense-in-depth concept and establish positive access control measures at entry control points to installations. Section 0502 states that installation/activity Commanding Officers shall, in addition to the required armed guards, determine additional security controls of perimeter gates, i.e., barriers, video surveillance, explosives detection, and vehicle inspection capabilities.

2.3 Installation Specific Requirements

As specified in OPNAV 5530.14C, the installation or activity Commanding Officer must define the access control measures. Additionally, DoD Instruction 2000.16 requires Commanders at all levels to develop and implement a comprehensive Antiterrorism (AT) program. DoD O-2000.12-H provides the procedures and recommendations for reducing risk and vulnerability of DoD personnel, their family members, facilities, and assets from acts of terrorism. DoD O-2000.12-H defines five Force Protection Condition (FPCON) Levels (previously known as THREATCONs) and the applicable FPCON measures to be enacted for each level. For reference the five levels are described in Table 2-1.

Installations are required to develop an AT Plan, which provides the action sets that occur as the FPCON level changes. For an Entry Control Facility, the installation AT plan identifies the necessary identification and inspection procedures based on the Force Protection Condition (FPCON). Additionally, many installations adopt Random Antiterrorism Measures (RAM). Implementing RAM involves identifying at any FPCON a set of measures extracted from higher FPCONs that supplement the basic FPCON measures already in place. Therefore, the level of identification and inspection at the Entry Control Facility will vary depending on the FPCON and the use of RAM. Some of the measures implemented include erection of barriers and obstacles to control traffic flow and/or the search of all vehicles and their contents before allowing entrance to the installation. Therefore, it is important for the designers of an Entry Control Facility to understand the anticipated operations at all FPCONs as outlined in the installation AT Plan.

FPCON	Description
NORMAL	Applies when a general threat of possible terrorist activity exists but warrants only a routine security posture.
ALPHA	Applies when there is a general threat of possible terrorist activity against personnel and installations, the nature and extent of which are unpredictable.
BRAVO	Applies when an increased and more predictable threat of terrorist activity exists.
CHARLIE	Applies when an incident occurs or intelligence is received indicating some form of terrorist action against personnel and installations is imminent.
DELTA	Applies in the immediate area where a terrorist attack has occurred or when intelligence has been received that terrorist action against a specific location is likely. Normally, FPCON DELTA is declared as a localized warning.

Table 2-1 FPCON Descriptions (ref. DoD O-2000.12-H)

The design of an entry control facility must consider the likely operations and anticipated volume and flow of traffic during all FPCON(s). However, as outlined in DoD O-2000.12-H, the implementation of terrorist FPCONs does not come without adverse impact or costs to day-to-day operations. Table 2-2, provides guidance from DoD 0-2000.12-H on the expected capabilities and impacts associated with the different FPCON levels.

FPCON	Description
NORMAL	The baseline posture.
ALPHA	The measures must be capable of being maintained indefinitely.
BRAVO	The measures must be capable of being maintained for weeks without causing undue hardship, affecting operational capability, or aggravating relations with local authorities.
CHARLIE	Implementation of this measure for more than a short period will probably create hardship and affect the peacetime activities of the unit and its personnel.
DELTA	Measures to be implemented in response to local warning and *not intended* to be sustained for substantial periods.

Table 2-2 FPCON Impacts and Implementation Times (ref. DoD O-2000.12-H)

Since some disruption in the level of service is expected at high FPCON(s) (Charlie or Delta), the traffic impacts will be designed based on the elimination of congestion at FPCON Bravo and below. At FPCON Charlie and Delta, some congestion may occur but this is sometimes offset by the installation also reducing the population seeking to enter the installation to mission essential personnel only during FPCON Charlie or Delta.

2.4 Existing Design Guidance

Table 2-3 provides a summary of the design guidance and criteria available for infrastructure issues related to Entry Control Facilities.

Subject	Document(s)
Entry Control Point (ECP) Layout	• MIL HDBK 1013/1A (4.4.5) • MTMCTEA Bulletin • TM5-853-2 (3.7) • Air Force Installation Entry Control Facilities Design Guide (DRAFT)
Exterior Security Lighting	• MIL HDBK 1013/1A (4.7) • OPNAV INST 5530.14C (Ch. 7) • TM5-853 (ECP, 3-7b.1.g) • TM5-811 • MIL HDBK 1013/10 – Section 4 • IESNA "Lighting Handbook"
Exterior CCTV	• MIL HDBK 1013/1A (4.6) • TM5-853-4
Exterior Perimeter IDS	• MIL HDBK 1013/1A (4.5) • TM5-853-4
Security Power Supply	• MIL HDBK 1013/1A (4.8.2) • OPNAV INST 5530.14C (0703)
Vehicle Barriers	• MIL HDBK 1013/14
Guard Facilities	• MIL HDBK 1013/10
Traffic and Highway Design Considerations	• MTMCTEA Bulletin • A Policy on Geometric Design of Highways and Streets – AASHTO • Roadside Design Guide - AASHTO • Manual of Uniform Traffic Control Devices for Streets and Bridges-DOT/FHA • Standard Highway Signs – DOT/FHA

Table 2-3 References Related to Entry Control Facilities

3 Entry Control Facility Classifications and Functions

3.1 ECF Classifications

The functions and the relationships at an ECF are based on the classification or type of entry control facility. There are four basic types of ECFs; however, specific projects will require modifications of these types or in some cases combinations (7, 10). The four basic types of ECFs based on functional classifications are:

- DoD Personnel Only (Authorized Vehicles)
- DoD Personnel / Visitors
- Commercial / Large Vehicle
- Truck Inspection

Where an installation has a limited number of entry points or only one entry point, the entry control facilities will be required to support the combined functional requirements of each type (7, 10). For example, an installation with only one entry control facility will likely combine the functions of supporting DoD Personnel, visitors, large vehicles, and a full inspection facility. On a large installation with several entry points, one entry point may be designated for truck inspection and commercial vehicle access only, while other entry points will only support the remaining types of traffic. This type of arrangement reduces the infrastructure requirements, by not requiring support for all functions at each entry point. Also some installations may use a centralized truck inspection facility that is separate from the entry control points. For this reason, the functions of truck inspection and general commercial/large vehicle entry have been listed separately. In general, where commercial/large vehicle entry is required, truck inspection will be combined into the same facility unless it is provided at a separate centralized facility. Due to the specialized requirements for truck inspection operations, the design considerations for a Truck Inspection ECF have been covered separately from the other types of ECFs in Chapter 7.

These types of ECFs can further be subdivided based on the intended use and volume of traffic at the ECF. The use classifications are outlined in the table below.

Use Classification	Traffic Volume	Operational Hours	FPCON Considerations
Primary	Heavy / Moderate	Open Continuously	Open thru FPCON Delta
Secondary	Moderate to Heavy	Regular Hours, Closed at Times	Potentially closed at or above FPCON Charlie
Limited Use	Low	Only Opened for Special Purposes	Closed at Most Times

The focus of this guidance is on primary and secondary entry control facilities to installations. Although many of the concepts also apply to entry control facilities into restricted areas or limited-use entry control facilities, the requirements and considerations vary due to the decreased volume of traffic into a restricted area.

3.2 ECF Functional Diagrams

As illustrated in Reference 7, functional diagrams can be used to illustrate the functional relationships and adjacencies of the components of each type of ECF. Diagrams for each classification of ECF are provided in Figures 3.1through 3.3. Figure 3.3 illustrates the use of a centralized truck inspection ECF and a commercial/vehicle ECF in series or alternatively, the inclusion of the truck inspection facility into the commercial/vehicle ECF. These functional diagrams are intended to illustrate the relationships encountered at each type of ECF. These relationships can be modified based on installation or site-specific requirements.

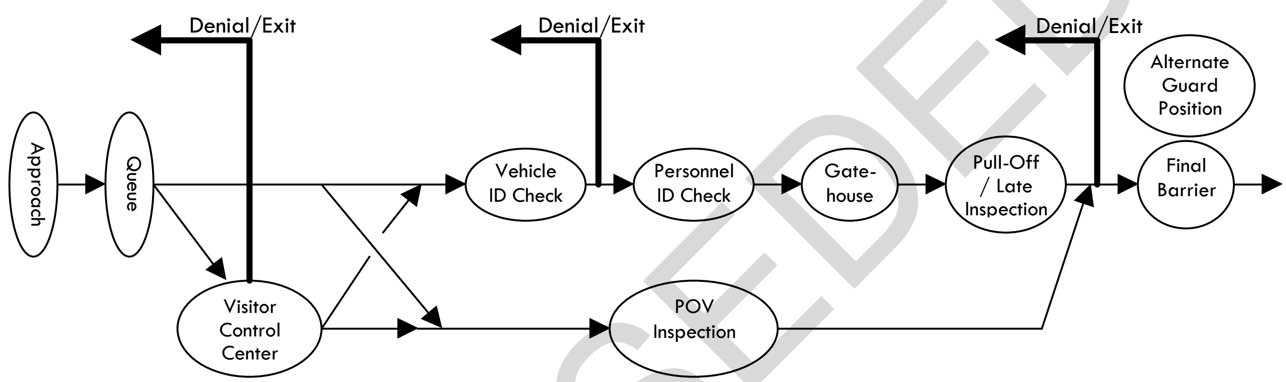


Figure 3.1 Visitor/DOD Personnel Gate Incorporating a Visitor Control Center

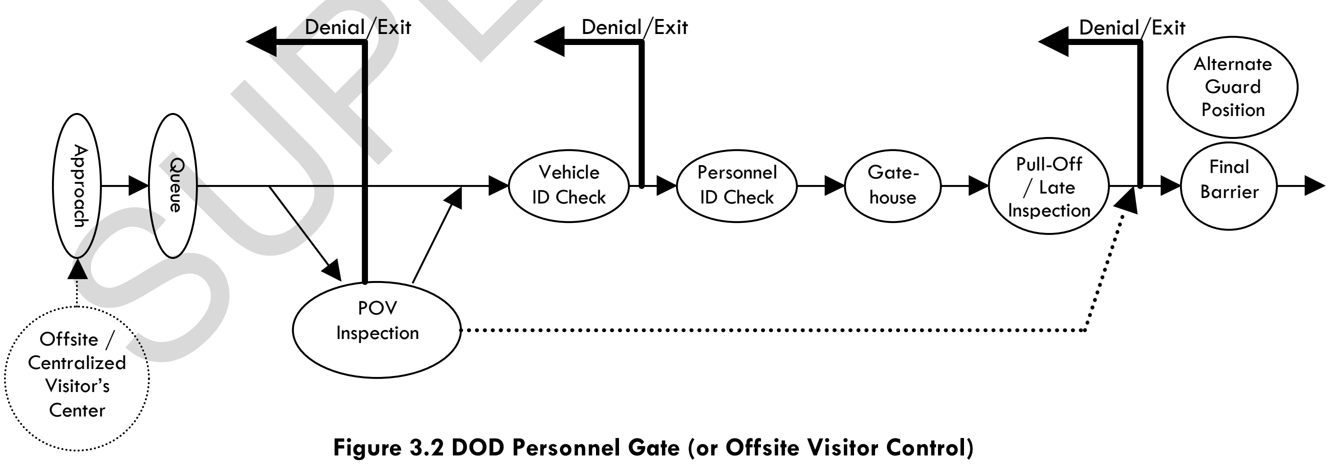


Figure 3.2 DOD Personnel Gate (or Offsite Visitor Control)

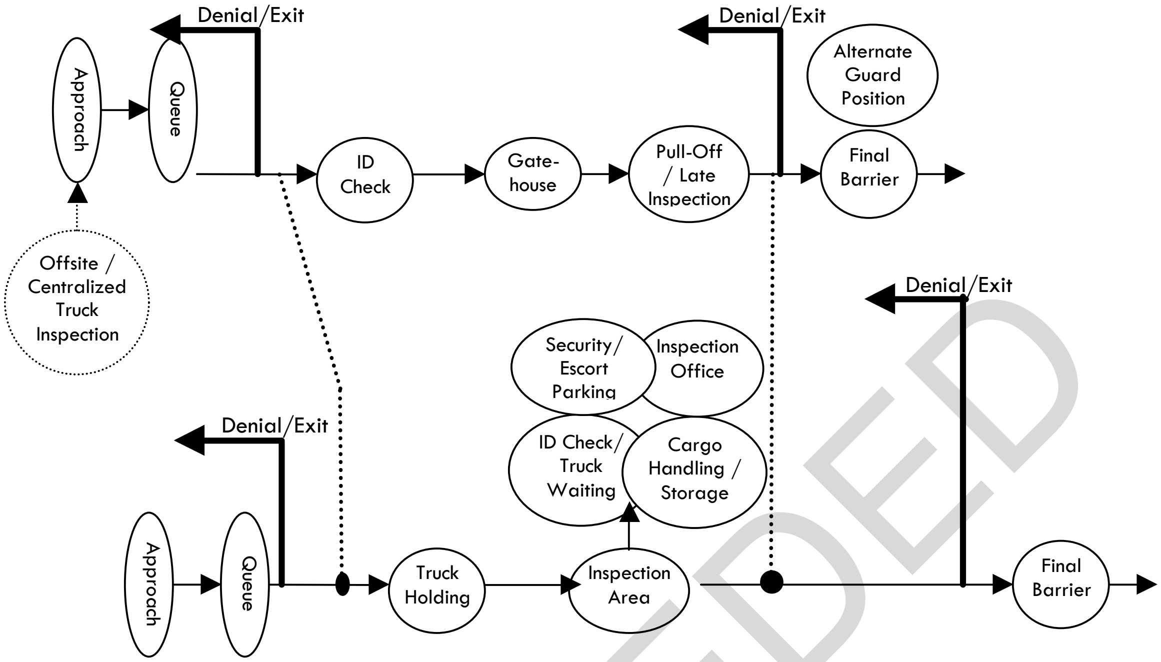


Figure 3.3 Commercial Vehicle / Truck Inspection (Centralized or Included)

3.3 *ECF Organization / Structure*

An Entry Control Facility (ECF) is defined as the access point for pedestrian and vehicular traffic into an installation or restricted area. An ECF can be subdivided into four zones, each encompassing specific functions and operations. Beginning at the installation property boundary, the zones include the approach zone, access control zone, response zone, and the safety zone. Specific components are used within each zone to conduct the necessary operation (1). The location of each zone of an entry control facility is illustrated in Figure 3.4.

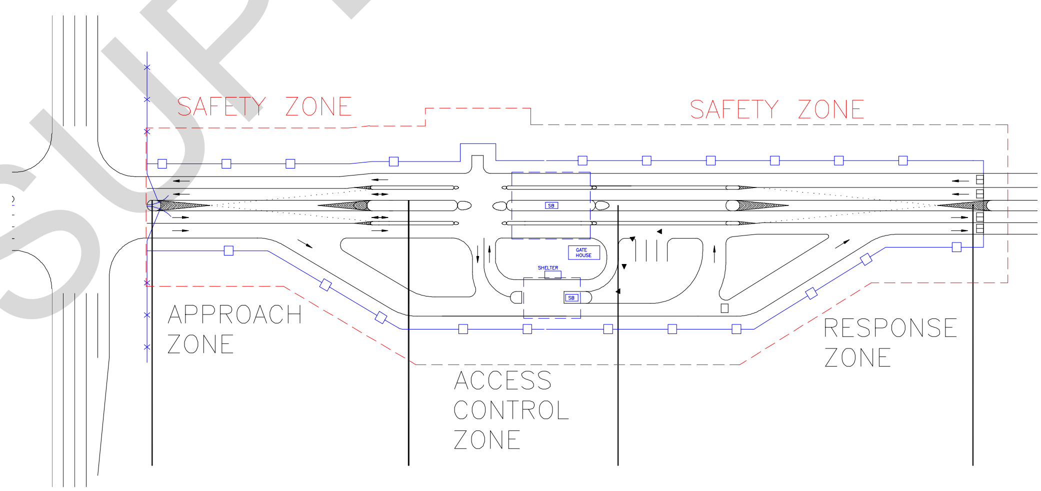


Figure 3.4 Entry Control Point Zones

3.3.1 Approach Zone

The approach zone lies between the access control zone and the installation boundary. It is the area all vehicles must transverse before reaching the actual checkpoint. The following functions occur in the approach zone:

1. Reduce the speed of incoming vehicles to at or below the design speed of the ECF.
2. Perform sorting of traffic by vehicle type. An example would be sorting trucks or visitors into the proper lane before reaching the inspection area or the checkpoint.
3. Provide adequate stacking distance for vehicles waiting for entry, especially during times of peak demand, to insure minimal impact on traffic off the installation.
4. Provide the first opportunity to identify potential threat vehicles, including those attempting entry through the outbound lanes of traffic.

Roadway layout and various traffic control devices such as signs, variable message systems, signals, and lane control markings should be utilized to perform these functions. Drivers should be notified of the upcoming access control point, the proper speed to travel, and proper lane to utilize. The length of the approach zone will vary based on constraints such as availability of land, distance required to perform traffic sorting, and space requirements associated with creating additional lanes of traffic (1). The approach zone design should also consider temporary traffic control measures, such as the placement of traffic barriers to constrain and slow traffic, which are frequently specified in the installation AT Plan for higher FPCONs or as RAMs at lower FPCONs.

3.3.2 Access Control Zone

The access control zone is the main controlling element of the ECF. This area includes the gatehouse and traffic management equipment in support of the work of the security force. As technology changes, it is important to provide flexibility in the design of the access control zone to insure the infrastructure can support future demands of inspection and access control equipment.

The design of the access control zone should consider the requirements to process the following types of vehicles:

1. POV of Authorized Personnel
2. Government Vehicles
3. Visitor Vehicles
4. Military Convoys
5. Delivery vans, trucks, and buses

These vehicles in turn become one of the following types of traffic that must be accommodated at the access control point:

1. Vehicles given access to the installation
2. Vehicles denied access to the installation (rejected traffic)
3. Vehicles denied access that attempt unauthorized entry (threat)
4. All vehicles departing the installation

3.3.2.1 Typical Operations in Access Control Zone

3.3.2.1.1 Manual

Currently, security personnel conduct identification procedures manually. Most installations require vehicle and personnel identification. Security personnel, in each traffic lane, currently complete the following procedures in access control zones at FPCON Bravo and below:

- Verification of vehicle decals
- Verification of personnel identification
- General surveillance of the vehicle and its contents
- Complete inspections of the vehicle and contents at varying occurrence intervals based on FPCON and use of RAM

Currently, visitors to an installation are issued passes at a centralized pass office at most installations. These vehicles then become authorized vehicles handled in the same manner as other authorized vehicles. These operations occur for both inbound and outbound traffic, although often at a reduced frequency for outbound traffic. Frequently, installations will use tandem processing, two security personnel posted to each lane of traffic, to increase the throughput of an ECF. It has been estimated that tandem processing may improve capacity by up to 25% per lane (2, 5). This additional capacity may be critical during increased FPCON or during RAMs, therefore, as a minimum, all entry control facilities shall be designed to support tandem processing.

3.3.2.1.2 Automated

In the future, identification procedures may be automated. Guidance from OPNAV indicates that anticipated automated operations will be designed to mimic current identification procedures by requiring identification of both vehicles and personnel. Pilot projects have been initiated by OPNAV N34 at North Island, by the Air Force at Hanscom AFB, and other DoD organizations to test potential technologies. Therefore, the design of the access control area should facilitate manual and/or automated identification of both vehicles and personnel. In order to facilitate the automated systems, the location of vehicles must be controlled. The following procedure, based on the OPNAV pilot program, is anticipated for future automated entry control points during FPCON Bravo and below:

- An initial traffic arm will stop a vehicle for automated vehicle identification, such as a bar code reader or RF transmitter
- If the vehicle is authorized, the vehicle will be allowed to proceed to the personnel identification station while stopping the next vehicle in the queue
- The vehicle will proceed forward and stopped by a second traffic arm
- The occupant will be identified with automated equipment; such as a proximity card reader for “smart” cards similar to the DOD Common Access Card
- If the occupant is authorized, the vehicle will be allowed to proceed and enter the installation by opening the traffic arm
- The ECF is supervised by CCTV and security personnel posted in the gatehouse and sentry booth
- Monitoring and identification of outgoing traffic may also be completed using automated identification equipment

In addition, at varying occurrence intervals normally dependent on FPCON, vehicles and their contents will continue to be inspected. Monitoring and control of both inbound and outbound traffic should be considered. If a vehicle is denied entry, during either identification check, the access control point must be configured to allow that vehicle to be re-directed to exit the ECF before entering the installation. It is likely that the traffic arms will be used to control traffic when a vehicle is being rejected from the ECF. The exact types of automated equipment and procedures used for vehicle or personnel identification is currently unknown, so it is paramount that the layout and electrical power infrastructure remain flexible.

In the future, it is possible that the processing of visitor traffic, including the issuance of passes, will occur at each ECF in lieu of a centralized visitor control center. Therefore, the design of an ECF, should consider this possibility. This facility would likely support one guard with automated equipment for issuing passes to each vehicle in the visitor queue.

3.3.3 Response Zone

The response zone is the area extending from the end of the access control zone to the location of the final active vehicle barrier, bounded by the passive vehicle barriers, which create containment. This zone defines the end of the ECP. The main function of the response zone is to provide time for the security personnel to react to a threat and operate the active vehicle barriers, closing the entry control point if necessary.

3.3.3.1 Determining Response Time and Length of Response Zone

Response time is defined as the time required for complete activation of the active vehicle barriers once a threat is detected. The response time includes the time for security personnel to react to a threat and initiate the activation of the barrier system and the time for the selected barrier system to fully deploy and close the roadway. MIL-HDBK 1013/14 provides guidance in estimating the activation time for active vehicle barrier systems and determining the available response time for a given layout. When evaluating the adequacy of response time and the length of the response zone, a minimum of two threat scenarios will be considered. The first scenario is a potential terrorist vehicle approaching the entry control facility at a moderate or high rate of speed. The attack will be detected much earlier due to the high-speed approach; however, the high speed and subsequent acceleration may limit the response time available. The second scenario is a potential terrorist vehicle approaching the entry control point to attempt covert entry. The vehicle will approach at a slow speed or stop to offer false credentials. In this scenario, the vehicle is closer to the active vehicle barrier when detection occurs, but the vehicle has a low velocity and must accelerate towards the barrier, increasing the time required to cover the distance. Typically, the first scenario will control unless the initial velocity of the threat vehicle as it enters the ECF is kept low by other design features or site characteristics. The design of the entry control point shall consider both scenarios, determine which scenario governs, and verify the adequacy of the response time and active vehicle barrier selected. The response time shall be maximized. In no case shall the reaction time of the security personnel be taken less than three (3) seconds or the deployment time of the active barrier taken less than one (1) second. This results in a minimum of four (4) seconds of response time provided in all cases. To facilitate the evaluation, Tables 3-1 and 3-2 are provided for reference; however site-specific calculations should be completed for each ECF. The acceleration rates used in these tables are based on the guidance in MIL-HDBK 1013/14.

Threat Vehicle	Response Time (sec)	Maximum Velocity (mph)	Distance Traveled (ft)	Dist. from Access Control Point
High Performance Car	4	75.8	354.4	204.4
	6	91.2	599.4	449.4
	8	106.6	889.6	739.6
Large Truck	4	60.8	310.4	160.4
	6	68.7	500.4	350.4
	8	76.6	713.6	563.6

Note: Assumes Detection 150 ft prior to the Center of the Access Control Zone

Table 3-1 Response Time Based on Threat Scenario 1, Initial Velocity = 45 mph

Threat Vehicle	Response Time (sec)	Maximum Velocity (mph)	Distance Traveled (ft)
High Performance Car	4	30.8	90.4
	6	46.2	203.4
	8	61.6	361.6
Large Truck	4	15.8	46.4
	6	23.7	104.4
	8	31.6	185.6

Table 3-2 Response Time Based on Threat Scenario 2, Initial Velocity = 0 mph

Decreasing the initial velocity of the threat vehicle increases the available response time, or correspondingly decreases the required length of the response zone. Therefore it is recommended that roadway layout features such as reverse curves or S-curves be used to reduce the maximum velocity traffic can proceed through the ECF. Reference 1 and MIL-HDBK 1013/14 provide guidance on determining the maximum attainable velocity for curved paths.

3.3.4 Safety Zone

The safety zone extends from the active and passive vehicle barriers, which surround the ECF. It is possible that a terrorist vehicle will explode inside this contained area. Therefore, consideration should be given to the effects an explosion may have on nearby personnel, buildings, or assets. The safety zone extends from the passive and active barriers in all directions. The acceptable standoff distance or safety zone would be determined by the expected weight of the explosive charge, the facility or asset to be protected, and the required level of protection.

Ref. 3 provides a thorough discussion of determining the proper standoff distances associated with planning for vehicle barriers. Based on the assumed explosive weight, injury levels can be predicted based on distance from the explosion. As discussed in Ref. 3, the user must make decisions based on the risk involved and the probability that an incident would take place. High value assets such as mission critical, high profile facilities or facilities close to the ECF with a high concentration of personnel should be considered at higher risk. If an adequate safety zone or standoff distance cannot be achieved to produce acceptable damage and injury levels, other alternatives must be evaluated or a decision made to accept additional risk (3).

Another consideration in the development of the safety zone is any exclusion zones, which may be required to minimize radiation exposure from x-ray, gamma ray, or similar inspection equipment. See Chapter 7 for further information on these considerations.

4 Entry Control Facility Design Considerations

The following design considerations are provided for DoD Personnel Only (Authorized Vehicles), DoD Personnel / Visitors, and Commercial / Large Vehicle ECFs with a separate centralized Truck Inspection Facility. For a Truck Inspection Facility or a Commercial/Large Vehicle ECF which incorporates the truck inspection function follow the guidelines in Chapter 7 which reflect the unique requirements of supporting inspection functions for these types of vehicles.

4.1 Location

When determining the location for a new entry control or inspection facility it is important to consider the potential impact on nearby facilities. The effect on nearby facilities of an explosion occurring inside the entry control facility should be evaluated when considering new entry control facilities or expanding an existing facility. It may be desirable to limit the proximity of the ECF to nearby facilities or it may be necessary to harden an existing facility in order to limit the amount of damage occurring from an explosion.

Another important factor in determining the location or extent of an ECF is the relevant requirements given in UFC 4-010-01 "DOD Minimum Antiterrorism Standards for Buildings." This criteria indicates that "(w)here practical, all roadway and parking area projects should comply with the standoff distances from inhabited buildings in Table B-1. Where parking or roadways that are within the standoff distances in Table B-1 from existing buildings are being constructed, expanded, or relocated, those parking areas and roadways shall not be allowed to encroach on the existing standoff distances of any existing inhabited building. That applies even where such projects are not associated with a building renovation, modification, repair, or restoration requiring compliance with these standards." This criteria requirement may limit the space available to relocate or expand the roadways associated with an existing constrained ECF.

The site selected for an ECF should also consider the potential of expansion due to changes in the traffic volume. Consideration should also be given to any anticipated changes in the local roadways or highways entering the installation. It may be necessary to coordinate the location of an ECF with the local municipality or other government agencies, as the location may have significant traffic or other environmental impacts on the local community. The local municipality or other government agencies may be able to make modifications or improvements to the existing roadways, which will improve the function of a new ECF.

4.2 Layout

The functions and operations occurring in the each zone of the ECF were described in Sections 3.3.1 to 3.3.3. To support these requirements the following layout guidelines are provided for each zone.

Approach Zone Guidelines

1. Consider the use of simple/reverse curves, S-curves, or traffic circles in the geometric roadway design to reduce and control the speed of traffic. Ensure that any curves are adequate to support the design vehicles (recommend minimum of AASHTO WB-50).
2. Consider the possibility of temporary barriers required by the installation AT Plan at certain FPCONs. Many installations may use jersey barriers, water-filled plastic barriers, or similar obstructions to reduce the number of lanes and reduce the speed of oncoming traffic. If possible, consider the incorporation of design details to support the installation of temporary barriers. This might include the incorporation of pre-positioned sleeves or anchors to secure temporary bollards, etc. Any obstructions in the roadway shall be clearly marked and identified with Type III Barricade markings in accordance with Section 3F.01 of MUTCD.
3. Maximize the length of the approach zone, to provide optimal stacking distance for the traffic queue.
4. Consider the use of reversible lanes to facilitate increased throughput and increased flexibility where space is unavailable for additional lanes.
5. Where necessary and desirable perform sorting of traffic by vehicle type. One example would be utilizing the farthest right lane for truck traffic, which facilitates the rejection of these vehicles by supporting their larger turning radii. Sorting can also increase throughput by separating vehicles with varying inspection requirements.

Access Control Zone Guidelines

1. Provide infrastructure to support manual and automated identification and inspection procedures for the inbound and outbound lanes. The access control zone should be configured to support tandem processing.
2. The main identification area will generally be covered with an overhead canopy to protect against inclement weather, facilitate identification and inspection procedures, and provide a platform for lighting and CCTV.
3. As illustrated by the functional diagrams shown in Figures 3.1 through 3.3 there may be the need for several rejection points from an ECF. At a minimum two rejection points shall be provided. One shall occur prior to the central identification area / gatehouse and the other will occur after this point.
4. Provide a channelization island between all inbound and outbound lanes. A primary channelization island will be located in the identification area. A secondary channelization island will be positioned prior to the first rejection point. This island will support the installation of future automated access control systems.
5. The access control zone will be designed to facilitate POV inspections out of the traffic lanes. This can be accomplished with a separated lane/inspection area or through the use of a late pull-off.
6. Each ECF will have a minimum of one gatehouse. Additional sentry booths may be provided if required. The gatehouse can be centrally located on a median, or may be positioned to the side of the ECF.

Response Zone Guidelines

1. The response zone will be designed with a sufficient length to provide adequate reaction time for security personnel to respond to a threat.
2. Active vehicle barriers will be provided at the termination of the ECF to provide the capability to stop threat vehicles from using high-speed attacks to gain entry to the installation.

Many of these design guidelines are illustrated in Figures 4.1 through 4.4. Figure 4.1 illustrates an ECF with manual identification and inspection procedures. Figure 4.2 illustrates the same ECF operating using an automated access control system, similar to the one described in Section 3.3.2. Figures 4.2 and 4.3 illustrate alternative layouts of the access control zone utilizing pull-off inspection areas in lieu of a separate inspection lane. The following sections provide further detailed design guidelines for the layout of the entry control facility.

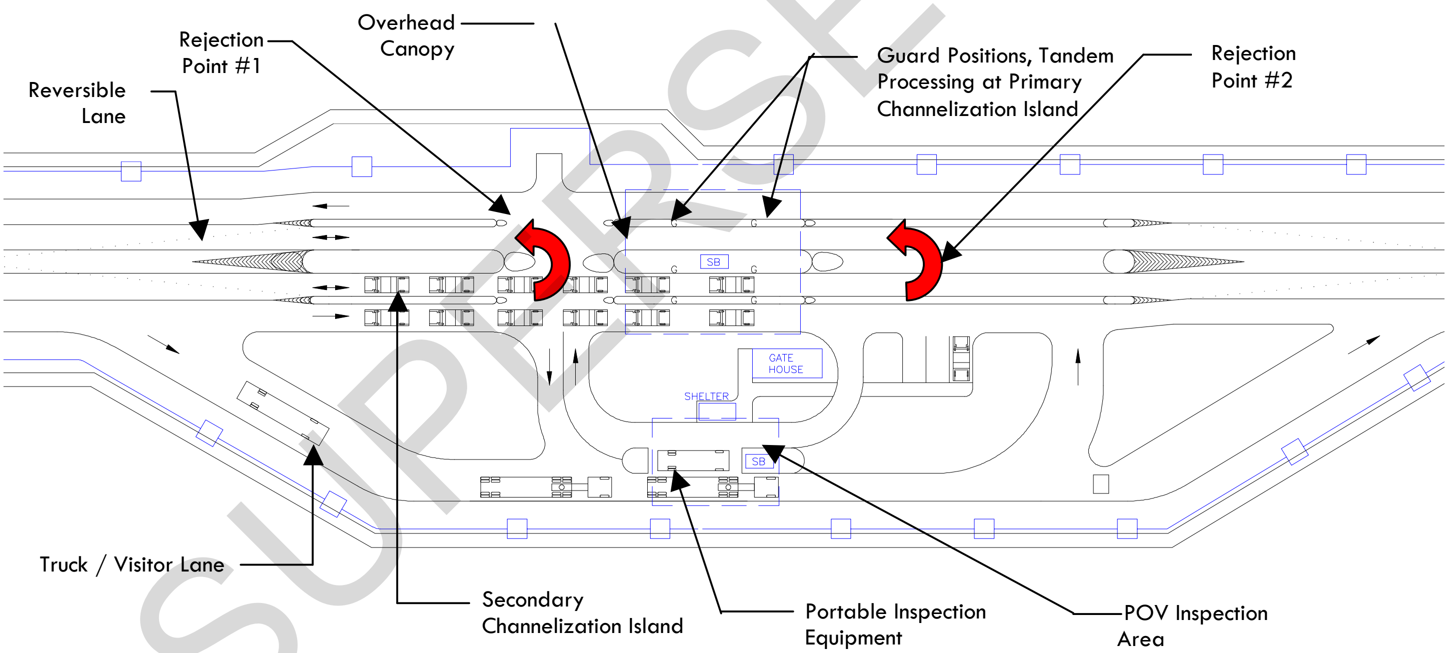


Figure 4.1 Access Control Zone Operated by Security Personnel

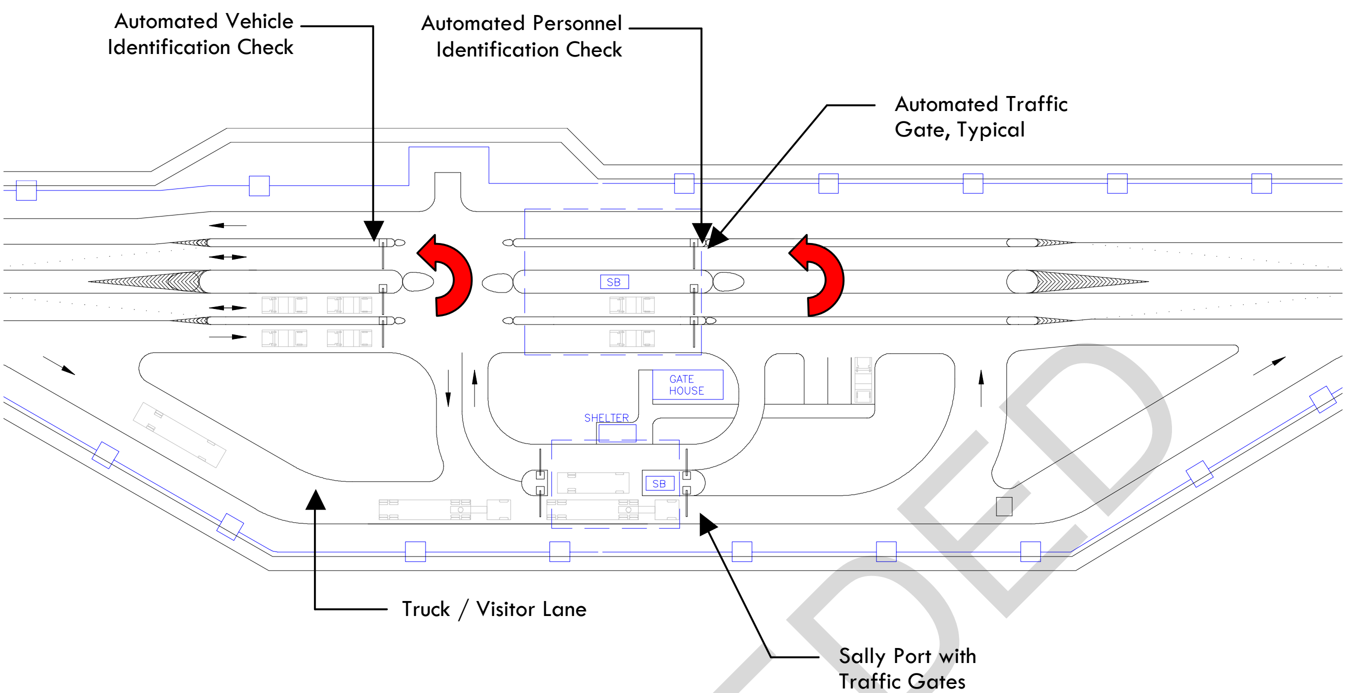


Figure 4.2 Access Control Zone Operated by Automated Equipment

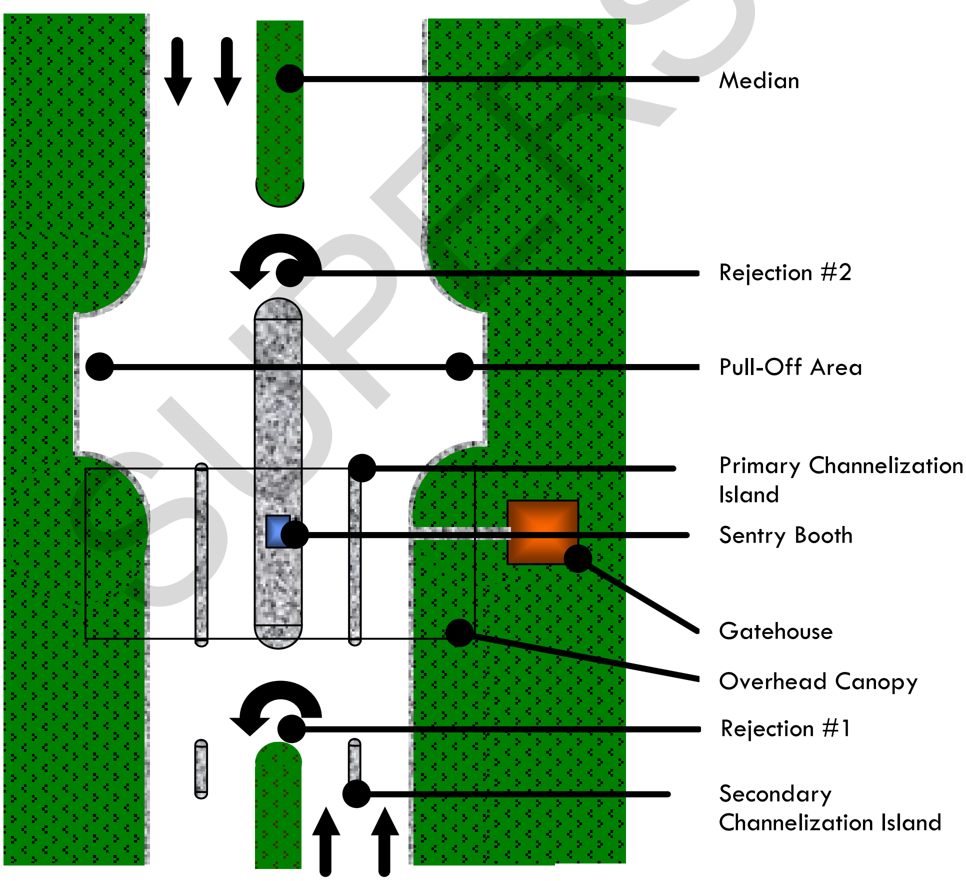
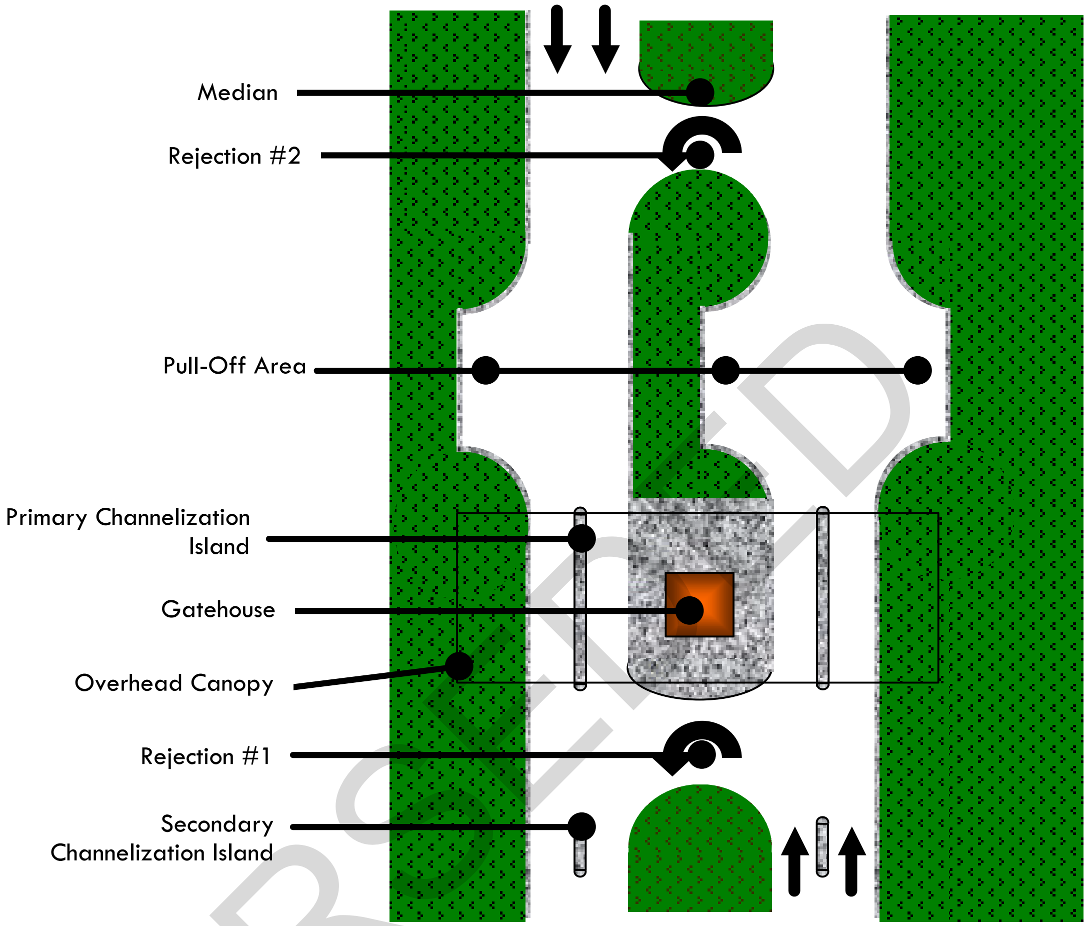


Figure 4.3 Access Control Zone with Pull-Off Area for Inbound and Outbound Lanes

Figure 4.4 Access Control Zone with Pull-Off Area for Each Inbound Lane



4.2.1 Containment and Control of Vehicles

Perhaps one of the most important goals of the design of Entry Control Facilities is to ensure that vehicles are contained through an arrangement of passive and active vehicle barrier systems such that a threat vehicle cannot exit the entry control facility and enter the installation upon detection. The barrier system will start at the beginning of the approach zone and then surround the approach, access control, and response zones. Full containment and control of vehicles is required for all ECFs. Reference 3 provides detailed guidance on the selection and application of passive and active vehicle barriers. The aesthetics and design of the barrier system should be consistent with the installation exterior architectural plan and the surrounding architectural and landscape features.

4.2.1.1 Vehicle Barriers

There are two types of vehicle barriers, passive and active. Both active and passive barriers can be fixed or movable. Active barriers require some action, either by personnel, equipment, or both, to prevent entry of a vehicle (3). Passive barriers generally have no moving parts and rely on the ability to absorb energy and transmit the energy to its foundation. The design of vehicle barrier systems will be completed in accordance with MILHDBK 1013/14 (Ref. 3), which provides a thorough discussion of the selection and application of active and passive vehicle barriers, except as modified herein.

Passive vehicle barriers shall be provided starting at the installation boundary. The passive vehicle barriers shall continue around the entire perimeter of the ECF, to the active vehicle barriers at the end of the response zone. Any of the passive barrier systems defined in MIL-HDBK 1013/14 are acceptable. The aesthetics of the barrier system shall also be considered. Breaks in the passive barrier system will be provided to support pedestrian access to the access control point, however no break will exceed 1 meter (3 feet) in width.

All entry control points will be provided with active vehicle barriers to enable the entry control point to be closed and prevent a threat vehicle from breeching security. All active barriers for the main traffic lanes shall have a minimum Department of State (DOS) rating of K12. The penetration is designated L1 – L3 in the DOS rating system. The allowable penetration will be based on site considerations and the proximity of inhabited facilities or high value assets. Active barriers for secondary lanes or to be used as access gates to the ECF are to be designed in accordance with MIL-HDBK 1013/14 based on a design vehicle with a gross weight of 15,000 lbs, a maximum speed based on the site design, and considering the angle of approach. Provide active vehicle barriers in the incoming and outgoing lanes in order to prevent threat vehicles from using the outgoing lanes to gain access to the installation (1). Insure the active vehicle barriers are planned and constructed in accordance with MIL-HDBK 1013/14, including all necessary safety measures. The emergency activation of active vehicle barriers will in all cases trigger the ECF duress alarm. Active vehicle barrier systems can require significant maintenance. Therefore to facilitate maintenance and reduce costs it is desirable that the types of vehicle barriers be minimized at each installation. One example would be employing hydraulically operated, wedge type barriers at all ECFs at an installation.

As discussed when defining the response zone, the reaction time required between the detection of threat and the activation of the active vehicle barriers is a critical factor in determining the function and layout of an entry control point. It is also important to identify where controls for the active vehicle barriers will be located. It is suggested that as a minimum, tamperproof activation controls be provided at each guard facility or post (channelization island, gatehouse, sentry booth, and alternate guard position). This will reduce reaction time and increase the effectiveness of response by providing redundant control. Most active barrier systems are capable of being operated through several devices such as push button switches, wired and wireless hand operated switches, computer control systems, and radar or detection loop monitoring excessive speed or unauthorized entry (1). Due to the dangers associated with activation of a barrier system and the potential for false alarms, in no case shall activation of the barrier system be triggered through automatic detection and response. All control systems shall be based on the actions of the security personnel manning the entry control facility (such as push button or hand operated switches). This will provide an opportunity for security personnel to distinguish confused, inattentive, or drunk drivers from potential terrorists attempting forced entry (1). Automatic detection equipment such as detection loops or radar for excessive speed could be utilized for warning security personnel. Final selection of control systems should follow the guidance in MIL-HDBK 1013/14 and the preferences of the user. The active vehicle barrier control system shall be designed such that deactivation of the barrier requires a key or similar device. This requirement is based on the need to ensure a potential attacker is not capable of re-opening the ECF if the security personnel are incapacitated during an attack. The deactivation key would normally be kept by the duty officer or in a central location.

Safety of innocent personnel caught by an active vehicle barrier when it is deployed should be considered. Any deployed active vehicle barrier system has the potential to be lethal. Limitations on the maximum speed serve to reduce the potential for fatalities. For this reason, the speed of traffic in the response zone shall be kept to the minimum necessary to maintain the flow of traffic through the entry control facility. Detection loops embedded in the pavement around the active vehicle barrier system should be used to avoid activation of the vehicle barrier when a vehicle is directly over the barrier. In addition, warning lights should be placed at all active vehicle barriers. When the active vehicle barrier is in the closed position (stopping vehicle flow), a red stoplight should be used. At other times a yellow flashing light should be used (1).

4.2.2 Vehicle Inspection Capability

Most installations have inspection requirements that vary with force protection condition. The levels of inspection include vehicle identification (decal or automated checks), vehicle identification and personnel identification (ID check), random vehicle content inspections, and content inspection of all vehicles. These inspections are to be conducted on all vehicles, including those considered "authorized." Since vehicle content inspection can be time consuming, during periods of random vehicle content inspection it is important to allow the inspection to occur without impeding the flow of traffic through the entry control facility. This can be accomplished through the use of a separate inspection lane, a pull-off area, or dedicating a lane as dual purpose such as visitor and inspection. Ensure that the installation clearly defines the levels of inspection likely to occur for the different types of vehicle traffic (delivery vehicles, authorized vehicles, and visitors). Then, determine if a separate lane is required in order to mitigate the impact of inspection operations on traffic. Automation of identification procedures will not eliminate the need for this capability.

At some installations centralized truck inspection stations have been developed to inspect all delivery and truck traffic to the installation. Some installations have the requirement that all delivery and truck traffic enter a specific ECF/gate(s). This procedure centralizes the large vehicle inspection function and reduces the infrastructure requirement for access control zones at other ECFs to support the larger vehicles. However, due consideration should be given to the need for re-directing an errant large vehicle without major traffic disruptions should one mistakenly enter the wrong ECF. Note, the requirement to support the random inspection of POV and government vehicles at all entry control points remains. See Chapter 7 for more information on inspection of trucks or other large commercial vehicles.

During vehicle inspections, standard procedure normally involves removing the occupants from the vehicle. During periods of inclement weather, it is necessary to provide shelter for the occupants. Therefore a small shelter, similar to a bus shelter shall be provided as a minimum.

Consider using a "sally port" configuration in the inspection area. A "sally port" is created through the use of vehicle barricades or traffic gates. These barriers are intended to confine the vehicle during inspection until it is determined whether the vehicle is authorized to proceed or denied access to the installation.

4.2.2.1 Location and Support for Inspection Equipment

At this time most vehicle inspections use manual procedures with manual tools or handheld detectors. However, there are a number of inspection devices currently fielded or in development that aim to automate the inspection procedure. Some examples of these technologies are x-ray, ion mobility spectrometry, gamma ray imaging, and neutron analysis. The design of the access control zone should include provisions for the future incorporation of these devices where possible. Since many of these devices are not currently deployed, the design should include space for vehicle inspection equipment and provide utility conduits to the anticipated location for future use. The inspection equipment may be a mobile or fixed installation. It is possible that mobile units will be used randomly at standard ECFs, while a fixed or mobile unit would be utilized on a continuous basis at a truck inspection facility.

Chapter 7, which discusses truck inspection facilities, provides information concerning common types of inspection equipment including layout considerations. Further information concerning the types and configurations of explosive detection equipment is available at the Department of Navy Explosive Detection Equipment website at http://www.explosivedetection.nfesc.navy.mil/.

4.2.3 Capability to Reject Unauthorized Vehicles

Inevitably, unauthorized vehicles will enter the ECF. It must be possible to redirect these vehicles such that they can exit the ECF prior to leaving the access control zone and entering the installation. The impact on traffic of this function should be minimized. Vehicles denied entry may be required to cross several lanes of incoming and outbound traffic to exit the ECF. These vehicles will require assistance to exit quickly (1). The assistance will be from security personnel directing traffic or, if the ECF is automated, through the use of traffic gates to stop normal traffic. The roadway should be designed considering the required turning radius to allow a single movement for the vehicle to be redirected. The design should consider the largest design vehicle expected at the gate. Therefore where possible, the design of the entry control point should accommodate the turning radii of the AASHTO WB-15m (WB-50) vehicle to limit the time necessary for the reject vehicle to leave the entry control facility. If space is unavailable to support a single movement, the impact on the flow of traffic while a vehicle makes a three-point turn or similar movement must be considered. If the impact is infrequent or acceptable, or large vehicles are not expected at the ECF, then the required space can be minimized.

As illustrated by the functional diagrams shown in Figures 3.1 through 3.3 there may be the need for several rejection points from an ECF. At a minimum two rejection points shall be provided. One shall occur prior to the central identification area / gatehouse and the other will occur after this point. These rejection locations are illustrated in Figures 4.1 through 4.4.

4.2.4 Geometric Design of Roadways

The design of roadways in an Entry Control Facility will be based on the latest edition of the AASHTO Policy on Geometric Design of Highways and Streets except as modified in this guidance. See Chapter 7 for requirements specific to truck inspection operations and facilities. Additionally, the design should consider the requirements to support oversized, atypical vehicles such as those frequently encountered during construction operations or during mobilization of military vehicles and equipment.

4.2.4.1 Channelization Islands

Channelization islands provide a safe position for security personnel and serve as a location to install present or future access control devices. A primary channelization island will be provided between each incoming and outbound traffic lane in the access control zone. The island is required in the outbound lanes due to security regulations that may periodically require the inspection of exiting vehicles and also due to the potential for automated access control, which may be used to monitor and identify exiting vehicles. The minimum primary channelization island will be 914 mm (3 feet) in width, 160 mm (6 inches) in height and 15.2 meters (50 feet) long. A secondary channelization island will be provided prior to the first rejection point in the access control zone. This island will support potential future automated access control systems. The secondary island will be a minimum of 914 mm (3 feet) in width, 160 mm (6 inches) in height and a length of 3 meters (10 feet).

4.2.4.2 Median

As discussed in Reference 9, medians are constructed to:

- Separate opposing traffic
- Provide stopping areas during emergencies
- Support left-turning or U-turning vehicles
- Provide refuge for pedestrians
- Reducing the effect of headlight glare
- Provide temporary lanes and cross-overs during maintenance operations

Medians can greatly improve the safety of the roadway. Medians can be either raised, flushed, or depressed depending on the required functions (9, 542). A flushed median would be utilized to facilitate the operation of reversible lanes. A raised median surrounded by a curb should be utilized in the access control zone for the central identification island. The minimum recommended median width is 3.6 meters (12 ft.). Automated access control systems may be installed in the median similar to a channelization island. Therefore medians should have infrastructure to support this potential (see Section 4.6 for additional detail).

4.2.4.3 Lane Width

The minimum lane width will be 3.0 meters (10 feet). Caution when using the minimum lane width is warranted where large vehicle traffic is anticipated, as a 3-meter lane is highly restrictive. The narrow lane would also negatively impact the ability to conduct safe POV inspections that are required during periods of higher FPCON or during the exercise of RAMs. The designer should also assess the impact of a narrow lane on the capacity of the ECF. Traffic flow is restricted when the lane width is less than 3.6 meters (12 feet) due to the close proximity of vehicles, which leads to motorists compensating by driving more cautiously and increasing the spacing between vehicles (9, 247). The preferred lane width, facilitating the flow of traffic and other operations, is 3.6 meters (12 feet).

For lanes or pull-off areas utilized for random inspection purposes, the minimum width will be 5.5 meters (18 ft.) to facilitate the safe inspection of vehicles. The length of the pull-off area will be a minimum of 12.2 meters (40 ft.) or the length required to support the largest expected vehicle at the ECF.

4.2.4.4 Curbs and Gutters/Shoulders

Shoulders are desirable for accommodation of disabled or stopped vehicles (7, 20). However, curb and gutter are preferable in areas where lane control is desired and to improve safety. Therefore, shoulders are recommended for use in the approach and response zones. Curb and gutter is required in the access control zone and around all channelization islands.

4.2.4.5 Transitions and Tapers

When lanes are redirected, dropped, or added, proper transitions must be provided to enhance traffic flow and ensure safety (2). The transition affords drivers the opportunity to recognize the change and react appropriately (2). At a minimum, transitions will be required to redirect lanes at the curbed islands. Ref. 2 provides transition length criteria for the situations listed above. Other traffic engineering references will provide useful information and design guidance for these situations as well.

The recommended transition distances in Ref. 2, should be followed as minimums unless it can be shown through proper traffic engineering that shorter transitions will not inhibit the flow of traffic through the entry control facility. The minimum speed (S) used for determining transition lengths will be 40 kmph (25 mph). If the minimum transition distances are unavailable, then the lane addition, lane deletion, or lane width modification requiring the transition shall be eliminated.

4.2.4.6 Roadside Safety

Barrier end treatments and the need for crash cushions will be determined in accordance with AASHTO Roadside Design Guide, latest edition. For personnel protection requirements see Section 4.11.

4.2.4.7 Lateral Clearances

Lateral obstructions present a safety hazard and tend to negatively impact traffic flow. The negative effects are eliminated or reduced if the object is less than 152 mm (6 in.) in height or located at least 1.8 meters (6 ft.) from the edge of the roadway (9, 247). Ideally the lateral clearance would be greater. Therefore, the location of lateral obstructions in the approach and response zones, including the passive vehicle barriers, shall be a minimum of 1.8 meters (6 ft.) from the edge of roadway. It is recommended that passive vehicle barriers defining the boundary of the ECF be located 3.6 meters (12 ft) from the edge of road. Where passive vehicle barriers must extend close to the active vehicle barriers at the end of the response zone to maintain containment, this minimum is not applicable. Additionally, in the access control zone the location of facilities and access control equipment will likely provide less lateral clearance. Where possible, a minimum lateral clearance of 610 mm (2 ft.) should be maintained in the access control zone to allow security personnel to pass between the obstruction and the roadway.

4.2.4.8 Vertical Clearances

AASHTO standards indicate a minimum vertical clearance of 4.3 meters (14 ft.) for highways or 4.9 meters (16 ft.) for freeways. In order to support potential over height vehicles and/or future pavement overlays, a minimum vertical clearance of 5.2 meters (17 ft.) will be maintained throughout the ECF.

4.3 Traffic Considerations

The effect of an entry control facility design on the surrounding roadways and intersections is of paramount concern. If congestion occurs, and there is inadequate stacking distance the queues may extend into adjacent intersections or cause congestion on feeder roads. Additionally, the stopped vehicles become a target of opportunity themselves. Reference 2 suggests the access control zone should ideally be a minimum of 100 meters (300 feet) from any intersection, however, in many cases this may not be possible. The design of a modification or renovation of an existing ECF should improve the throughput of the ECF, and as a minimum not reduce the throughput.

4.3.1 Capacity

The design capacity is based on the peak hour traffic volume that the entry control point would handle without unreasonable congestion. The design should consider both current and future traffic demands, where the design demand is the peak hour traffic volume, such as the morning rush hour. If the rate of vehicles arriving at an entry control facility exceeds the rate of processing, then congestion will occur (2). As discussed in Section 2.3, the FPCON has a great effect on the processing time per vehicle and the traffic volume due to changes in the inspection procedures and the number of authorized vehicles. The traffic design of the ECF will consider the operations at all FPCONs. However, since some disruption in the level of service is expected at high FPCON(s) (Charlie or Delta), the traffic impacts will be designed based on the elimination of congestion at FPCON Bravo and below. At FPCON Charlie and Delta, some congestion may occur but this is sometimes offset by the installation also reducing the population seeking to enter the installation to mission essential personnel only during FPCON Charlie or Delta. The congestion during FPCON Charlie or Delta should be minimized where possible.

If the final capacity achieved at an entry control point is below the expected peak hour traffic volume, congestion can also be reduced by implementing staggered work hours, encouraging carpooling, adding lanes, and/or tandem processing (multiple identification checks per lane) (2). It has been estimated that tandem processing may improve capacity by up to 25% per lane (2). Therefore as a minimum, all entry control points shall be designed to support tandem processing. It may also be possible to design lanes to be reversible such that outbound lanes can be used for incoming traffic during periods of peak volume. However, priority should be given to maximizing the number of lanes prior to utilizing reversible lanes.

4.3.2 Adequate Lanes

The number of lanes planned for an entry control point shall be sufficient to handle the expected volume of traffic, especially during times of peak demand such as morning rush hour. If necessary and possible, increase the number of lanes to increase the throughput of the entry control point. To aid in the determination of the required number of lanes, Table 4-1 provides reference information concerning the approximate throughput of entry control points during different levels of identification.

Identification Type	Capacity (vehicles/lane/hour)	
	Reference 1 (1986)*	Reference 2 (2001)*
No Direct Checks	1400	600-800
Vehicle Identification Only	1000-1200	400-600
ID and Vehicle Identification	400-600	100-200
Complete Vehicle Inspection	<60	N/A
Traffic Arm w/ Card Reader	150	N/A

*Note: Tandem Processing increases capacity by 25% (2)

Table 4-1 Estimated Vehicle Throughput (Ref. 1and 2)

4.4 Traffic Control

Signs, markings, and signals are necessary to perform traffic control and satisfy regulatory requirements and will be provided in accordance with OPNAV 5530.14C Appendix VII and the Manual on Uniform Traffic Control Devices (MUTCD). Due to the likely increase in use of automation and the subsequent increase in channelization of traffic, guide signs will become increasingly important to indicate lane use and direct traffic into the appropriate lanes. Regulatory signs will provide information on traffic laws and regulations. Warning signs, markings, object markings, and delineators will indicate hazards to users. These signs will reduce conflict between approaching vehicles and improve the flow of traffic through the ECF. A limited use of signs in all zones and especially in the access control zone is strongly encouraged. Signs in the access control zone may obstruct the view of the guards. Replacing signs with pavement markings will provide the desired effect. Overhead guide signs should be used when the gate has three or more lanes, with varying functional use in each lane. Variable Message Signs (VMS) provide the ability for security personnel to inform motorists of security level, roadway status, or other general information (2). Vehicles approaching the ECF should be informed of their approach to a restricted area. This may require coordination of signage on approaching roads with state or local officials. Additional information on the standard size and shapes of markings and signs can be found in the latest edition of the Federal Highway Administration's "Standard Highway Signs."

It is also desirable to manage the speed of traffic in the entry control facility for the safety of the accessing vehicles and security personnel (see Section 4.2.1.1 concerning the risks presented by active vehicle barriers). The speed limit in the entry control facility shall be clearly posted. In addition the use of geometric roadway layout features or other traffic control devices such as "rumble strips" or warning strips, caution signs, or traffic or flashing lights should be used in the response zone to manage the speed of traffic and increase awareness of the active vehicle barrier system.

4.4.1 Speed Limit

The speed limit must be 25 mph or below throughout the ECF to protect security personnel and to minimize the potential for accidental impact with vehicle barricades. This speed limit also applies to the outbound lanes as they approach the vehicle barricades. Any deployed active vehicle barrier system has the potential to be lethal. Limitations on the maximum speed serve to reduce the potential for injuries or fatalities.

4.4.2 Signage

Signage will be provided in accordance with OPNAV 5530.14C Appendix VII and the Manual on Uniform Traffic Control Devices (MUTCD). Examples of signage, which will frequently be used in an ECF, are provided below. Sign designations in accordance with the latest edition of the Federal Highway Administration's "Standard Highway Signs" are provided in parentheses.

<u>APPROACH ZONE</u>

Inbound Traffic

- Reduce Speed Ahead (R2-5a)
- Speed Limit Sign (R2-1)
- Trucks Use Right Lane (R4-5 or R4-6) (if applicable)

Outbound Traffic

- Do Not Enter (RS-1), at end of transition
- One Way (R6-1 or R6-2), at end of transition

Both Directions

- Road Closed (R11-2) Secured to both sides of gate
- Type III Barricade marking signs, (3 per lane) Secured to both sides of gate at installation perimeter (horizontally)

<u>ACCESS CONTROL ZONE</u>

- Guide signs indicating lane use (One per lane)
- Type 1 Object marking signs on barriers for personnel protection

<u>RESPONSE ZONE</u>

Warning signs shall be placed a minimum of 100 ft before the active vehicle barrier, where the active vehicle barrier signal is not visible.

Outbound Traffic

- Reduce Speed Ahead (R2-5a)
- Speed Limit Sign (R2-1)

Inbound Traffic

- Do Not Enter (RS-1), for inbound traffic at end of transition
- One Way (R6-1 or R6-2) for inbound traffic at end of transition

4.4.3 Markings

Provide individual broken lane lines for each lane. Provide dotted transition lines for reversible lanes. Double yellow broken lines will be used on both sides of a reversible lane. Provide, repair, or upgrade crosswalks impacted by the ECF. Solid yellow lines, delineators, and chevron markings will be used to indicate obstructions between lanes traveling in different directions and reversible lanes. Provide dotted transition lines for reversible lanes. Solid white lines, delineators, and chevron markings will be used to indicate obstructions between lanes traveling in the same direction. Solid lines will be used to prevent changing lanes just before and just after the elevated islands. Provide symbols to indicate the appropriate turning movements. Black may be used to outline the pavement marking where light-colored pavements do not provide sufficient contrast with the markings.

4.4.4 Traffic Control Devices

As a minimum "rumble strips" shall be utilized at the entrance to the entry control facility to alert oncoming vehicles and prior to the active barriers in the outbound lanes to alert exiting vehicles. The use of speed bumps, humps, etc. with a height greater than 0.5" above the pavement surface is prohibited. Guardrails will be used to transition from shoulder to passive vehicle barriers. Where active vehicle barriers or traffic arms are utilized, provide red and white reflectorized arms or surfaces. As discussed in Section 3.4.2, at a minimum, all active vehicle barriers will have warning signals placed prior to all active vehicle barriers in each direction. The warning signals will have red and yellow lights; with the yellow light having the ability to flash. When the active vehicle barrier is in the closed position (stopping vehicle flow), a red stoplight should be used. At other times a yellow flashing light should be used (1).

4.5 Pedestrian Considerations

Many entry control points handle vehicular and pedestrian traffic. Many installations may have a significant pedestrian volume. Where pedestrian access control is required, insure proper sidewalk and safety provisions to direct pedestrian traffic to the access control zone and separate it from vehicular traffic. Pedestrian access should be designed to ensure security personnel can maintain visual contact with the pedestrians as they approach the ECF. Sidewalks shall be planned to integrate into the existing site layout and accommodate new facilities. Breaks should be provided in the passive barriers to allow pedestrians access to the entry control facility. Any break in the passive barrier shall not exceed 1 meter (3 ft.) in width.

Provide sidewalks with a minimum width of 1.2 meters (4 ft.). Crosswalks shall be 1.8 meters (6 ft.) in width. The ECF shall also incorporate turnstiles or similar devices that can be automated to facilitate authorized access control. Ensure turnstiles incorporate access control systems or are capable of being upgraded in the future. Other considerations in the selection of turnstiles or similar access control devices include the control of potential tailgating and the likelihood that personnel will have equipment or luggage, which may require additional space in the turnstile.

4.6 Electrical Power Requirements

Electrical design shall consider current power demands as well as the power requirements for future traffic control devices, identification equipment, and other devices associated with potential automation of the entry control facility.

OPNAV 5530.14C specifies emergency power for protective lighting provided for restricted areas. TM5-811-1 specifies an alternate electrical power requirement for security lighting. Similarly, each ECF shall have provisions of an alternate electrical power source. In the event of a loss of the primary electrical source, a reliable alternate power source is necessary to ensure continuous operation of the ECF. A standby generator will be used as the alternate electrical power source. Either automatic or manual starting of the generator and load transfer will be provided depending on the permissible electric power outage duration (5). In some cases, installations may specify the use of portable generators in addition to stationary auxiliary electric power sources. Provision of portable units is not the designer's responsibility, beyond providing a connection point when directed.

Due to operational considerations, it may be necessary to provide an uninterruptible power supply (UPS) for use during generator starting and load transfer. The UPS system would support any computerized equipment to avoid power disruption. In accordance with TM5-811-1, UPS will not normally be used for security lighting. An UPS system designed for computer loads will not perform satisfactorily for lighting applications. If the installation requires the use of UPS, the design should clearly identify the nonlinear nature and switching patterns of the load to be served (5, 11-5). The sites of ECFs are commonly congested and limited in size. Therefore, transformers provided for ECFs should be provided with less flammable insulating fluid in order to facilitate the placement of the transformer closer to structures located in the ECF.

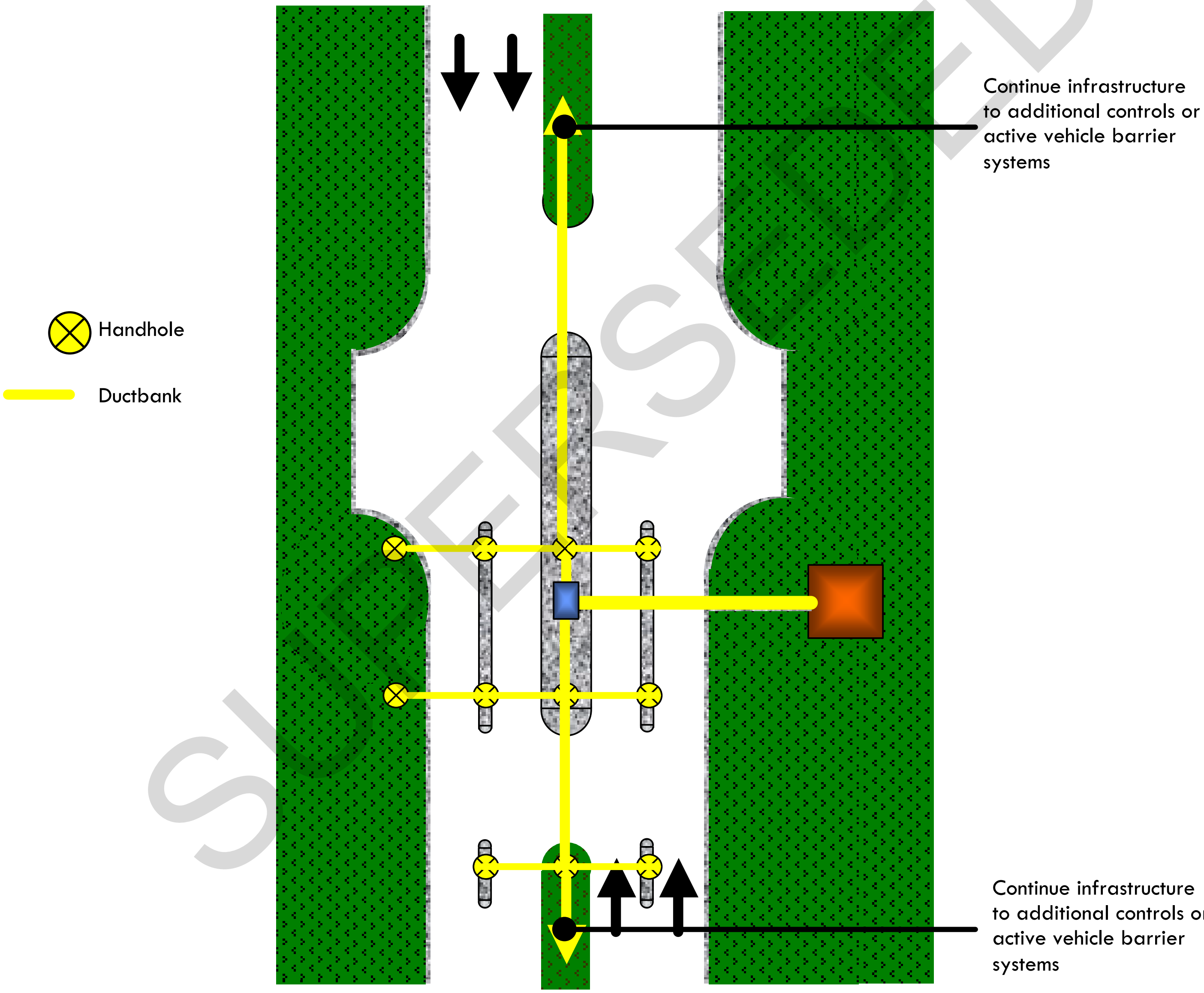


Figure 4.5 Typical Locations for Provision of Future Power/Control Connections

In order to facilitate the installation of the electronic systems, spare duct bank and conduit shall be run in a similar manner to that shown in Figure 4.5. At a minimum provide a system of underground concrete-encased PVC ductbank and fiberglass/composite handholes for distribution of power, control, and communications/data wiring from the ECF control center (gatehouse) to each remote device. If no detailed locations are pre-determined for remote devices, provide two handholes located at either end of each primary channelization island, one at each secondary channelization island, and similarly in the median. The layout should consider the first automation device to be positioned prior to the rejection point located before the main identification checkpoint. Consider the possibility of access control systems being used for recording outbound lane activity in addition to inbound traffic identification. Power and communications wiring shall be separated in accordance with the National Electrical Code (NFPA 70) and the National Electrical Safety Code (IEEE C2). Details of minimum sizes for the ductbank and handholes are provided in the prototype drawings in Appendix 1. Space shall be reserved in the gatehouse for the controls and electric panelboards associated with the future control systems.

4.7 Exterior Lighting

There are several references that discuss site lighting for general security purposes and entry control facilities (see Ref. 2,5,6). As indicated in reference 5, the quantity and quality of illumination will conform to the latest edition of the Illuminating Engineering Society's of North America (IESNA) Lighting Handbook, except as modified in this guidance. In the design of lighting for an ECP, the lighting requirements vary depending on the zone of the entry control point. The ECF should be provided with multiple, redundant luminaires to ensure the loss of a single luminaire does not seriously degrade the total available lighting available for security personnel (8, 29-20).

The approach and response zones require typical roadway lighting. The roadway lighting should provide enough intensity so that pedestrians, security personnel, islands, signage, and other hazards are visible (2). The lighting should not be directed in the driver's eyes and it should not backlight important signage (2). Table 4-2 provides the suggested minimum illuminances for the various areas of an ECF. Transitional lighting is necessary on approaches to the entry control point so that drivers are not blinded during arrival and departure (7). As discussed in the IESNA Lighting Handbook, a "visually safe installation must be free of glare and of uncontrolled, large differences in luminances. Maximum luminance ratios are important in order to avoid temporary reductions in visibility because of changes in readapatation when alternately looking a areas of widely different brightnesses (8, 29-17)." The guidance provided in the IESNA Lighting Handbook for limiting glare and adaptation effects should be followed. Reference 7 indicates the illumination level should be reduced by 50 percent within the average distance traveled in 15 seconds in order to create proper transitional lighting The lighting at the ECF should be designed as controlled lighting, to reduce light pollution and increase traffic safety. Glare projection or glare lighting should be avoided where a safety hazard would be created. Utilize luminaires that are classified as cutoff or semi-cutoff.

In the access control zone, area lighting is provided in the vicinity of the facilities. This lighting must be provided at a higher level as indicated in Table 4-2, to facilitate identification and inspection procedures. The lighting needs to illuminate the exterior and interior of a vehicle to facilitate identification of the occupants and the vehicle contents. Good vertical illuminance facilitates the identification and inspection procedures (8, 29-20). Lighting levels above those

Application	Minimum Illuminance, lx (footcandles) at Ground Level*	Notes
Approach Zone and Response Zone	20 (2) Limited Use Gates 30 (3) Secondary Gates 40 (4) Primary Gates	Illuminance on the pavement and sidewalks
Access Control Zone	100 (10) or twice the immediate surrounding areas, whichever is greater	In immediate area where identification and inspection occur. Also vert. Illuminance = 25% of horizontal illuminance should be provided at the level of the vehicle driver.

*Ground level is defined as 15cm (6") above ground level

Table 4-2 Minimum Exterior Illuminances (Ref. 2 (pg. 3) and Ref. 8 (pg. 29-17))

indicated in Table 4-2, may be appropriate where practical and desired. However, careful consideration of the potential adaptation problems and the design of the lighting of surrounding areas are required for the safety of traffic and security personnel. It may also be necessary to provide additional task lighting in the ID and inspection areas to support adequate identification of vehicle occupants and contents. Lighting may also be mounted at or below pavement level to facilitate under vehicle inspection or associated with under vehicle inspection systems (see Section 7.2) (8, 29-20).

As discussed in the IESNA Lighting Handbook, the light source spectral power distribution is important for identification and inspection tasks such as seeing hair, eye, clothing, complexion, and vehicle colors. The ability to identify colors accurately and confidently is determined by the light source spectral power distribution and the illuminance level. This capability is commonly referred to as color rendition and is measured by the color rendition index (CRI). To ensure appropriate color rendition, any nominally white light source (CRI > 50) will be used at the illuminances typically encountered at an ECF (8).

When closed circuit television (CCTV) is used as part of the security operations, it is important to coordinate the lighting and CCTV system (5,11-1). References 5 and 6 provide further information on designing lighting systems for use with CCTV.

Another important consideration in the design of the site lighting, is the restart or restrike time for the selected lamps. Restart occurs when a lamp experiences a loss of power and there is a time delay before backup power restores power to the lamp and the subsequent restrike or restart of the lamp. The restart capability should be coordinated with the user. As an example, high intensity discharge (HID) lamps are more energy conserving than incandescent lamps, however, they require several minutes to warm up and restart after power is interrupted (5,11-4). This period of time may be unsatisfactory for security operations. The installation should designate the maximum acceptable period for which loss of illumination can be tolerated, however, without specific data two (2) minutes is considered the maximum outage period acceptable (5, 11-1). The selection of light sources, especially in the access control zone, should include an evaluation of restart or restrike time. It may be necessary to provide lamps and auxiliary equipment for rapid startup and restrike to provide minimal adequate lighting in the event of a power interruption.

Where an ECF includes modifications to the installation perimeter lighting system refer to references 5 and 6 for guidance on the design of installation perimeter lighting.

4.8 Communications and Information Technology

The guard facilities will have telephone communication capability. In addition, some installations may require an emergency ring down telephone, which provides a direct, hard-line connection to the installation emergency dispatch or control center. The requirements for radio-based communication should be coordinated with the installation. Due to the potential of computerized identification systems, the ECF shall be capable of connecting to installation wide information technology systems. Each guard shelter will have provisions for connection to the installation wide computer network, as well to a central server to be located in the gatehouse. If no installation wide data cabling system exists, this capability can be achieved through the use of the telephone system.

The ECF shall be provided with a central duress alarm, which will signal the installation emergency control center, dispatch center, or similar designated location. The duress alarm will be activated automatically upon emergency activation of the active vehicle barrier system.

As discussed in Section 4.6, to facilitate the installation of the electronic systems, spare duct bank and conduit shall be run in a similar manner to that shown in Figure 4.5. At a minimum provide a system of underground concrete-encased PVC ductbank and fiberglass/composite handholes for distribution of power, control, and communications/data wiring from the ECP control center (gatehouse) to each remote device. If no detailed locations are pre-determined for remote devices, provide two handholes located at either end of each channelization island and the median. The layout should consider the first automation device to be positioned prior to the rejection point located before the main identification checkpoint. Consider the possibility of access control systems being used for recording outbound lane activity in addition to inbound traffic identification.

4.9 Utilities

Water service for general use and for the unisex restroom in the gatehouse will be provided. Waste system utilities will be provided for the unisex restroom. If it is technically impossible or economically infeasible to provide these utilities to an ECF due to site constraints, the installation may wave the requirement to provide the water and waste utilities. See Section 4.6 for electrical power requirements.

4.10 Perimeter Fence and Gate

The ECF typically begins at the installation perimeter. In most cases the perimeter is defined and secured with a fence. Each ECF should have a gate enabling the ECF to be closed at the installation perimeter when not in use. This gate should be reinforced with cables as indicated in MIL-HDBK 1013/14 to increase resistance to a moving vehicle threat. In addition the gate shall have Type III Barricade markings in accordance with Section 3F.01 of MUTCD (3 per lane) secured to the gate horizontally. This configuration enables a reduced potential penetration, maximizes standoff, and controls the entry of pedestrians during periods when the ECF is not in use.

4.11 Personnel Protection

The design of the ECF should ensure safety of the security personnel operating the access control zone. The areas where guards will be posted shall be elevated above the roadway and the area should be protected from accidental impact from traffic (in either direction) through the use of barrier systems or crash cushions. One example of a barrier system would be a short, concrete bull nose wall at the beginning and end of an elevated island. By elevating the personnel on an island, they are protected from accidental impact during identification checks. The bull nose is designed to protect the personnel from potential injury caused by a vehicle leaving the roadway or lane. This type of system not only enhances the safety of security of personnel, but it also offers the personnel cover in the event of an attack. Guard facilities such as the sentry booth and gatehouse shall also be protected from vehicular impact through the use of barriers. See the AASHTO Roadside Design Guide for further information concerning barriers and crash cushions.

4.12 Facilities

The guard facilities at the ECF should provide a comfortable, safe working environment for security personnel. Generally, a single gatehouse centered in the entry control facility may be utilized, or alternatively the gatehouse may be located to the side of the roadway. If the gatehouse is located to the side of the roadway, consider providing a sentry booth in the central island of the access control zone to provide easily accessible shelter and protection for the guards operating the ECF. Ref. 4 provides guidance on the design of sentry booths, gatehouses, and guard towers. The sentry booth and gatehouse may be a site-built or prefabricated structure. The basic considerations in determining the size of the facility are number of personnel assigned during normal operations, space required for electronic and electrical equipment, mechanical equipment, and counter or work space. The appearance of the guard facilities should be in accordance with the installation exterior architectural plan. Visibility from the facilities should be maximized. Access will be provided from the guard facilities to the pedestrian walkways entering the ECF.

Where guard facilities are located near the roadway, a minimum platform width of 610 mm (2 ft.) shall be provided behind the curb (2, 2). This width is the minimum necessary for security personnel to stand post adjacent to the facility, therefore additional platform width is recommended to provide additional safety through increased lateral clearance and space for security personnel carrying weapons or equipment (7, 32).

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

4.12.1 Overhead Canopy

Providing an overhead canopy at the access control area can improve lighting, protect the guards and drivers from inclement weather, and serve as a platform for traffic control devices, signage, and security equipment. An overhead canopy will be provided for all posts routinely occupied by security personnel and the inspection/truck lanes unless directed by the installation not to provide the canopy over a portion or all of the posts. The canopy should extend over the entire access control area, providing protection for all potential guard positions. Variable message signs (VMS) should be provided on the canopy to indicate current force protection condition, provide driver instructions, and other general information (2). Each lane should have lane control signals in both directions, similar to toll collection or parking facilities, to inform incoming vehicles of the current lane configuration.

The overhead canopy also serves as a platform for lighting and security equipment. The canopy should be designed to support the future installation of closed circuit television (CCTV) cameras over each lane for inspection purposes or general observation.

The minimum clear height shall be 5.2m (17 ft.) to support common vehicle heights and facilitate use of the overhead canopy for lighting or security equipment. This clear height shall be measured from the pavement to the lowest point on the overhead canopy including light fixtures and other equipment. The architectural appearance of the canopy shall match surrounding features and meet the requirements of the installation exterior architectural plan.

4.12.2 Gatehouse

The gatehouse serves as the central control center for the ECF and provides shelter for security personnel. Every ECF must have a gatehouse, designed to support three to five security personnel (7). As the control center, the gatehouse controls the vehicle barricades, traffic control devices, access controls, and lighting. The design of the gatehouse should be based on consideration of the following equipment and functions:

- Communications equipment
- Electronic control panels for all current or anticipated future automated gates or barriers
- Monitor stations for CCTV or computer monitors associated with automation controls
- An electrical room for the main electric panelboards
- Locker storage for traffic control devices, weapons, and personnel equipment including vehicle inspection kits and the pre-positioning of personal protective equipment for CBR exposure
- Computer servers for future automated identification systems
- Counter or work space
- A unisex restroom.

4.12.3 Sentry Booth

The sentry booth is located in a median strip between incoming and outgoing lanes. The sentry booth provides one or two guards with protection against the weather and potential threats (1). The sentry booth should have space allotted for electronic control panels for gate automation equipment, workspace incorporating space for computer monitors, and an electrical panelboard. It should be possible to enter or exit the sentry booth from either side of the structure.

4.12.4 Auxiliary Guard Positions / Fighting Positions

Many installations desire additional position(s) for security personnel to facilitate a response to a threat. These positions are normally placed in the response zone to facilitate surveillance and armed response. This position may be fixed or temporary/portable. The auxiliary guard position/fighting position may be intermittently or routinely occupied. The facility will be designed to permit security personnel to respond to any attackers from a protected position (1). A permanent facility will normally be site-built. Other than openings or penetrations for weapons, the structure will provide ballistic protection from a medium threat severity level (UL 752 Level III) in accordance with MILHDBK 1013/10 as a minimum. The position shall be provided with controls to activate the active vehicle barrier system and HVAC as required for the environmental conditions.

The location of the auxiliary guard position should also be designed to afford personnel the ability to assess the threat, initiate alarms, activate the barrier system (if other personnel are incapacitated), and respond to the attack with force if necessary and authorized. Therefore the auxiliary guard position shall be located to provide a minimum of four (4) seconds of reaction time from the time a threat is detected or an alarm is initiated. The threat scenarios and guidelines for assessing the distance required in order to afford sufficient response time are discussed in Section 3.3.3. In most cases the auxiliary guard position will be located at or near the end of the response zone in order to provide sufficient distance for this response. Location of this facility shall also be coordinated with security personnel to ensure proper line of fire and safety considerations. If required, the facility may be elevated to facilitate the observation of incoming traffic and reduce incidental/collateral damage associated with line of fire considerations.

4.12.5 Floors/Walkways

The finished floor elevation should be 152 mm (6 inches) or more above grade or the adjacent walkways, unless the facility is located on a raised island. If the facility is on an island, the minimum finished floor elevation will be the elevation of the island (4). Provide floors and walkways with anti-skid surfaces. Anti-fatigue mats should be provided at all security personnel posts to relieve fatigue and discomfort from standing for long periods of time.

4.12.6 Construction

Design walls, doors, windows, and roof of the facilities for typical environmental loading. The required physical security design features shall be determined in accordance with installation requirements and existing security engineering references such as MIL-HDBK 1013/1A or TM-853. Threats that may commonly be considered include forced entry and ballistic attack. MIL-HDBK 1013/10 specifies, as a minimum, ballistic protection will be provided for a medium threat severity level. This threat severity level is equivalent to UL/ ANSI/ 752 Level III (SPSA). This protection will be a consideration in the design and construction of the exterior envelope including windows, doors, walls, and other equipment. Table 4-3 provides examples of the wall thickness required for commonly encountered materials to provide an adequate ballistic resistance from the medium severity threat level.

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

*Nominal thickness (Reference TM5-853 Volume 2)

Table 4-3 Thickness of Common Materials for Medium Ballistic Threat Severity Level

Since mechanical equipment may not be capable of providing sufficient ballistic resistance, the location of the equipment will be determined to minimize potential exposure to projectile penetration, or ballistic resistant louvers or equipment will be provided. As an example, it may be prudent to install the HVAC equipment on the roof of the gatehouse or sentry booth to reduce penetrations in the walls. Provide roof ballistic protection only where there are sightlines to the roof. Consideration of the corrosion resistance and maintenance requirements of the guard facilities, especially pre-manufactured facilities, is important due to the perils of shore side exposure commonly encountered at Navy installations and the high visibility of these structures.

As discussed in Section 4.12.8, specular-reflecting, low transmission glass at a tilted angle can be used in the windows to limit view into the guard facilities from the exterior. Any windows provided in the auxiliary fighting positions shall not interfere with the capability to respond to an attack. Therefore, any windows must be capable of being fully opened/removed quickly or have a substantial gun port to enable unobstructed line of fire from the position. Without these capabilities the auxiliary fighting positions should have no windows. If ballistic resistant glazing is maintained for some portion or all of an opening, consideration shall be given to the visibility through the glazing after it has been impacted during an attack. Some ballistic resistant glazing materials provide better visibility characteristics after impact than others.

4.12.7 Environmental Control

Provide heating and cooling appropriate for personnel, the electronic and electrical systems or fixtures, and the security support equipment (4). The HVAC requirements should be based on existing NAVFAC design guidance and installation requirements. Protection from chemical or biological agents used during an attack should be considered based on the anticipated threats. However, due to the small size of the facility comprehensive protection is often infeasible. In order to limit airborne contamination and maximize the time for security personnel to shelter in place and respond to an attack, the design of the HVAC system will include minimum measures such as those outlined in the DoD Minimum Antiterrorism Standards for Buildings (UFC 4-010-01). Design features should include elevated air intakes, emergency air distribution shutoff switch, and the use of gasketed doors and windows to minimize air leakage.

4.12.8 Interior Lighting

The interior lighting should be diffused lighting and should be provided with dimmer controls to aid with night vision and reduce the ability of those outside the guard facility to see inside. The interior lighting should be connected to the backup power source. As discussed in

Reference 8, the illuminance inside the guard facility should be limited to the minimum required for comfortable completion of the expected tasks and functions. As indicated in Figure 29-17 of Reference 8, the recommended average illuminance for the gatehouse is 300 lx (30 footcandles) on the work plane in the gatehouse. Additional recommendations from Reference 8, include providing well-shielded task luminaires to avoid reflections on monitors and windows. Also providing specular-reflecting, low transmission glass at a tilted angle and painting the inside of the gatehouse dark colors limit the view into the guard facility. Consideration should also be given to providing magenta filters for interior lighting to lessen the impact of interior lighting on the night vision of security personnel. See Section 4.6 for exterior lighting considerations.

4.12.9 Visitor Control Center / Pass Office (FUTURE)

4.13 Parking

The design of the access control zone should also incorporate parking to support security vehicles and vehicles associated with shift changes of security personnel.

4.14 Aesthetics

Primary entry control points provide the first public impression of the installation. It must present the proper appearance for visitors, employees, and military personnel (7, 1). The layout, landscaping, and architecture of the facilities are factors in the image.

4.15 Landscaping

Landscaping can greatly improve the aesthetics of the ECF and the impressions of personnel and visitors (7, 19). Landscape design should include line of sight considerations. It is important that the line of sight of security personnel through the ECF not be impeded. This includes consideration of auxiliary guard positions, which require an adequate and acceptable line of fire. Landscaping can also be used to provide natural features that can act as passive vehicle barriers to provide containment of vehicles through the ECF. As noted in MIL-HDBK 1013/14 (Ref. 3), ditches, berms, slope-cuts, and other natural features can be designed to be passive vehicle barriers. In addition, the existing natural terrain may be impassable by vehicles and incorporated into the design. Examples of using natural terrain would be utilizing bounding wetlands, dense forest, etc. as passive barriers. The use of the natural terrain and landscaping will aid in integrating the ECF into the existing landscape, improve aesthetics and image, and is encouraged.

4.16 Construction Phasing

If the project involves the modification of an existing entry control facility, considerable attention should be paid to the phasing of construction. In most cases, it is desirable to minimize the interruption of the entry control facility operations especially during periods of peak demand.

5 Entry Control Facility Design Philosophy

The design of a given ECF will be based on determining the appropriate application of the principles defined previously in order to satisfy the constraints of a given site. It is possible to identify four different design scenarios by varying the distances available to provide the approach zone and the response/safety zone (Ref. 1). Ref. 1 provides several conceptual layouts for ECFs that represent these design scenarios. Regardless of the scenario, all ECFs shall possess the minimum standards specified in the previous sections of this document.

The final design of an ECF will have to ensure that the concept of operations is fully defined and supported. Many installations are identifying specific ECFs for different classifications of traffic. One example would be identifying a specific gate for all truck access, that entry control point would likely be designed to support truck traffic and standard vehicles. Other gates at the installation may be designed to support only standard size vehicles. Due to the potential array of vehicle sizes that may utilize a given facility, determining the design vehicles for a given entry control facility is a critical decision. It is also important to recognize that, even though a specific gate may be designated for large vehicle traffic, the possibility of operator error may mean that other ECFs at the installation may still need the capability to at least reject the larger vehicle.

5.1 Design Scenario 1

The first scenario occurs when there is a long distance between the base or installation perimeter and the access control zone and another long distance available between the access control zone and the main part of the installation (or safety zone). This implies there is space available for a long approach zone to identify oncoming vehicles and a long response zone to allow for security personnel to react to a potential threat, while providing an adequate safety zone considering any nearby facilities or assets.

5.2 Design Scenario 2

The second scenario occurs when there is a long distance between the base or installation perimeter and the access control zone and a short distance available between the access control zone and the main part of the installation. This implies there is space available for a long approach zone, but limited space for a response zone. This scenario may occur at an installation located in a rural area with a long approach to the main part of the installation. It is important to recognize if the response zone is so limited that it is determined that security personnel will not have sufficient reaction time to deploy the active vehicle barrier system, then the entry control point should be operated with the barriers in the closed position (stopping vehicle flow) and opened for each authorized vehicle. This type of operation can significantly reduce the throughput of the entry control point, however, it may be required in order to provide a sufficient level of security.

5.3 Design Scenario 3

The third scenario occurs when there is a short distance between the base or installation perimeter and the access control zone and a long distance between the access control zone and the main part of the installation. This implies there is inadequate space to create an approach zone to identify and control oncoming vehicles. However, there is adequate distance available to create an acceptable response zone while ensuring an adequate safety zone to nearby facilities or assets. The limited approach zone will limit the available space for a traffic queue and prohibits the addition of lanes, due to the lack of space required to create a proper transition.

5.4 Design Scenario 4

The fourth scenario occurs when there is a short distance between the base or installation perimeter and the access control zone and a short distance between the access control zone and the main part of the installation. This situation occurs frequently in congested installations or installations located in an urban area. The implication of this condition is there is insufficient space to create a response zone without significant damage to nearby facilities or assets and that there is inadequate space to create an approach zone to identify and control oncoming vehicles. It is important to recognize if the response zone is so limited that it is determined that security personnel will not have sufficient reaction time to deploy the active vehicle barrier system, then the entry control point should be operated with the barriers in the up position, lowered for each authorized vehicle. This type of operation can significantly reduce the throughput of the entry control point, however, it may be required in order to provide a sufficient level of security.

6 Prototypical Entry Control Facility

Another important consideration during the design is to anticipate how the concept of operations may change over time. Currently, armed guards conduct most access control procedures. However, there is a significant effort underway to identify ways in which technology can be utilized to reduce the demand for manpower, while insuring an adequate level of security. The procedures and conceptual layouts provided in this guidance were developed considering the current operational concepts while including the necessary infrastructure to support potential components of automation that are anticipated in the future. Careful coordination between the designer, installation, region, and OPNAV N34 will be required to monitor changes in the technology available and adjust the infrastructure design as required.

6.1 Basis of Design for Prototype ECF

The prototype layout provided is designed to illustrate the concepts presented previously. This ECF was designed to support authorized and visitor POV, government vehicles, and trucks and is presented in Appendix 1. The prototype ECF has the following basis of design and features:

- It is assumed that trucks are inspected at a separate facility (no parking or significant queue provided for the trucks), however the possibility of errant drivers warrants the inclusion of a separate lane to process the trucks and provide the proper turning radii to reject trucks which are denied access.
- Visitor vehicles are directed into the truck lane due to the likelihood of increased processing time and to support future automation of visitor vehicle processing procedures.
- Vehicles to be inspected during periods of random inspection are to be directed to the visitor/truck lane. An early and late turn off to that area is provided to facilitate these procedures. The late inspection could alternatively be accomplished with a pull-off area.
- Space is reserved in the truck/visitor lane for the installation of mobile inspection equipment, such as X-ray or Ion detection, which may be provided in the future to facilitate random inspections at the entry control point. An example of mobile inspection equipment is illustrated in Figure 6.1. This space may also be utilized in the future for a visitor control center if visitor processing is handled at the ECF in the future in lieu of a central pass office.
- The access control zone is designed based on identification procedures conducted by security personnel, or alternatively, automated identification equipment and traffic control devices may be installed. During manual operation by security personnel, the access control zone is designed for tandem processing. In addition, one lane is designed to be reversible to increase the number of lanes available during periods of peak demand.
- The design supports the minimum of two required rejection points from the ECF. One prior to the central identification area and one following.

- The design allows for the rejection of denied vehicles after the vehicle identification and personnel identification points when operated with automated equipment. The layout supports rejection of the largest vehicles (AASHTO WB-15m (WB-50)) with one turning movement from the truck/visitor lane and standard POV from the remaining lanes. Rejection of a vehicle from the reversible lane will require a three-point turn, which is facilitated by a turnout in the roadway.
- The entire entry control facility is surrounded by a passive vehicle barrier system, which provides total containment of the vehicles until the active vehicle barriers are reached. Active vehicle barriers are provided in both the inbound and outbound lanes
- The electrical design incorporates spare duct bank and conduit to facilitate future installation of automated access control systems.

Figure 6.1 Mobile X-Ray Inspection Equipment

6.2 Variations and Alterations to the Prototype

Due to the wide array of potential design constraints and considerations it is impossible to handle all situations with a typical entry control facility design. As discussed in Chapter 5, there are four basic design scenarios that encompass possible design solutions. Ref. 2 identified several baseline concepts that encompass many commonly encountered design situations. These concepts are based on assumptions concerning the relative size of approach and response zones (Design Scenarios 1-4). The conceptual layout provided for the prototype is based on Design Scenario 1. The prototype is intended to illustrate the desirable elements of an ECF. These elements must be combined in an appropriate manner for each ECF.

7 Truck Inspection Facility Design Considerations

A truck inspection facility may be a separate centralized facility or combined into the functions of a commercial/large vehicle ECF as indicated in the function diagram in Figure 3.3.

7.1 Mission and Operation

An installation truck inspection facility is intended to be the single point of inspection for all truck traffic intending to enter the installation. It is envisioned, that a once a vehicle is inspected and authorized to access an installation that the vehicle will be tracked and monitored until it enters and exits the installation. The following guidelines are intended to provide general considerations in the design of a truck inspection facility.

7.2 Inspection Equipment

The design of the truck inspection station should be based on the use of large vehicle inspection equipment. Some examples of these technologies are x-ray, ion mobility spectrometry, gamma ray imaging, and neutron analysis. Since many of these devices are not currently deployed, the design should include space for vehicle inspection equipment and provide utility conduits to the anticipated location for future use. The inspection equipment may be a mobile or fixed installation. Further information concerning the types and configurations of explosive detection equipment is available at the Department of Navy Explosive Detection Equipment website at http://www.explosivedetection.nfesc.navy.mil/. It should be noted that some detection equipment is built-in to a large, drive-through structure. If this type of equipment is anticipated, then this could be coordinated and incorporated into the inspection office and overhead canopy facilities.

In addition, many installations desire CCTV inspection of the top and underside of vehicles. These cameras would be mounted on the overhead canopy and in the pavement below the vehicle. As a minimum, the truck inspection facility shall possess the infrastructure to support the installation of CCTV inspection equipment. This would include adequate lighting to illuminate the underside of the vehicles during inspection. Some installations may also consider the use of vehicle inspection pits, although this type of facility is not recommended due to commonly encountered soil conditions at Navy installations and operational safety issues.

The following sections contain information on various inspection related devices in order to facilitate the layout of the truck inspection facility and the determination of the required infrastructure to support inspection equipment. **Inclusion of any equipment in this section does not constitute an endorsement. The equipment shown is for illustration purposes only.**

7.2.1 Under Vehicle Lighting System

Systems similar to that illustrated below are used to illuminate the underside or other areas of a vehicle. The quality of light is as important as the quantity. The system should aim to eliminate shadows and create contrast. The systems are typically low cost, ranging from $100-$5000

.

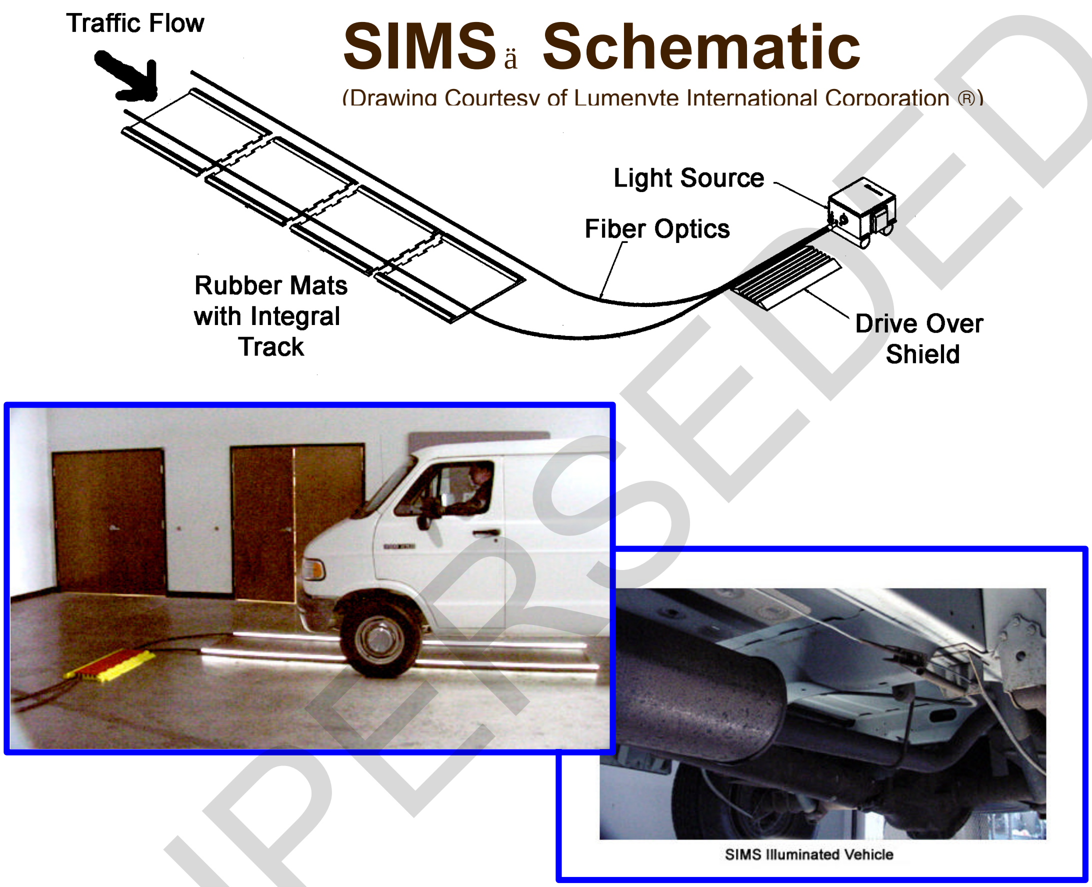


Figure 7.1 Example of an Under Vehicle Lighting System

7.2.2 CCTV Under Vehicle Search Systems

Several companies have developed fixed and portable CCTV systems for facilitating under vehicle search. This technology is meant to enhance or replace existing inspection techniques such as manual inspection using mirrors or accessing the underside of the vehicle from an inspection pit. Contacting the manufacturers of these systems is suggested to ensure proper installation and operation of this equipment.

7.2.2.1 Law Enforcement Associates – Model 5590 and 5591 UVIS

Point of Contact
Jim Oberdick
(703) 729-5700
(703) 729-6700
oberdick@erols.com
www.gsa-sales.com

Company Information
Law Enforcement Associates
P.O. Box 410
Ashburn, VA 20146
USA

Cost Data: $25K with suggested accessories. On GSA Schedule. Delivery 4 weeks. Installation and training included.

Description: The Model 5590 Fixed Site Under-Vehicle Inspection System provides excellent quality video of the underside of vehicles at remote locations. The system is easily transported and can quickly be put into operation. The system features a video ramp that incorporates the four wide-angle cameras and three illumination modules for low light situations. Its portable command center includes control for quad splitter, monitor, cameras, lighting modules and high-resolution monitor that provides crisp video images. The Model 5591 Under-Vehicle Inspection System was designed in conjunction with the U.S. Military to be portable, rugged, and have the ability to function in extremely adverse conditions. Within seconds, the under-side of a vehicle can be scanned for bombs, attached packages and other paraphernalia. Featuring many of the technology advancements of the Model 5590, this system is designed to function in adverse desert environments up to 43 degrees C and is weather, sand, dust and grit resistant. Product data sheets for the systems are available on line at www.gsa-sales.com

7.2.2.2 Perceptics - UVSS

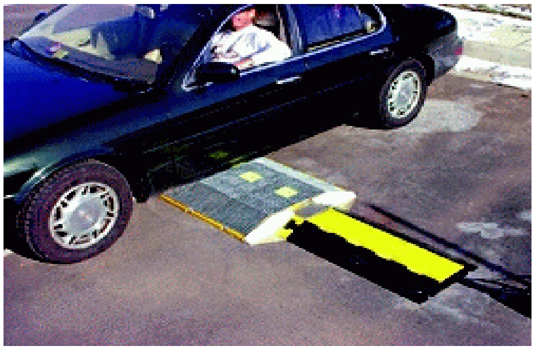
Point of Contact
Bradley Callahan
865-671-9247
865-966-9330
brad_callahan@perceptics.com
www.remotec-andros.com

Company Information
Perceptics
9737 Cogdill Rd., Suite 200N
Knoxville, TN 37932
USA

Cost Data: $40K with suggested accessories. On GSA Schedule. Delivery 10 weeks. Installation and training included. Discounts available for volume buys.

Description: Perceptics' Under Vehicle Surveillance System (UVSS) is a state-of-the-art, computerized vehicle searching device used to search vehicle undercarriages. This computerized system provides a more proficient and productive search method than manual techniques. The system provides the operator a safe and effective means to search the undercarriages of vehicles for hidden items; e.g., explosive devices, firearms, and other types of contraband. The UVSS can be purchased in two configurations: a fixed, in-ground system, or a portable system including ramp assembly.

7.2.2.3 Vehicle Inspection Technologies – Und-Aware AG-300 UVSS, BG-200



Point of Contact
William Peterson
703-834-1064
703-834-0263
b1peters@mindspring.com

Company Information
Vehicle Inspection Technologies
22800 Executive Drive
Unit 100
Sterling, VA 20166
USA

Cost Data: $50K On GSA Schedule. Delivery 10 weeks. Installation and training included.

Description: Und-Aware AG-300 Under Vehicle Security Surveillance System. Search the full width and length of any size vehicle, in any weather (with the AirWash option), in real time. Or, add recording for immediate review or later playback (with appropriate options). The Und-Aware AG-300 provides nine high-resolution (NTSC) color camera images for sharp detail over a full 8-foot vehicle width. Three separate base assembly units incorporate the AirWash components, lights and readily replaceable camera modules. Special end modules provide a smooth ground transition, or connect to the Hubbell Truk Trak cable management system. An easy-to-use integrated unit within the security facility controls the cameras and AirWash in full "A-76 (minimum-man)" compliance. The control system features a COTS multiplexer for easy integration with existing security installations. This portable unit may be deployed by one person in less than one-half hour. It is designed to be portable, lightweight and easy to maintain, yet sufficiently rugged to have an 80, 000 pound GVW rating. In the event of a camera failure, a camera module can be exchanged in less than one-minute. Likewise, a failed light can be replaced in less than three-minutes. High-resolution color cameras and lots of light combine to maximize the likelihood of seeing something you are looking for. Maximum use of brass, aluminum, stainless steel and high-strength plastics insures long-life operation under difficult outdoor conditions. For permanent installations specify the BG-200 installed system for even lower maintenance and perfectly flat surface-level grating. Special lighting available for very low or very high temperature operation and special low-voltage kit available to minimize voltages to less than 50 volts DC.

The following lessons learned have been generated through previous testing of Under Vehicle Inspection Systems by SPAWARSYSCEN and OPNAV N34.

- Consider maintenance requirements. Is the equipment self-cleaning?
- If installed below grade, is the enclosure waterproof? Is the vault and equipment designed to support large vehicle loading?
- Install the system far enough in advance of the access control point so that the largest vehicle can pass over the equipment without entering the installation.
- Drainage should be established such that water drains away from the equipment.
- When providing drains from the equipment enclosure, provide backflow prevention valves to prevent water from entering the vault. Ensure any water that may be captured in the vault will not drain through control conduit to the control center.
- The electrical circuit serving the equipment should be a ground fault interrupt (GFI) circuit.

7.2.3 Cargo and Vehicle Inspection Systems

There are many types of automated inspection equipment for large vehicle or cargo inspection. Some of the types available, which provide an image of the contents of a vehicle or container, include X-ray and Gamma Ray inspection systems. There are other systems available such as neutron or vapor/particle analysis which aim to detect the common chemical elements associated with explosives or other contraband. Currently the most commonly used equipment is imaging systems. Generally, this equipment can be divided into mobile and fixed installations. Many installations are considering procuring mobile systems that afford the possibility of varying the location of the equipment amongst various entry control facilities. Installations that plan centralized truck inspection facilities, will consider a fixed installation, which potentially has an increased throughput and a reduced space requirement. Due to the wide-ranging requirements for the different manufactured systems, it is not possible to provide detailed guidance that will support all types of this equipment. However, this section will attempt to identify the important infrastructure considerations associated with both mobile and fixed x-ray/gamma-ray inspection systems. Several manufacturers were consulted to obtain the data used to develop the following guidelines. However, the user is encouraged to consult with manufacturers of these systems during the design of an entry control facility to ensure data concerning operational considerations is current and the best available.

These systems offer the ability to inspect vehicles or containers without removing the cargo. The equipment typically consists of a transmitter (x-ray or gamma ray) and a detector on the opposite side of the target vehicle. Gamma ray systems utilize a low-level, gamma-ray radiation source to generate a beam of gamma rays to penetrate the object. The detectors on the opposite side then measure the amount of gamma ray absorption. This data is then translated into an image of the contents of the vehicle or container. X-ray systems typically utilize electro-mechanical equipment to generate X-rays to penetrate the object. Detectors on the opposite side then record the x-ray transmission, which is then translated into an image. The MobileSearch and Shaped Energy ISO Search systems (discussed below) also include a detector on the transmission side of the unit that detects the x-ray reflections, which occur from organic materials, producing a second type of image of the contents.

Due to the use of gamma or x-ray radiation, there are safety and regulatory considerations in the use of these systems. The requirements vary depending on the system. Normally an exclusion zone is established within and around the inspection equipment. The region outside of the exclusion zone is considered safe during scanning operations. The size of the exclusion zone varies greatly depending on the type of equipment. Nuclear Regulatory Commission regulations state that radiation dose limits in Public-Uncontrolled areas are 2 mR in any hour or 100 mR in any year. Therefore depending on the characteristics of the source, the frequency of scans, and the expected occupancies the exclusion zone can vary. Additionally, a shielding wall can be constructed to reduce the dose substantially. Some x-ray systems have qualified as a "cabinet x-ray system" in accordance with FDA regulations or similar standards, meaning minimal shielding is required and the exclusion zone does not extend outside of the footprint of the inspection area. In order to qualify for this designation, FDA regulations require an emission limit of 0.5 mR per hour at 5 cm from the surface of the cabinet. Another regulatory consideration is that systems utilizing radioactive sources may require operation under a radiation materials license held and administered by the owner of the equipment (the installation).

7.2.3.1 Mobile Vehicle Inspection Systems (Imaging)

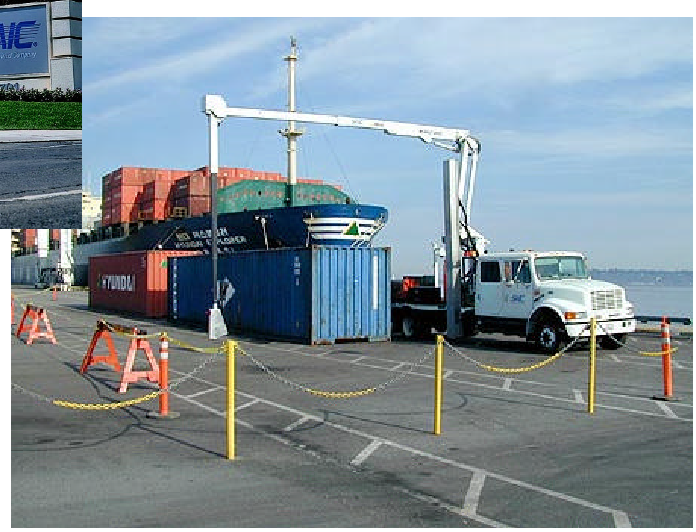
There are several truck-based, mobile large vehicle or container inspection systems currently available. Two examples are illustrated in the figures below.

Figure 7.2 MobileSearch Advanced X-Ray Portable Inspection System with Backscatter

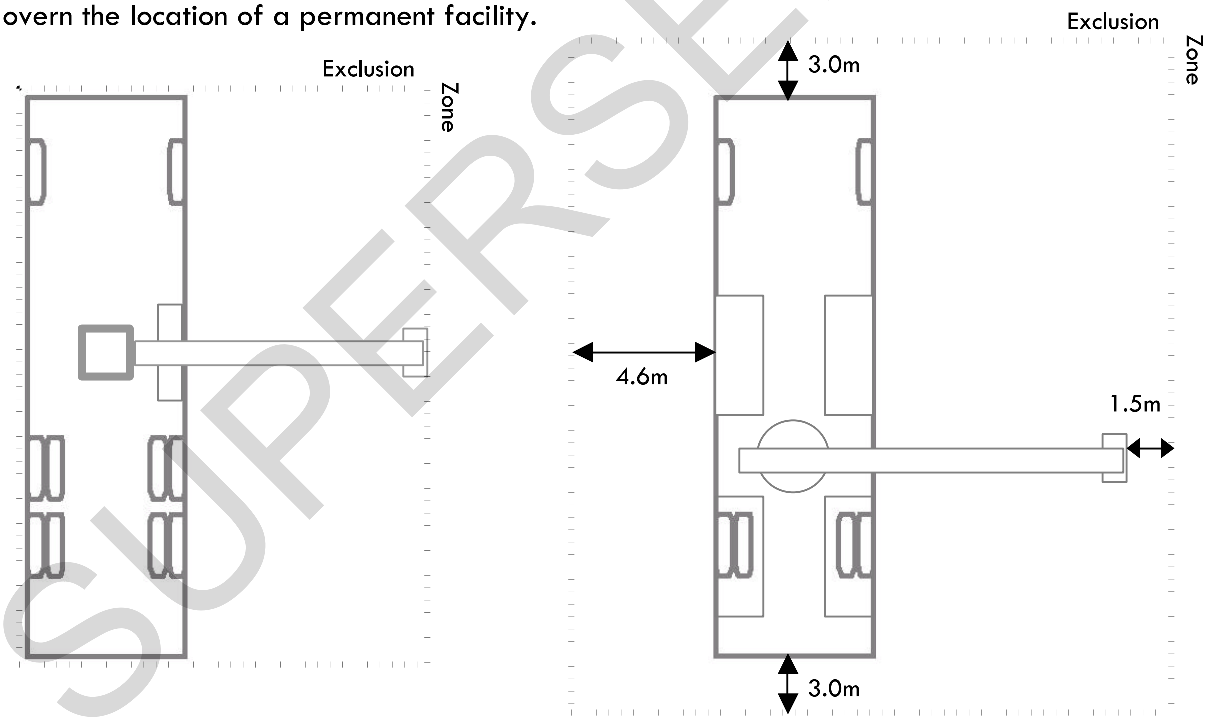
(Photo Courtesy of American Science and Engineering, Inc.)

Figure 7.3 Mobile VACIS – Gamma Ray Imaging System

(Photo Courtesy of Science Applications International Corporation, Inc.)



These systems utilize a boom type arm to form an inspection tunnel. In no case are the vehicle operators to remain in the vehicle during a scan. The operator is either to exit the vehicle or the vehicle is positioned such that the operator is outside the scan area prior to the scan initiating. In order to properly plan the required space for this type of equipment, the detailed operational procedures must be reviewed. The MobileSearch system is designed to acquire images by traveling at a constant velocity past any number of parked vehicles in a line. This is accomplished using an electric secondary drive motor that propels the vehicle at a constant velocity. The MobileSearch system is capable of scanning only on the “driver’s side” of the MobileSearch vehicle. The maximum height of the boom is 5.03 m (16’-6”), with a maximum scanned vehicle dimension of 2.59m (wide) x 4.27 m (high). The width of the equipment with boom and stairs deployed is 7.62 m (25’). The Mobile VACIS system is designed to acquire images by either traveling past a stationary vehicle or in a pass-through mode as a moving vehicle passes through the scan area. Additionally, the system can conduct operations on either side of the VACIS vehicle. The vehicle requires a clear height of 6.1 m (20’-0”) and a surface grade of less than 5%. The exclusion zone for each system is illustrated below. Note that this information was based on available manufacturer literature and it should be verified with the manufacturer of the specific system anticipated. Also these exclusion zones are based on the 2mR in any one hour dose limit. Therefore, the manufacturers should be contacted for the radiation rate data beyond the exclusion zone to determine the zone appropriate for a specific application. The 100 mR per year limit may govern the location of a permanent facility.



Exclusion Zone for MobileSearch
(Determined by 2 mR/hr threshold)

Exclusion Zone for Mobile VACIS
(Determined by 2 mR/hr threshold)

Figure 7.4 Example Exclusion Zones for Mobile Inspection Systems

Since the portable units are entirely self-contained they require no land based power or other facilities. If an entry control facility or truck inspection station design is to incorporate a portable vehicle inspection system similar to those illustrated above, but *the system is unspecified* the following recommendations regarding site development should be followed.

- Provide a 10.7 m wide x 33.5 m long paved inspection area for use by the portable equipment. 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.
- To increase throughput a longer inspection lane can be provided for operation of a portable system that scans stationary vehicles. This will allow the system to scan several vehicles at one time.
- Provide no canopy over the inspection area planned or dedicated for use by the portable equipment unless the clear height is a minimum of 6.7 m.
- Site all permanent facilities or guard posts such that they would remain outside of the exclusion zone. A shielding wall may be required if there are occupied buildings or areas near the detector.
- 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 90m. The intent is to insure that the 100 mR / 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 m if a 305 mm wide x 2.4 m high (minimum) 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.

7.2.3.2 Fixed / Portable Vehicle X-Ray Inspection Systems (Imaging)

There is a wide range of fixed vehicle inspection systems. The systems operate in a manner very similar to the mobile systems. The types of systems can be categorized as follows:

- Stationary Target Vehicle, transmission source and detector travel past the target on a rail system or similar platform
- Target Vehicle is moved through a fixed inspection system on a platen or gantry transport, on a rail system, or similar device
- A Portal system, with a fixed inspection system where vehicles pass-through the equipment

Examples of these systems are illustrated in Figures 7.5 - 7.7. The space requirements vary from minimal for the portal system to significant for a transport or stationary vehicle system. Illustrations of these systems are shown below. As encountered for the mobile inspection systems, exclusion zones may be required for the fixed systems. For illustration purposes, the exclusion zones and/or radiation levels associated with the SAIC VACIS II and AS&E Shaped Energy ISO Search systems are provided in Figures 7.8- 7.10. Note that the VACIS II exclusion zones depend on the type of radioactive isotope utilized and the presence of a shielding wall. Some systems will have no exclusion zone outside of the actual scan area. In no case are the vehicle operators to remain in the vehicle during a scan. The operator is either to exit the vehicle or the vehicle is positioned such that the operator is outside the scan area prior to the scan initiating.

Figure 7.5 VACIS II - Gamma Ray Imaging System

(Photos Courtesy of Science Applications International Corporation, Inc.)

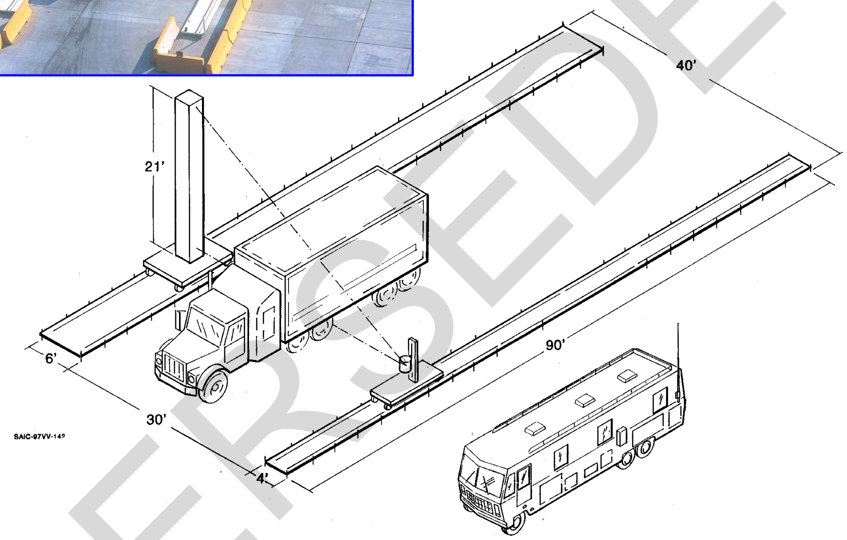


Figure 7.6 Portal VACIS - Gamma Ray Imaging System

(Photos Courtesy of Science Applications International Corporation, Inc.)

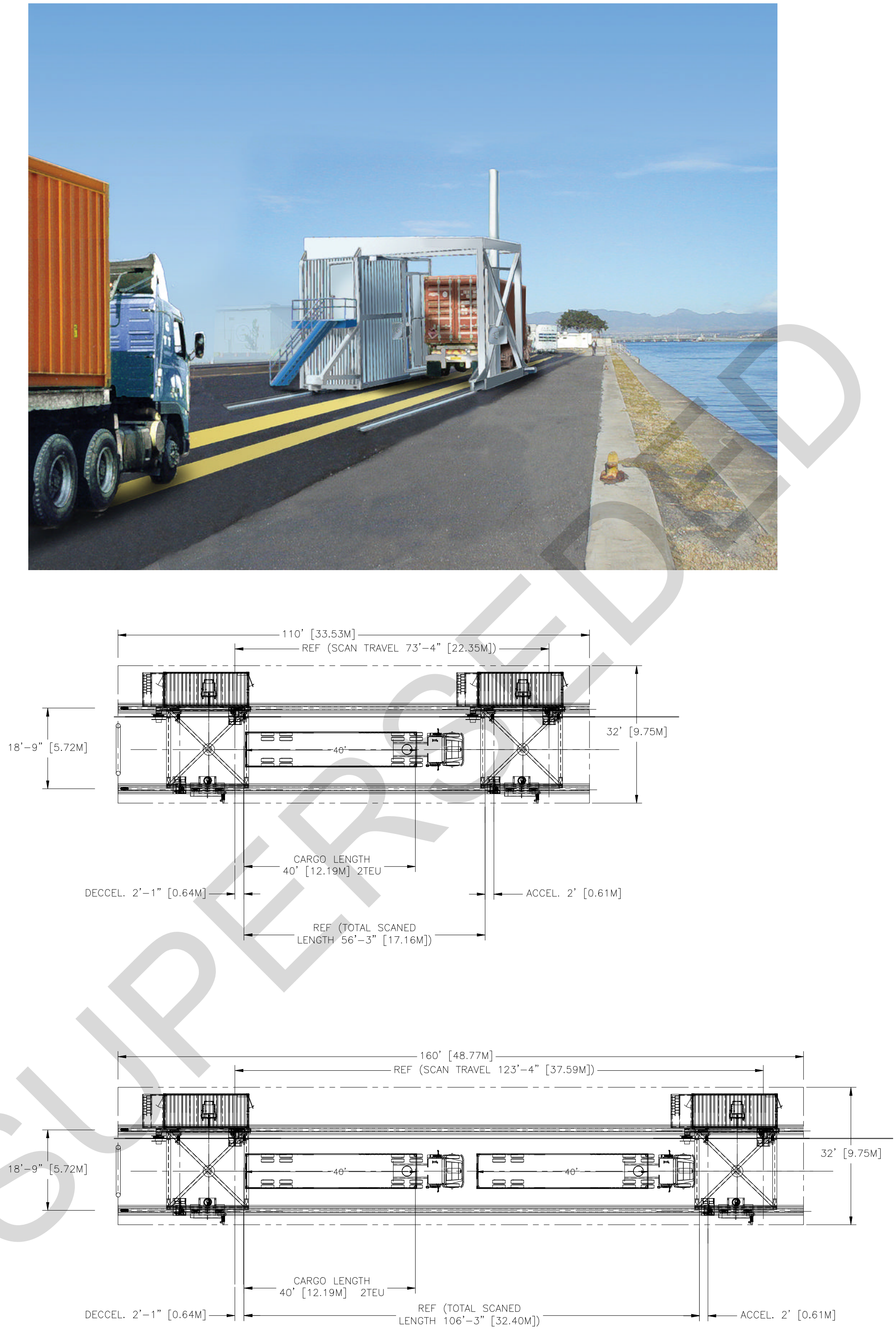


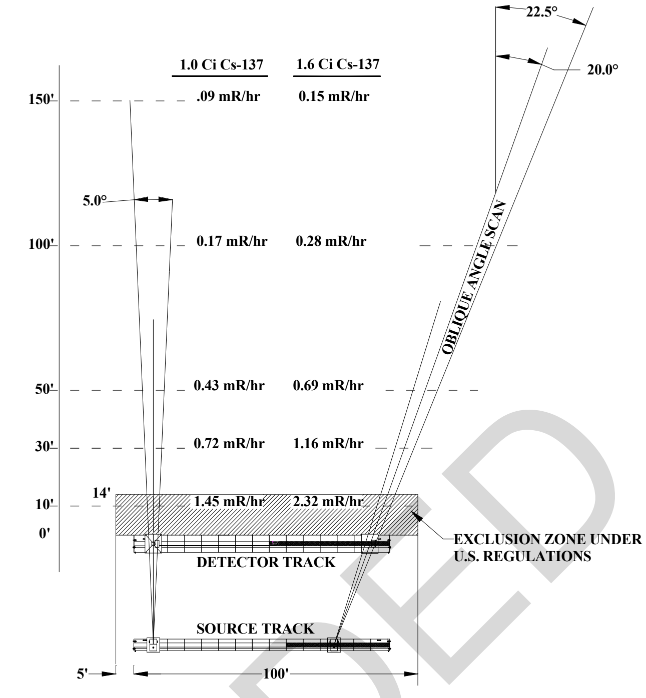
Figure 7.7 Shaped Energy ISO Search X-Ray Inspection System

(Rendering and Drawings Courtesy of American Science and Engineering, Inc.)

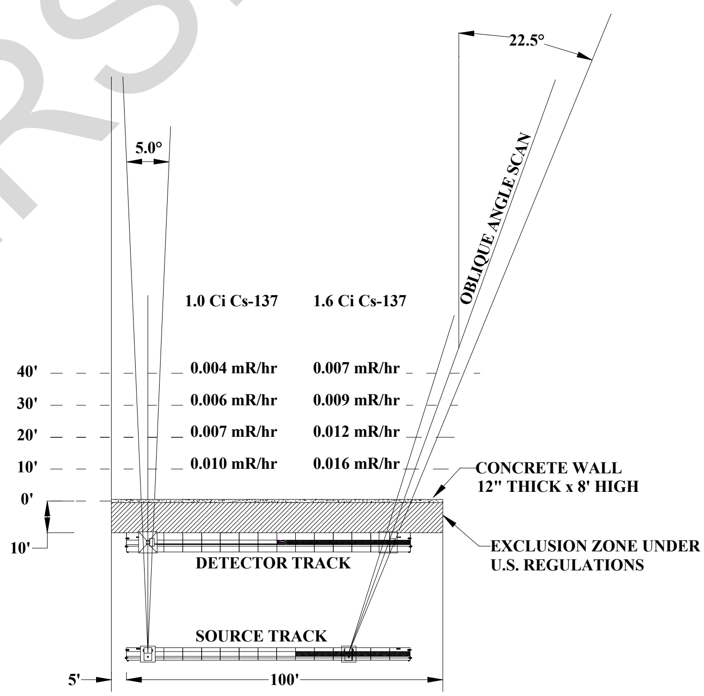
Figure 7.8 VACIS II - Gamma Ray Imaging System Exclusion Zones

Cesium Source with and without Shielding Wall

(Courtesy of Science Applications International Corporation, Inc.)



NOTE: EXCLUSION ZONE PERIMETER SHOWN FOR TYPICAL U.S. INSTALLATION FOR 1.6 Ci SOURCE AT 2.0 mR/hr LIMIT.



NOTE: Value at wall rear for 1.0 Ci Cs source is 0.015 mR/hr.
Value at wall rear for 1.6 Ci Cs source is 0.023 mR/hr.

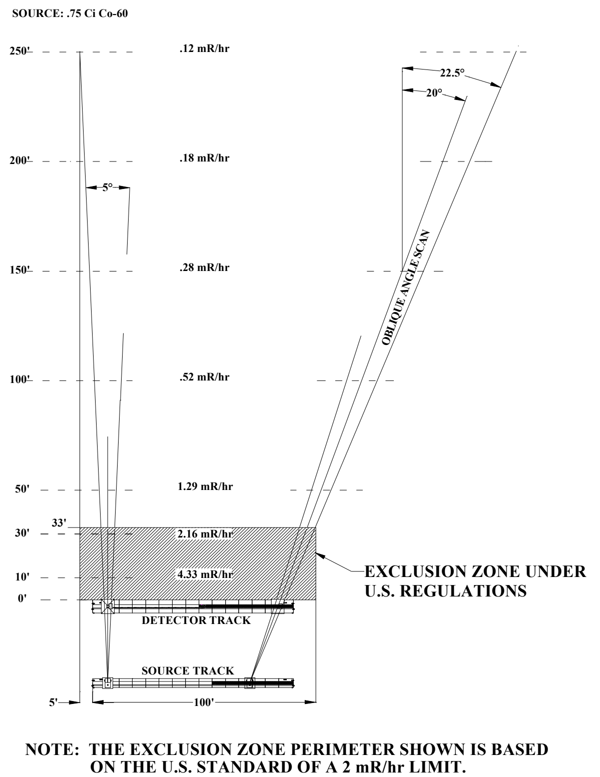
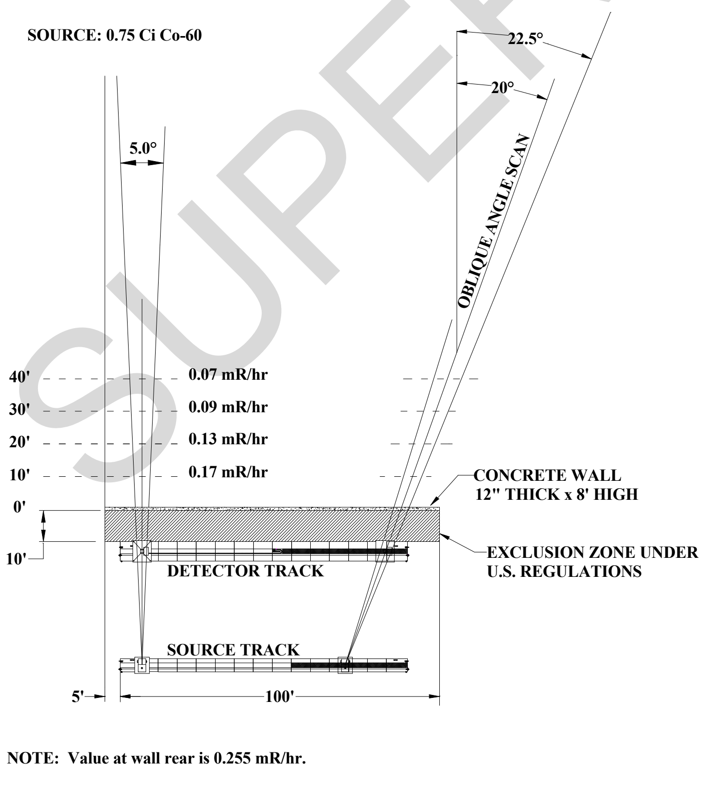


Figure 7.9 VACIS II - Gamma Ray Imaging System Exclusion Zones

Cobalt Source with and without Shielding Wall

(Courtesy of Science Applications International Corporation, Inc.)



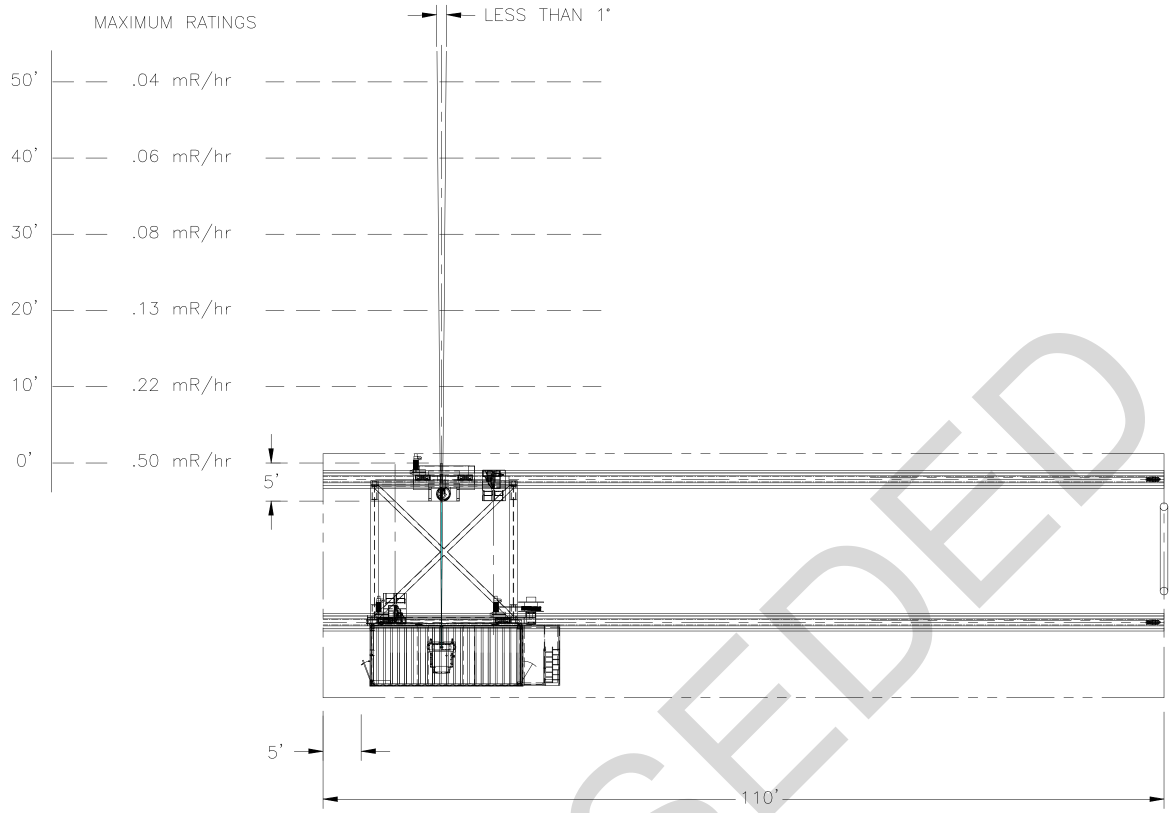


Figure 7.10 Shaped Energy ISO Search X-Ray System Radiation Levels

(Courtesy of American Science and Engineering, Inc.)

The power requirements of fixed/portable systems vary widely depending on the system type. Gamma-ray systems utilize a radioactive source to generate the transmission rays, this requires less power compared to an X-ray system, which generates the x-ray transmission using electro-mechanical means. Table 7-1 illustrates the potential power requirements.

Inspection System	Power Requirements	Notes
AS&E Shaped Energy ISOSearch X-ray Inspection System	100 kVA site power	Includes power to inspection equipment and power for gantry transport
SAIC Portal VACIS	3 kVA per lane 120/240 VAC	
SAIC VACIS II (track system)	30A , 220-240 VAC	Documentation indicates 5kW of backup power is sufficient for the VACIS II system components, additional power required for operating booth, HVAC, etc.

Table 7-1 Sample Power Requirements for Fixed Inspection Systems

If an inspection system is specified, consult with the manufacturer concerning the latest requirements for power. If no inspection is specified, however, the future inclusion of a system is likely, the design of the electrical power system should consider an allowance to provide sufficient site power to support this future requirement.

The space requirements of these systems also vary greatly. Systems that require a stationary vehicle or move the vehicle on a rail or platen system passed fixed detectors require the most space. A portal system requires minimal space. If an entry control facility or truck inspection station design is to incorporate a fixed vehicle inspection system similar to those illustrated above, but if the *system is unspecified* the following recommendations regarding site development should be followed.

- Provide a 10.7 m wide x 33.5 m long paved inspection area for use by the fixed equipment. This provides enough width for the inspection system and the length of travel for the equipment or a platen/gantry system. The length is sufficient to allow the inspection system to scan a large stationary vehicle and maneuver.
- To increase throughput a longer inspection lane can be provided for operation of a portable system that scans stationary vehicles. This will allow the system to scan several vehicles at one time.
- Provide no canopy over the inspection lanes dedicated for use by the fixed equipment unless the clear height is a minimum of 6.7 m. This is conservative since some systems will operate with a clear height of 4.57 meters (15 ft.) and could be installed under a canopy.
- Consider provisions for automated inspection equipment to be installed prior to the main inspection area. It is often desirable to complete any automated inspection such as UVSS or imaging prior to arriving at the main, covered inspection area for identification and further inspection tasks. Therefore these functions should precede the final inspection area. Most inspection systems are designed to be outside and do not require shelter from the weather.
- Site all permanent facilities or guard posts such that they would remain outside of the exclusion zone. A shielding wall may be required if there are occupied buildings or areas near the detector.
- Site all permanent facilities such that they are not in the direction of travel of the transmission beam unless the distance between the inspection vehicle and the facility is at least 90m. The intent is to insure that the 100 mR / 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 m if a 305 mm wide x 2.4 m high (minimum) concrete shielding wall is provided between the radiation source and any facility of concern.
- Provide channelization islands with a minimum width of 1.5 meters (5 ft.) to support the future installation of a portal inspection system.

In Section 7.3, layout design recommendations intended to provide flexibility for the future inclusion of these systems are developed.

7.3 Layout

The layout of the truck inspection facility is extremely important in ensuring the facility will function properly. The civil design must consider the turning radius and other operating characteristics of the expected vehicle types. In addition, the facility should have multiple lanes of inspection to support different vehicle types, or varying inspection levels. The design should have adequate stacking distances for the anticipated queue and parking for vehicles to be inspected and security vehicles. Parking areas should be sized for the range of expected vehicles and consider the anticipated volume of vehicles to be inspected.

Consider providing a “sally port” in the inspection area. A “sally port” configuration is created through the use of vehicle barricades or traffic gates. These barriers are intended to confine the vehicle during inspection until it is determined that the vehicle is authorized to proceed or if the vehicle is denied admission to the installation. The barriers can also be used to aid in positioning the vehicle relative to inspection equipment.

Some installations may require screening of the inspection operations from the remaining portions of the ECF. As discussed in Reference 7, screening may increase safety and shields the inspection procedures from public view to prevent visual surveillance from unauthorized personnel.

As discussed in section 7.2, the inspection equipment can have a significant impact on the layout of a truck inspection facility. It is difficult to develop a layout that can support all potential types of automated inspection equipment. If the installation specifies the anticipated inspection systems, then the layout can be customized. However, if the specific system is not identified, however the use of imaging or related inspection equipment is anticipated the layout should facilitate the future incorporation of this equipment. Figures 7.11 through 7.13 illustrate the incorporation of several types of inspection equipment into the layout of a truck inspection facility. As illustrated, it is possible to provide areas for future equipment or as a minimum reserve space for the equipment when developing the site plan for an inspection facility. The following sections provide further detailed design guidance.

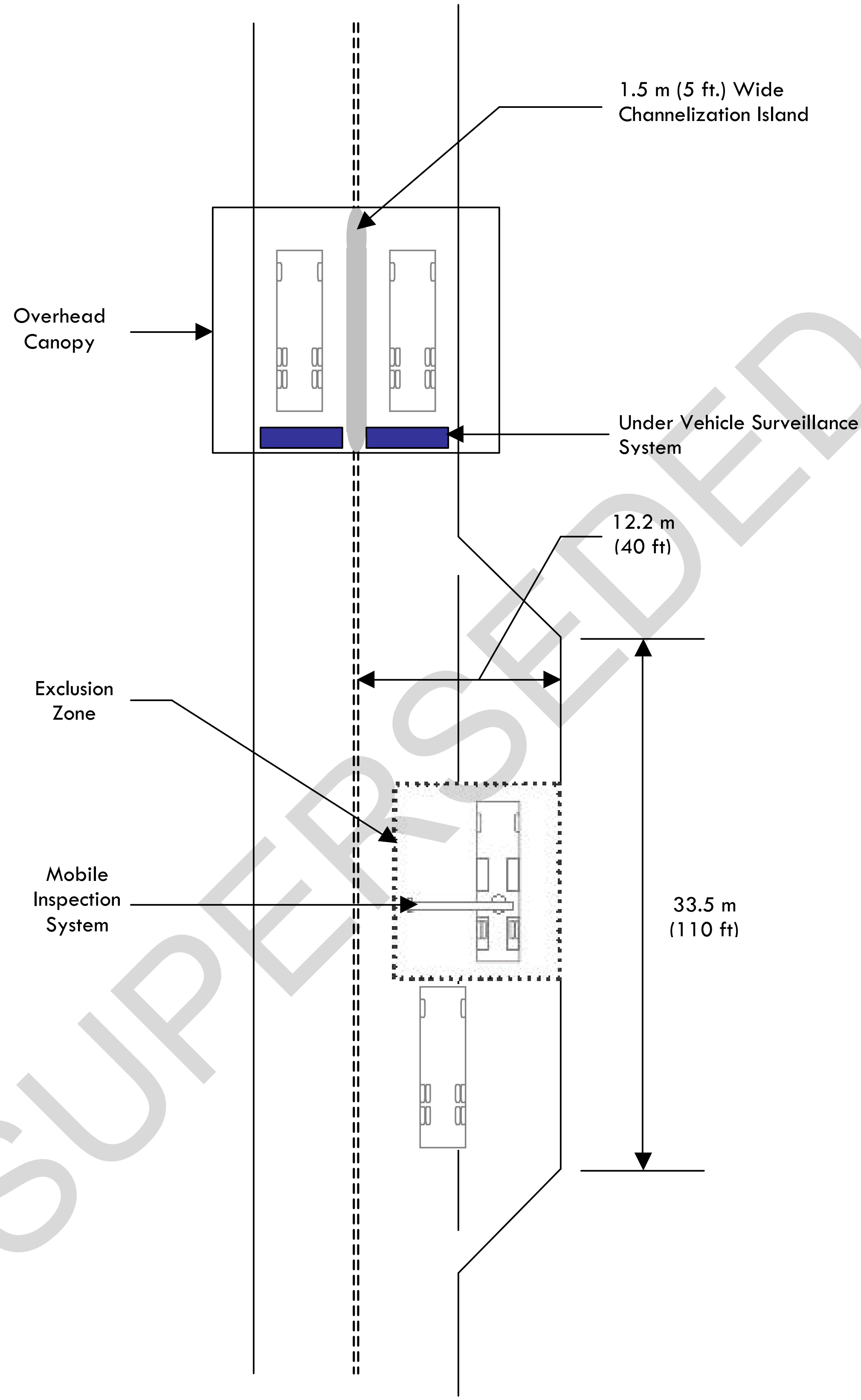


Figure 7.11 Truck Inspection Facility Incorporating Mobile Imaging Systems

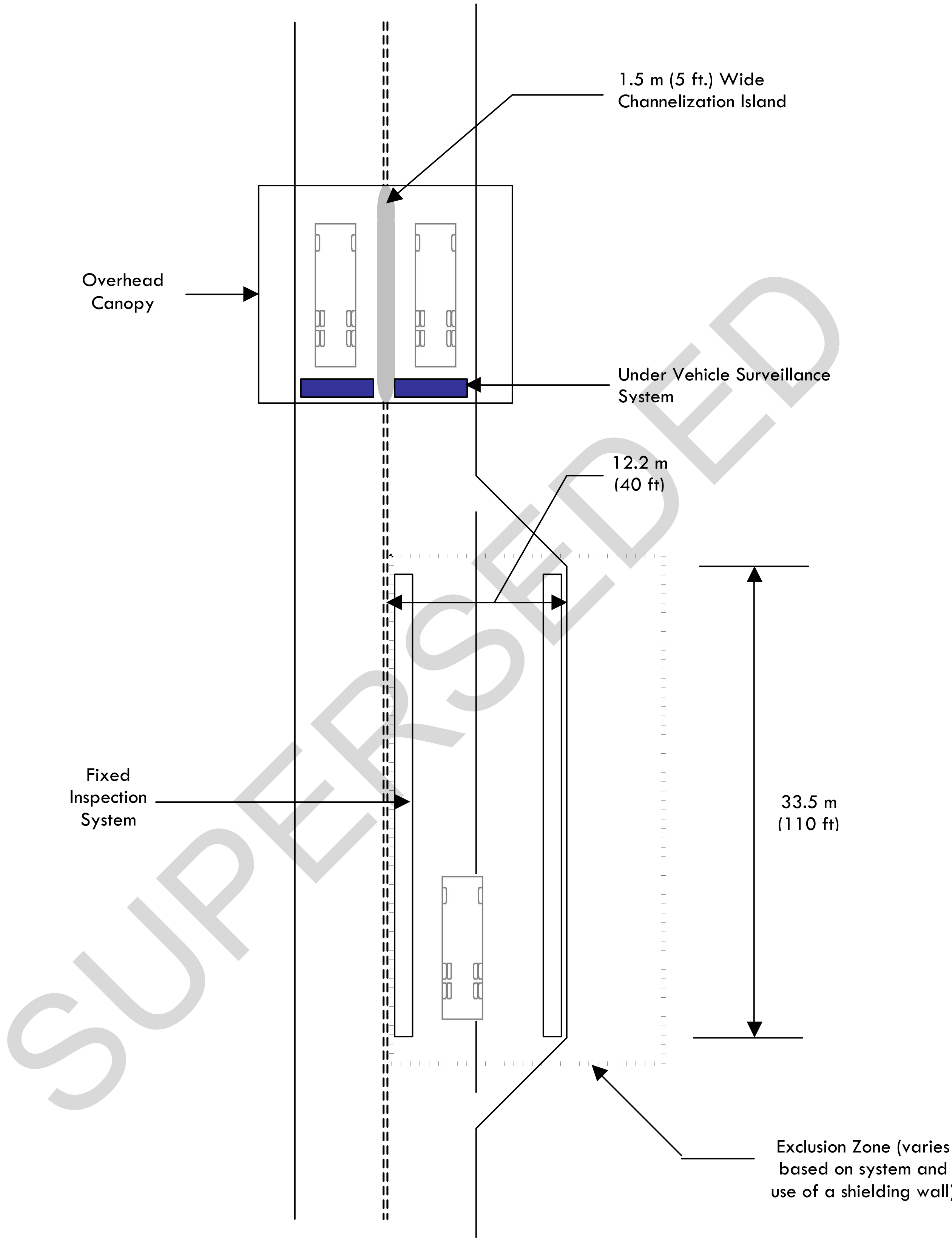


Figure 7.12 Truck Inspection Facility Incorporating a Fixed Imaging System

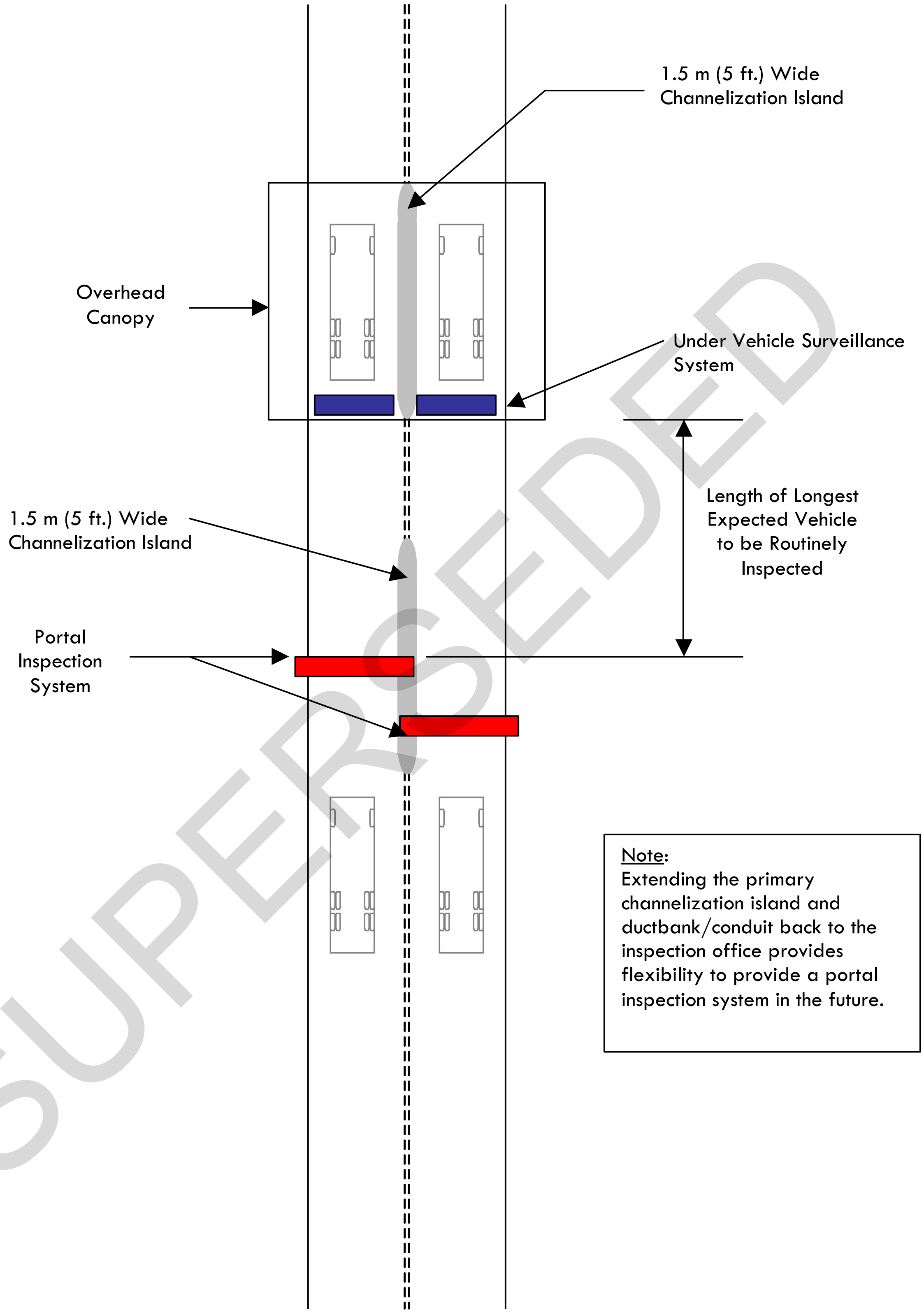


Figure 7.13Truck Inspection Facility Incorporating a Portal Imaging System

7.3.1 Geometric Design of Roadways

The design of roadways in a Truck Inspection Facility will be in accordance with the guidelines provided in Section 4.2.4 and the latest edition of the AASHTO Policy on Geometric Design of Highways and Streets except as modified in this section. Additionally, the design should consider the requirements to support oversized, atypical vehicles such as those frequently encountered during construction operations.

7.3.1.1 Channelization Islands

The minimum raised channelization island will be 1524 mm (5 feet) in width, 160 mm (6 inches) in height and 15.2 meters (50 feet) long. A channelization island will be provided between each incoming traffic lane. These islands provide a safe position for security personnel and a location to mount present/future vehicle inspection devices.

7.3.1.2 Lane Width

The minimum lane width will be 4.9 meters (16 feet) in the inspection area. A preferred lane width of 5.5 meters (18 feet) is recommended. The increased lane widths are required to facilitate the manual inspection procedures and to support the potential for future automated inspection technology. Outside of the inspection area the minimum lane width, facilitating the flow of traffic and other operations, is 3.6-meters (12 feet).

7.3.1.3 Curbs and Gutters/Shoulders

Shoulders are desirable for accommodation of stopped vehicles (7, 20). However, curb and gutter are preferable in areas where lane control is desired and to improve safety. Therefore, shoulders are recommended for use in the approach roadways and vehicle holding area. However, curb and gutter is required in the inspection area and around all channelization islands.

7.3.1.4 Lateral Clearances

Lateral obstructions present a safety hazard and tend to negatively impact traffic flow. The negative effects are eliminated or reduced if the object is less than 152 mm (6 in.) in height or located at least 1.8 meters (6 ft.) from the edge of the roadway. Ideally this lateral clearance would be greater. In the inspection areas, the location of facilities and inspection equipment will likely provide less lateral clearance. Ideally, a lateral clearance of 610 mm (2 ft.) should be maintained in the inspection areas where possible.

7.3.1.5 Vertical Clearances

AASHTO standards indicate a minimum vertical clearance of 4.3 meters (14 ft.) for highways or 4.9 meters (16 ft.) for freeways. In order to support potential over height vehicles or future pavement overlays a minimum vertical clearance of 5.2 meters (17 ft.) will be maintained throughout the inspection facility. Higher clearance may be desirable for inspection equipment.

7.4 Facilities

The facilities shall be developed in accordance with the guidelines provided in Section 4.12 except as modified in the following sections.

7.4.1 Overhead Canopy

Providing an overhead canopy at the inspection area improves lighting, protects the guards and drivers from the inclement weather, and serves as a platform for traffic control devices, signage, and security equipment. The canopy should cover all inspection lanes for the length of the expected vehicles. Variable message signs (VMS) should be provided on the canopy to indicate current force protection condition, provide driver instructions, and other general information (2). Each lane should have lane control signals in both directions, similar to toll collection or parking facilities, to inform incoming vehicles of the current lane configuration.

The overhead canopy also serves as a platform for lighting and security equipment. The canopy should be designed to support the future installation of closed circuit television (CCTV) cameras over each lane for inspection purposes or general observation.

The architectural design of the canopy structure shall match surrounding architecture and the Base Exterior Architectural Plan.

7.4.2 Inspection Office

The inspection office serves as the central control center for the truck inspection station and provides shelter for security personnel. Every truck inspection station must have an inspection office. As the control center, the inspection office controls the vehicle barricades, traffic control devices, access controls, and lighting. The office will include space for the following equipment and functions:

- Support 3 to 5 security personnel (7)
- Communications equipment
- Electronic control panels for all current or anticipated future automated gates or barriers
- Monitor stations for CCTV or computer monitors associated with automation controls, UVSS, and imaging systems
- An electrical room for the main electric panelboards and electronic controls
- Locker storage for traffic control devices, weapons, and personnel equipment including vehicle inspection kits and the pre-positioning of personal protective equipment for CBR exposure
- Computer servers for future automated identification systems
- Counter or work space
- A unisex restroom.
- Waiting / Processing Area for Vehicle Occupants

7.4.3 Occupant Shelter

Shelter for the vehicle occupants can be provided in a separate shelter similar to those specified for ECFs, or within the inspection office as specified in section 7.4.2.

7.4.4 Cargo Handling Equipment and Storage

Although advanced inspection equipment is designed to inspect the contents of a suspect vehicle without opening or removing the cargo, it is anticipated that removal of cargo will be necessary at times for a complete inspection. In addition, current inspection procedures frequently require the removal of all or portions of the cargo in the suspect vehicle. Therefore the truck inspection station shall have cargo handling equipment and storage areas to provide temporary storage of material removed from suspect vehicles. The size of this area will be based on the anticipated demand.

7.5 Electrical Power Requirements

Electrical design shall consider current power demands as well as the power requirements for future traffic control devices, identification equipment, and other devices associated with potential automation of the truck inspection station. This includes an allowance for the power demands of future vehicle inspection equipment, such as fixed large vehicle x-ray devices. See Section 7.2 for additional information concerning vehicle inspection equipment.

OPNAV 5530.14C specifies emergency power for protective lighting provided for restricted areas. TM5-811-1 specifies an alternate electrical power requirement for security lighting. Similarly, each truck inspection station shall have provisions of an alternate electrical power requirement. In the event of a loss of the primary electrical source, a reliable alternate power source is necessary to ensure continuous operation of the ECP. A standby generator will be used as the alternate electrical power source. Either automatic or manual starting of the generator and load transfer will be provided depending on the permissible electric power outage duration (5). In some cases, installations may specify the use of portable generators in addition to stationary auxiliary electric power sources. Provision of portable units is not the designer's responsibility, beyond providing a connection point when directed.

Due to operational considerations, it may be necessary to provide an uninterruptible power supply (UPS) for use during generator starting and load transfer. The UPS system would support any computerized equipment to avoid power disruption. In accordance with TM5-811-1, UPS will not normally be used for security lighting. A UPS system designed for computer loads will not perform satisfactorily for lighting applications. If the installation requires the use of UPS, the design should clearly identify the nonlinear nature and switching patterns of the load to be served (5, 11-5).

The sites for a truck inspection station may commonly be congested and limited in size. Therefore, transformers should be provided with less flammable insulating fluid in order to facilitate the placement of the transformer closer to structures.

7.6 Exterior Lighting

References 2,5, and 6 discuss exterior lighting for general security purposes. The parking and roadway areas of the truck inspection station should have a minimum illumination of 10 lux (1 footcandle). The areas where the actual inspections take place should be illuminated to a minimum of 100 lux (10 footcandles).

It may also be necessary to provide additional task lighting in the ID and inspection areas to support adequate identification of vehicle occupants and contents. Lighting may also be mounted at or below pavement level to facilitate under vehicle inspection or associated with under vehicle inspection systems (see Section 7.2) (8, 29-20).

As discussed in the IESNA Lighting Handbook, the light source spectral power distribution is important for identification and inspection tasks such as seeing hair, eye, clothing, complexion, and vehicle colors. The ability to identify colors accurately and confidently is determined by the light source spectral power distribution and the illuminance level. This capability is commonly referred to as color rendition and is measured by the color rendition index (CRI). To ensure appropriate color rendition, any nominally white light source (CRI > 50) will be used at the illuminances typically encountered at an ECF (8).

The lighting in the truck inspection station should be designed as controlled lighting, to reduce light pollution and increase traffic safety. Glare projection or glare lighting should be avoided. Utilize luminaires that are classified as cutoff or semi-cutoff. The lighting should not be directed in the driver's eyes and it should not backlight important signage (2).

Since closed circuit television (CCTV) will likely be part of the inspection operation, it is important to coordinate the lighting and CCTV system (5,11-1). References 5 and 6 provide further information on designing lighting systems for use with CCTV. See Section 4.7 for further considerations.

7.7 Communications and Information Technology

The inspection office and guard facilities will have telephone communication capability. In addition, some installations may require an emergency ring down telephone, which provides a direct, hard-line connection to the installation emergency dispatch or control center. The requirements for radio-based communication should be coordinated with the installation. Due to the potential of computerized identification systems, the inspection office shall be capable of connecting to installation wide information technology systems. If no installation wide data cabling system exists, this capability can be achieved through the use of the telephone system. Any sentry booths provided as part of the inspection facility will have provisions for connection to the installation wide computer network, as well to a central server to be located in the inspection office.

7.8 Utilities

Water service for general use and for the unisex restroom in the inspection office will be provided. Waste system utilities will be provided for the unisex restroom. If it is technically impossible or economically infeasible to provide these utilities to a truck inspection office due to site constraints, the installation may wave the requirement to provide the water and waste utilities. See Section 7.5 for electrical power requirements.

7.9 Perimeter Fence and Gate

Where the truck inspection facility is part of a Commercial/Large Vehicle ECF, each ECF should have a gate enabling the ECF to be closed at the installation perimeter when not in use. This gate should be reinforced with cables as indicated in MIL-HDBK 1013/14 to increase resistance to a moving vehicle threat. In addition the gate shall have Type III Barricade in accordance with Section 3F.01 of MUTCD (3 per lane) secured to the gate horizontally. This configuration enables a reduced potential penetration and maximizes standoff during periods when the ECF is not in use.

A centralized truck inspection facility located off installation should be secured with a security fence in accordance with OPNAV 5530.14C, including a gate enabling the truck inspection facility to be closed at the perimeter of the inspection facility site when not in use.

8 References

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3. Naval Facilities Engineering Command – Engineering Innovation and Criteria Office. Department of Defense Handbook, Selection and Application of Vehicle Barriers (MIL-HDBK-1013/14). Norfolk, VA: US Govt; 1999.

4. Naval Facilities Engineering Command – Engineering Innovation and Criteria Office. Department of Defense Handbook, Design Guidelines for Security Fencing, Gates, Barriers, and Guard Facilities (MIL-HDBK-1013/10). Norfolk, VA: US Govt; 1993.

5. Office of the Chief of Engineers, U.S. Army. Electrical Power Supply and Distribution (TM5-811-1). Washington, DC: U.S. G.P.O.:1995-386-731:2IO

6. Naval Facilities Engineering Command – Engineering and Innovation and Criteria Office. Department of Defense Handbook, Physical Security of Facilities (MIL-HDBK-1013/1a). Norfolk, VA: U.S. Govt; 1993

7. Askew, Mark; Evans, Johnny; Slade, Ron; (and others). Air Force Installation Entry Control Facilities Design Guide. HQ Air Force Center for Environmental Excellence Design Group. Brooks AFB, TX; 2002

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9. Garber , Nicholas J; Hoel, Lester A. Traffic and Highway Engineering. New York: West Publishing Company; 1988

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VACIS Systems:
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POC Portal VACIS: Terry Armstrong
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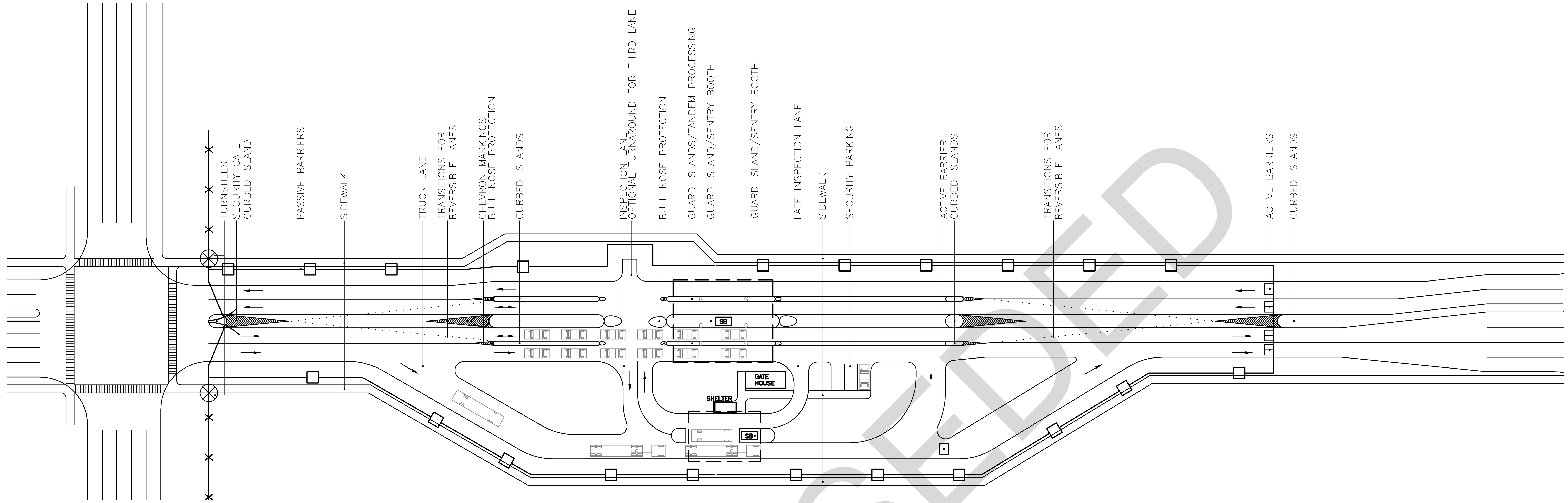
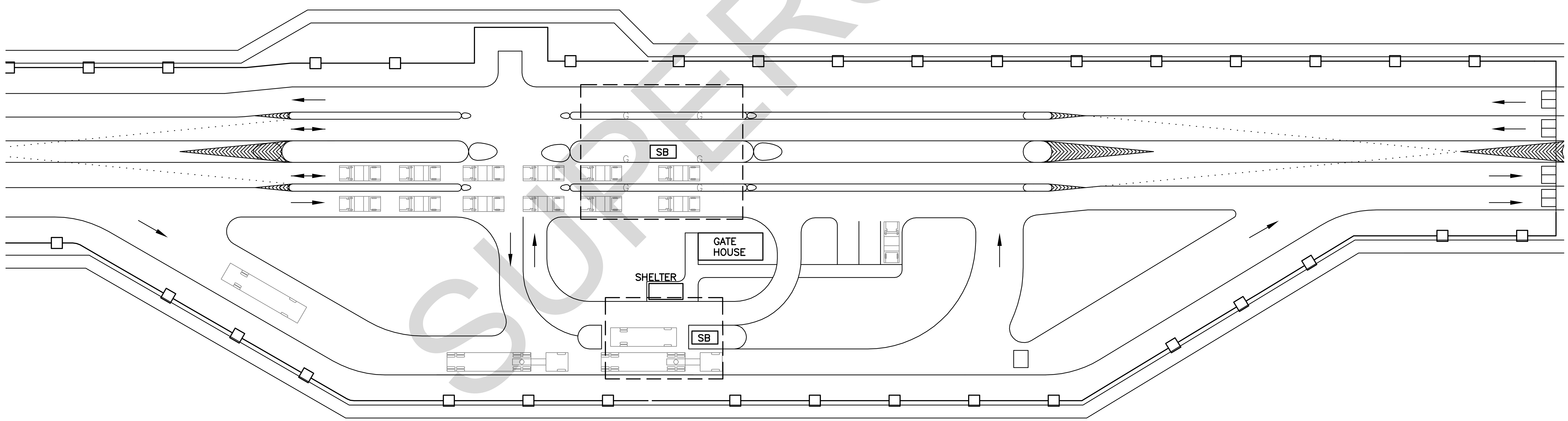
Email: armstrongte@saic.com

Appendix 1 – Prototype Design Drawings



ACCESS CONTROL ZONE OPERATED BY SECURITY PERSONNEL

SCALE 1:500



ACCESS CONTROL ZONE OPERATED BY SECURITY PERSONNEL

SCALE 1:300

1:500 0 10 20 30 40 50m

1:300 0 5 10 20 30m

DESIGNED & ENGINEERED BY:
LANTDIV
NAVAL FACILITIES ENGINEERING COMMAND

SYM. DESCRIPTION DATE APPR

SEAL

APPROVED

ACTIVITY – SATISFACTORY TO

DATE

APPROVED

FOR EFD FOR COMMANDER NAVFAC

DATE

A/E		EFD
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	DRAWN	RLW
	REVIEW	BRC
	QC	
	CHIEF ARCH./ ENGR.	

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DESIGN DIRECTOR

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ATLANTIC DIVISION
NAVAL STATION NORFOLK, VIRGINIA

PROTOTYPE ECP

CODE ID. NO. 80091 SIZE D
SCALE: AS NOTED
EFD NO.
STA. PROJ. NO.
SPEC. NO.
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
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C–1
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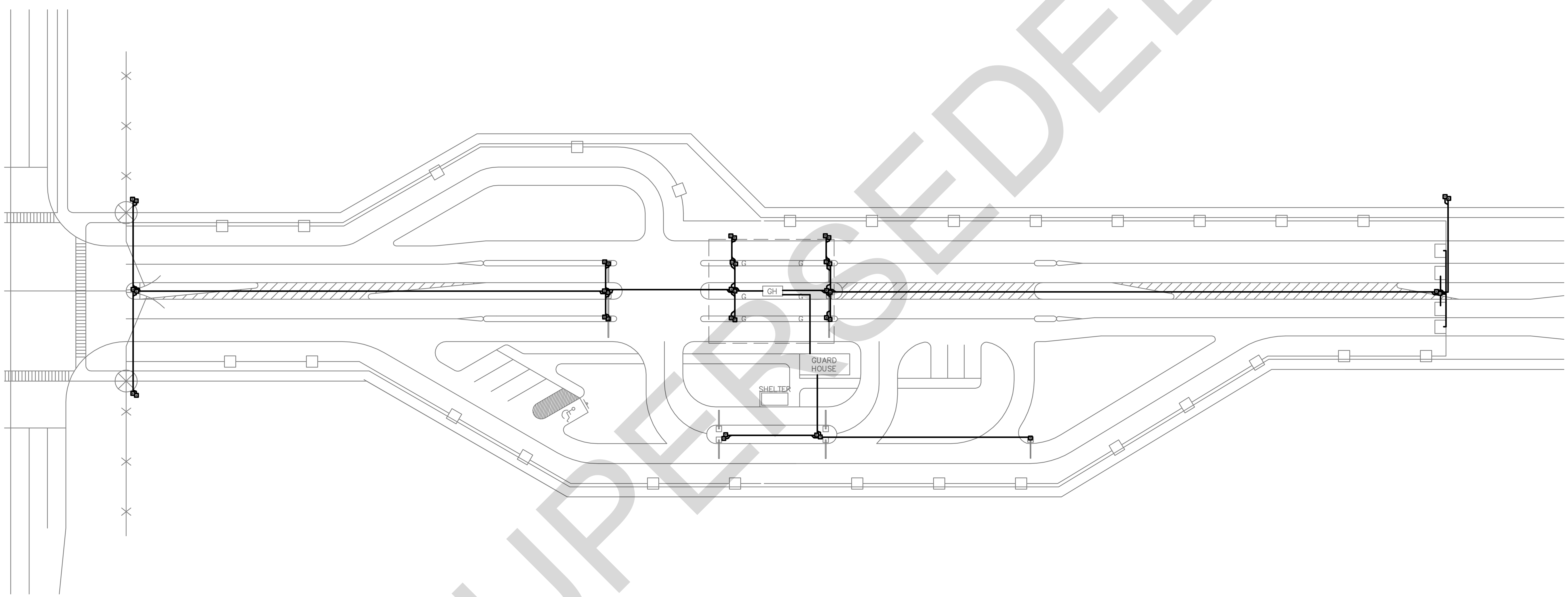

SITE PLAN

SCALE 1:400

GRAPHIC SCALE

1:400 0 10 20 30 40m

SYM. | DESCRIPTION | DATE | APPR.

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ACTIVITY – SATISFACTORY TO

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	DESIGN	RLS
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	REVIEW	BRC
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ATLANTIC DIVISION
NAVAL STATION NORFOLK, VIRGINIA

PROTOTYPE ECP

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SCALE: 1:400
EFD NO.
STA. PROJ. NO.
SPEC. NO.
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET OF
E–1

DRAWFORM REVISION SEPT 2001

FILENAME: PRELIM_FINAL.DWG, UPDATED ON 07/02/02 AT 15:26, XREFS: STREETLAYOUT

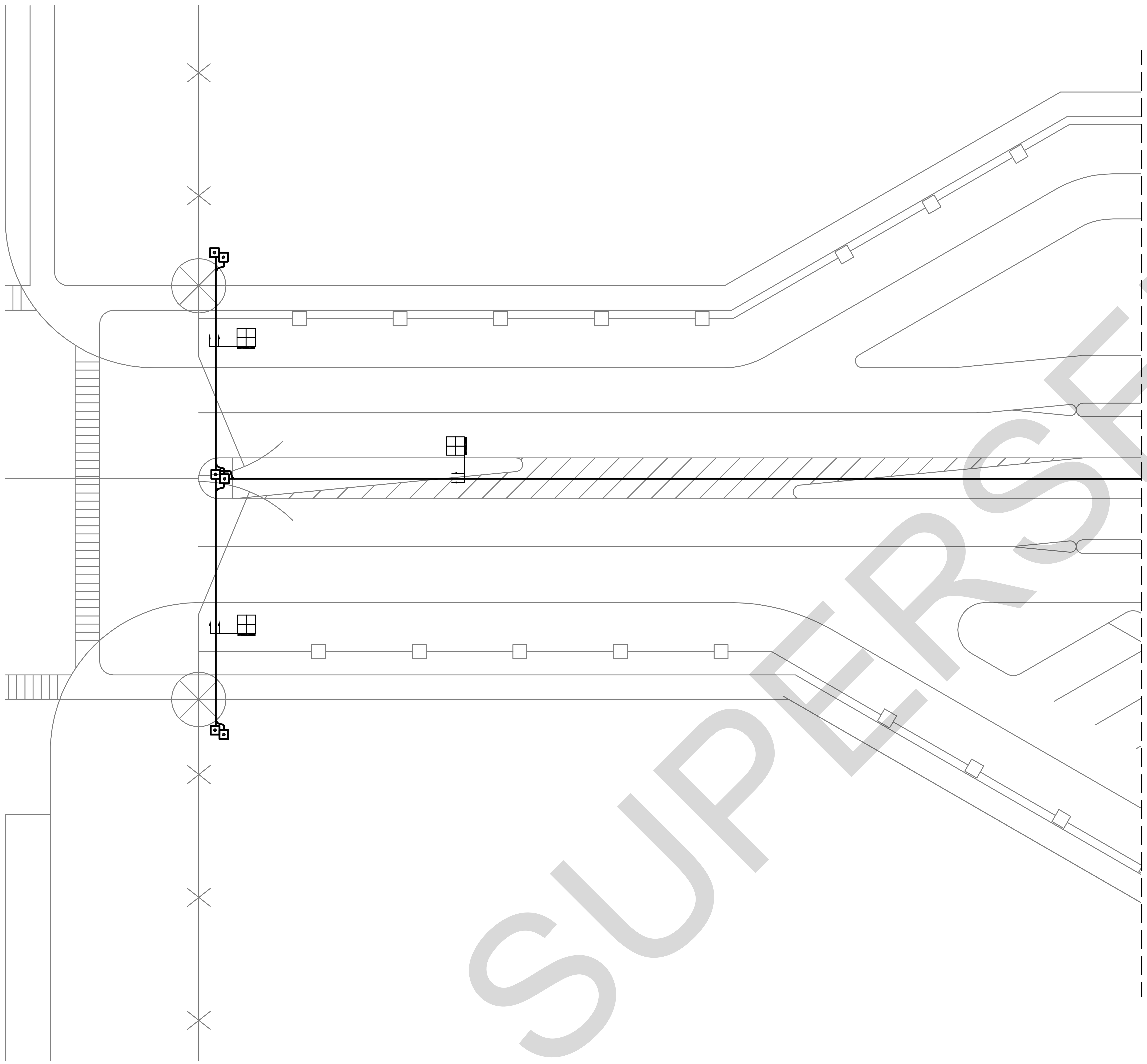
LEGEND

UNDERGROUND DUCTBANK, CONCRETE ENCASED UON. DESCRIPTION AS INDICATED.

HANDHOLE, TYPE 5 UNLESS OTHERWISE NOTED.

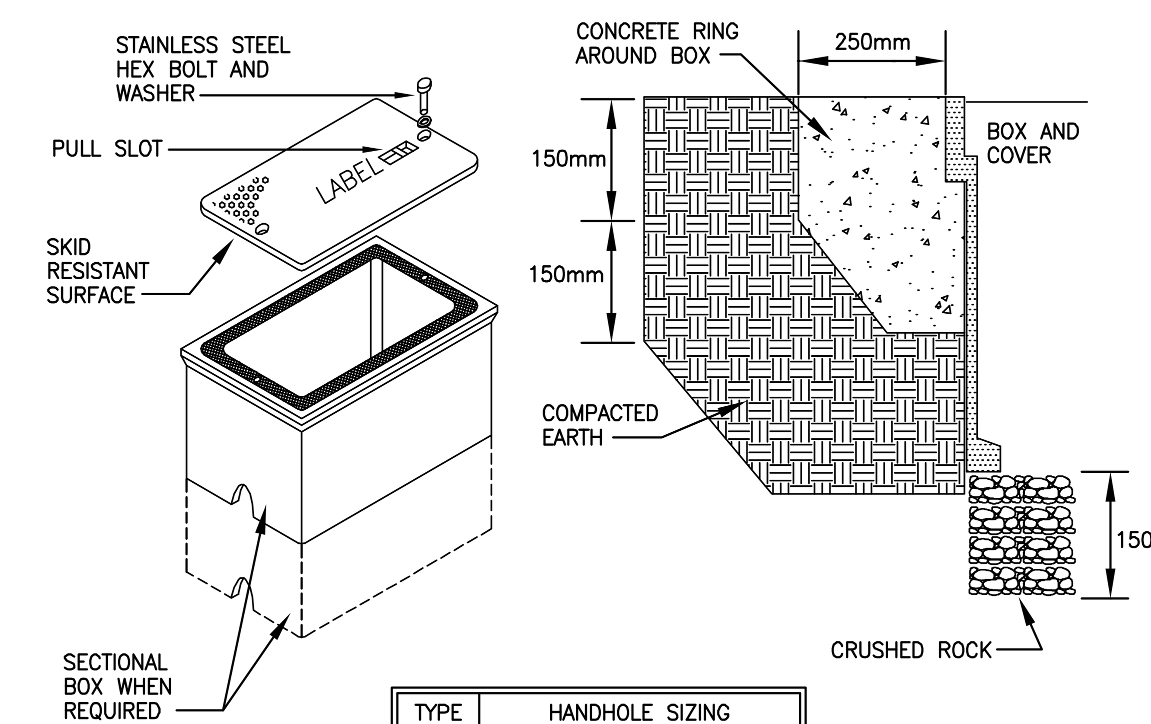
DUCTBANK SECTION LOOKING IN DIRECTION OF ARROWS.
SPARE DUCT (53mm TYPICAL).
HEAVY LINE INDICATES BOTTOM OF DUCT.

(E) EQUIPMENT CONNECTION



PARTIAL SITE PLAN – APPROACH ZONE

SCALE 1:200



TYPE	HANDHOLE SIZING
5	300mm X 300mm X 600mm DEEP
6	300mm X 500mm X 600mm DEEP
7	300mm X 600mm X 600mm DEEP
8	600mm X 1000mm X 600mm DEEP
9	800mm X 1250mm X 600mm DEEP

HANDHOLE REQUIREMENTS

1. HOUSING SHALL BE A POLYMER CONCRETE REINFORCED WITH A HEAVY WEAVE FIBERGLASS REINFORCING WITH COMPRESSIVE STRENGTH OF NO LESS THAN 70 MPa.
2. COVER AND BOX SHALL WITHSTAND A SERVICE LOAD OF NO LESS THAN 6800 kg OVER A 250 x 250 AREA.
3. PROVIDE STAINLESS STEEL BOLTS AND INSERTS.
4. PROVIDE WITH (2) 64mm MOUSEHOLES.
5. PROVIDE LABEL "ELECTRICAL" FOR POWER HANDHOLES OR "TELEPHONE" FOR TELEPHONE HANDHOLES, OR AS INDICATED.

STANDARD ELECTRICAL HANDHOLE (NONTRAFFIC)
(COMPOSITE/FIBERGLASS) TYPES 5, 6, 7, 8 & 9

SKETCH DATE JUNE 2002 | STYLE UG-6

GRAPHIC SCALE

1:200 0 5 10 15 20m

FILENAME: PRELIM_FINAL.DWG, UPDATED ON 07/01/02 AT 10:45, XREFS: STREETLAYOUT

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REVIEW BRC
QC
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BRANCH MANAGER
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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA

NAVAL STATION

PROTOTYPE ECP

CODE ID. NO. 80091 | SIZE D
SCALE: 1:200
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STA. PROJ. NO.
SPEC. NO.
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET OF
E-2

DRAWFORM REVISION SEPT 2001

SHEET NOTES

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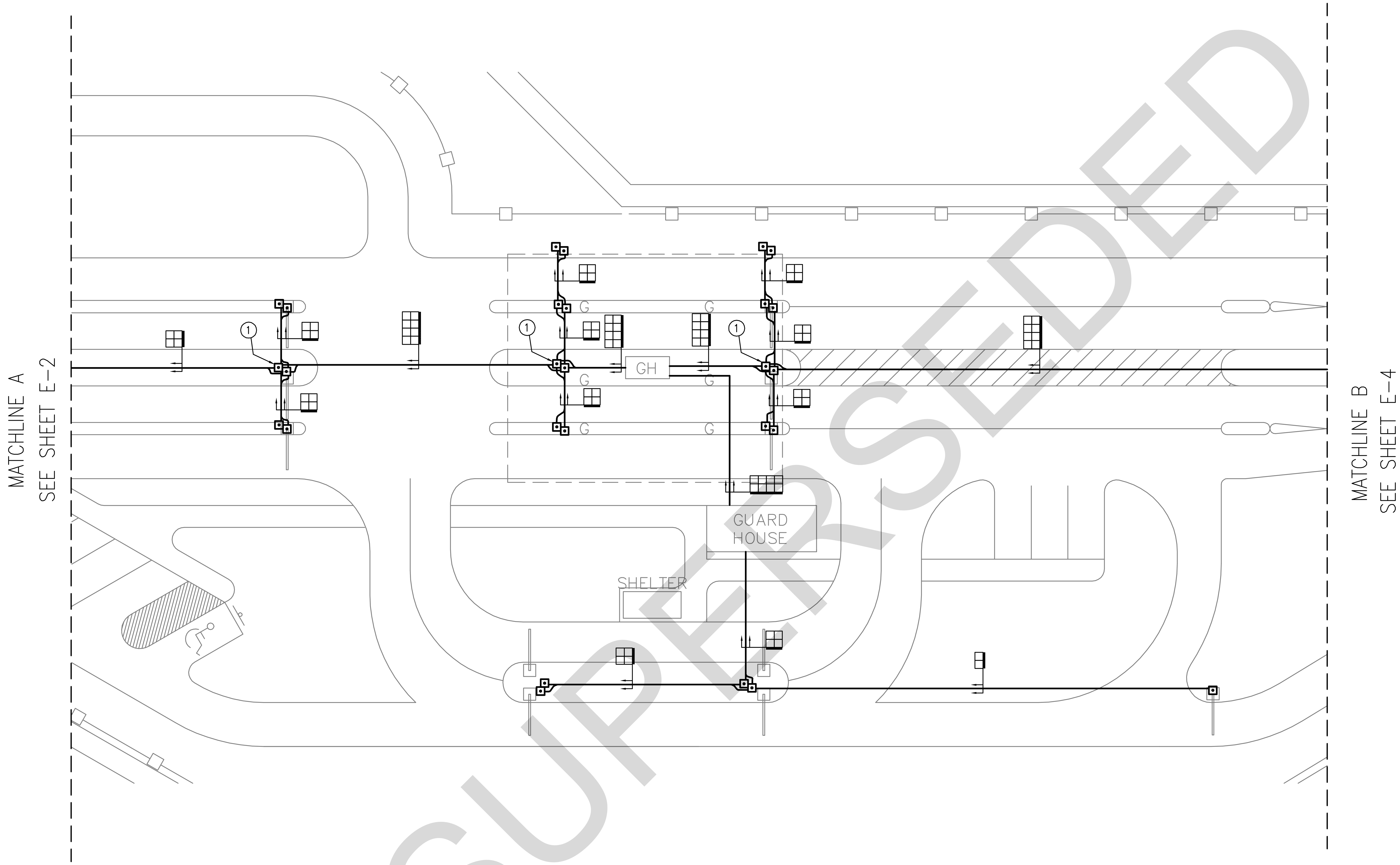

PARTIAL SITE PLAN – ACCESS CONTROL ZONE

SCALE 1:200

GRAPHIC SCALE

1:200 0 5 10 15 20m

SYM. DESCRIPTION DATE APPR

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ACTIVITY – SATISFACTORY TO

DATE

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DATE

A/E EFD

DESIGN RLS

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REVIEW BRC

QC

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NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION

PROTOTYPE ECP

CODE ID. NO. 80091 SIZE D

SCALE: 1:200

EFD NO.

STA. PROJ. NO.

SPEC. NO.

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET OF

E-3

DRAWFORM REVISION SEPT 2001

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SHEET NOTES

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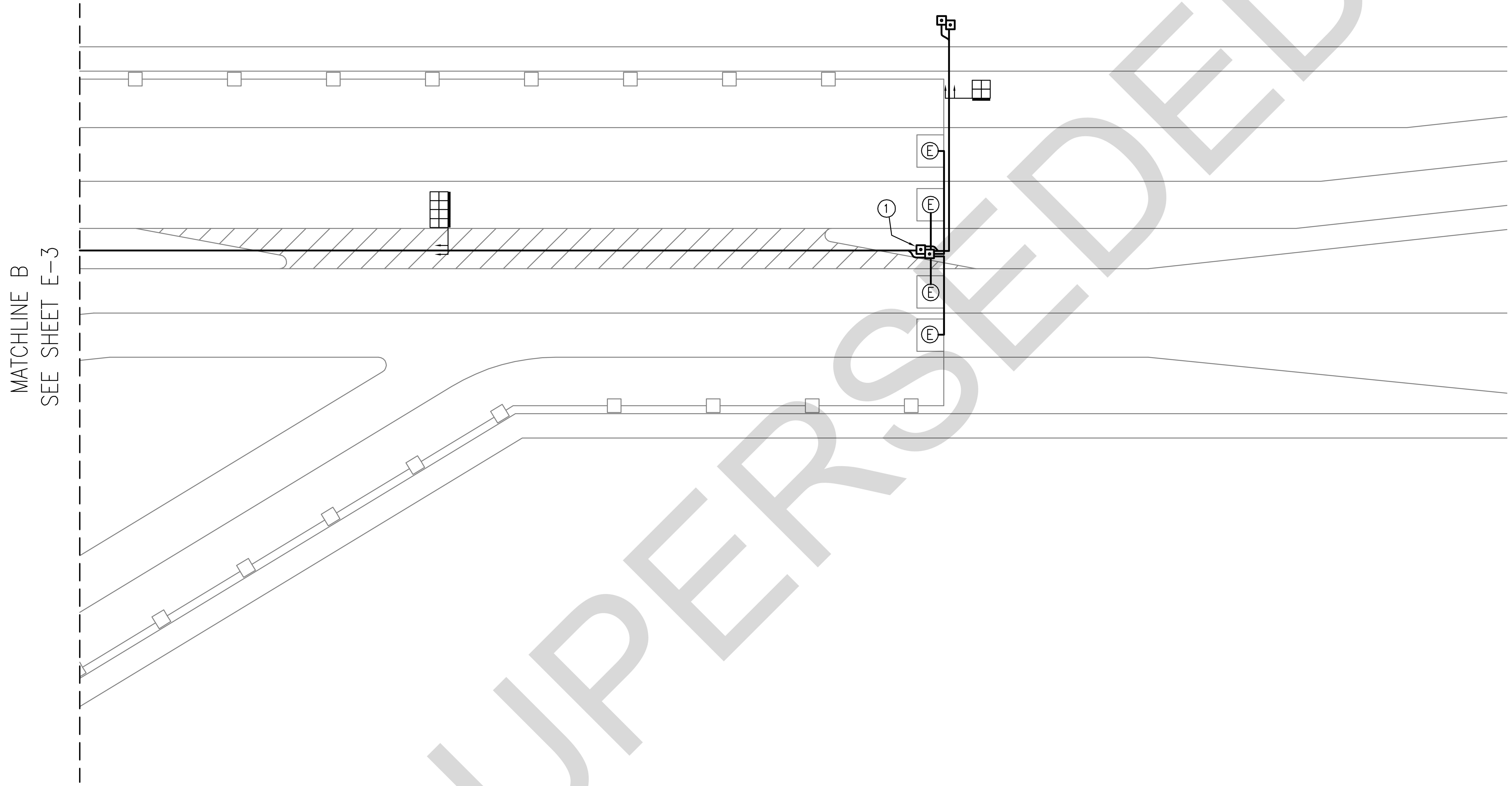
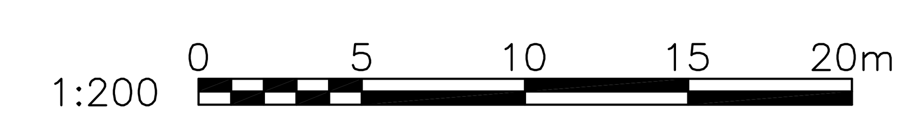


PARTIAL SITE PLAN – RESPONSE ZONE

SCALE 1:200



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	DESIGN	RLS
	DRAWN	SRG
	REVIEW	BRC
	QC	
	CHIEF ARCH./ ENGR.	

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ATLANTIC DIVISION
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NORFOLK, VIRGINIA

PROTOTYPE ECP

CODE ID. NO. 80091 SIZE D

SCALE: 1:200

EFD NO.

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SPEC. NO.

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E–4

DRAWFORM REVISION SEPT 2001